SCIENCE NEWS

THE AURORA BOREALIS

Science Service

THE shimmering glow of the aurora borealis, which has mystified scientists for many years, is now declared to be due to the action of electric radiations on crystals of solid nitrogen floating in the upper atmosphere. The statement is made by the Norwegian scientist, Professor Lars Vegard of the University of Christiana, as the result of experiments made in the cryogenic laboratory of Dr. Kamerlingh Onnes at Leyden.

Earlier theories about the aurora attributed it to electric radiations from the sun. Professor Vegard extended these theories and concluded that the aurora was due to the action of these radiations on nitrogen "snow" which he assumed to exist at an altitude of more than sixty miles above the earth.

To test the theory he froze nitrogen on to a copper plate by chilling the plate to the temperature of liquid hydrogen, much as the moisture of a warm room is frozen on to refrigeration pipes in cold-storage plants. The rest of the nitrogen was mostly exhausted, resulting in greatly reduced pressure above the deposit of solid nitrogen. These crystals were then bombarded by cathode rays.

Using potentials of from 250 to 750 volts, Vegard was able to make the nitrogen crystals emit light of a greenish color, which, when examined in the spectroscope, proved to be identical with the mysterious strong green line in the spectrum of the aurora that has always been a puzzle to investigators. Vegard also found that the crystalline nitrogen kept on emitting this greenish light several minutes after the bombardment of cathode rays had ceased.

He also explains the wonderful changes of color in the aurora, for he found that under the electric excitation the solid nitrogen partly evaporates and then begins to emit light of the reddish color so characteristic of nitrogen gas.

BIRDS ATTACKING FRESHLY SHORN SHEEP

Science Service

MYSTERIOUS and vicious attacks upon newly shorn or branded sheep in the grazing country of our northwest have at last been traced to the ubiquitous magpies which frequent the sheep ranges in great numbers. For several years the sheepmen have been puzzled by fierce attacks on sheep recently clipped or branded, the wound usually being made directly in the fresh brand mark or in some cut due to the shearing operation. S. Stillman Berry, of Redlands, California, determined to make a personal investigation of the matter and finally ran the culprits down.

It was known that in Australia the Kea parrot had been guilty of similar attacks and, as the magpies were particularly numerous in the bottom lands where the sheep were turned in for pasture after shearing, a close watch was kept and the birds caught in their nefarious work. When these occurrences were first noticed the wounds were not usually serious, but as the practice became more common the birds seemed to acquire great dexterity in inflicting deep and sometimes fatal wounds. It was found that they usually started on animals showing bad shearing cuts. They would perch on the animal's rump and peck and tear at the flesh, the sheep meanwhile standing utterly helpless. With development of the habit the birds became so bold that they would attack uninjured animals, tearing and pecking until they had opened a hole through the thin coating of wool left after the shearing and then into the body cavity in an endeavor to reach the kidneys, which for some reason appear to be particularly delectable to the birds. They were quick to learn the location of these organs in the animal's body and to recognize the ease with which they could claw and tear their way to their objective.

While Mr. Berry notes a considerable number of attacks by the magpies, they extend over a period of several years and he is inclined to believe that they are sporadic and not indicative of a general habit on the part of the bird. Should the habit develop into a general characteristic of the birds, the sheepmen will indeed be confronted by a serious problem.

BAYER 205

Science Service

THE mystery of the composition of Bayer 205, the famous and well-advertised German remedy for African sleeping sickness, is believed to have been solved by the French chemist, Fourneau, and his associates. A detailed account of their work has just been published in the *Annales de l'Institut Pasteur.*

The French scientists have composed a drug which they call "309," as absolute proof of its identity with the German drug has not yet been attained. It cures mice afflicted with the trypanosome infection that causes African sleeping sickness and which is transmitted to human beings through the bite of the tsetse fly. It appears to be superior to Bayer 205 in that only 1-160th of the fatal dose cured mice. Like the German drug, it irritates the kidneys.

The French savants were guided in their search for the elusive formula by a study of a succession of patents taken out by the Bayer Company. The compound they prepared was compared with a small amount of Bayer 205 that they had at their disposal, and the two appeared to be identical.

The name "309" is merely a nickname for this interesting drug which may be invaluable in opening for settlement areas of the African tropics now devastated by the sleeping sickness. Its full name with all decorations and titles attached is: "the urea of meta-aminobenzoyl-paramethyl-meta-aminobenzoyl-1-aminonapthalene-trisulphonate of sodium 4-6 8."

Other similar but less effective substances have been

prepared which it is thought may be serviceable in treating the sleeping sickness of domestic animals, which require larges doses than do human beings.

CHEAPER PHOSPHATES

Science Service

A REVOLUTIONARY method for the production of phosphoric acid, which will result in the saving of millions of dollars in freight rates now paid by the farmers, has been perfected by the Bureau of Soils of the U. S. Department of Agriculture. It consists in the smelting of the phosphate rock, briquetted with silica and carbon.

The phosphorus is driven off as fumes of phosphoric anhydride which are condensed and collected. The silica combines with the calcium. The process eliminates the old method of washing and screening phosphate rock, involving the loss of sometimes half the phosphoric acid contained in the deposit; and the further treatment with sulphuric acid which dilutes the phosphate rock one half and compels the consumer to pay freight on much useless material.

The volatilization process gives, on the contrary, a highly concentrated product which can be shipped long distances in lead-lined or wooden containers. Upon reaching its destination it can be mixed with the proper carriers to increase its bulk and to reduce it to the strength required for utilization by crops.

Arrangements for development of the process on a commercial scale are being made, which will result not only in a cheaper product but also in conservation of our resources of phosphate rock.

SULPHUR, SICILY AND CIVILIZATION

Bulletin of the National Geographic Society

THE United States is the world's greatest consumer of sulphur. Scientists maintain that, in the twentieth century, a nation's consumption of sulphur is a true measure of progress in civilization. Sulphur figures in practically every important manufacturing process.

Not only does the United States consume more sulphur than any other nation; it has become since the war the outstanding producer of sulphur. Back of this rise to preeminence, is a world drama between machinery and muscle, in which the United States and Sicily played the leading rôles.

The United States, armed with steam pipes, won. Sicily, actually starving, was about to give up when the American sulphur producers made an agreement to let Sicily serve the entire Italian market and ship a certain amount to other countries. It was an echo of the industrial revolution of the eighteenth century when machines began to do men's work.

Sicily in certain localities still mines sulphur as it was mined hundreds of years ago; even as the Aztecs mined gold and silver by laboriously carrying ore up in baskets. In some places the old smelting process is in use. This consists of erecting a pile of sulphur, igniting it, and letting the sulphur's own heat melt the ore. Only sixty per cent. of the mineral is recovered by this crude process and the product is impure. Better mines have cones in which the sulphur is melted and in some cases it is taken off in a volatile form, cooled to a liquid, and then to a solid block called "zolfogreggio."

Driven by competition, Sicilians used children in the mines. Child-labor presented itself in its most horrible aspects as children of seven and eight years tugged at baskets of ore in ill-made mines. Many were permanently deformed by the burdens. Gases engendered by sulphur compounds make the mines unusually dangerous.

Sulphur is found in paying quantities in many parts of the United States, but the richest deposits were discovered in Louisiana and Texas, near the coast. Here thousands of dollars and many lives were lost in wresting sulphur from nature. Quicksand, the great enemy of miners, was always on the job until finally necessity mothered invention. Frasch, a mining engineer, had an idea which revolutionized the sulphur industry.

Over a known sulphur "dome" 4,000 feet in diameter, a derrick looking for all the world like an oil derrick, was erected and a shaft forced down 1,000 feet to the sulphur. Three pipes were put down the shaft and in one superheated water under pressure was sent to do man's work. Sulphur melts at 240 degrees Fahrenheit, so it dissolves in the water. Hot air under compression was forced down a second pipe and soon hot water with liquefied sulphur came spouting up the third pipe. The stream from a "sulphur well" is directed into bins where the water is taken off leaving the mineral generally more than 99 per cent. pure. Steam shovels load it direct to freight cars. Economies of this process excluded the competition of cheapest Sicilian labor. The United States now produces 1,800,000 tons annually, almost nine times as much as Sicily mines.

If the world had known that a nation could be judged by its sulphur, England might have realized at once the American colonies' importance. The first ore shipment ever made from the United States was sulphur. When Captain John Smith established the Jamestown settlement in 1607, the colonists spent more time hunting gold than planting crops. Ships starting back for England filled their holds with what we now call "fools gold." The "precious" yellow mineral the colonists unearthened was sulphur; they sent pyrites back to England.

CARBON MONOXIDE IN CLOSED GARAGES

THE dangerous fallacy that the atmosphere in a closed garage is safe as long as an automobile engine continues to function has been disproved by a test conducted by engineers of the Interior Department at the Pittsburgh Experiment Station of the Bureau of Mines.

An ordinary touring car of popular make, which is operated daily, was run into a brick garage having a capacity of approximately 3,000 cubic feet, a dog was placed upon the driver's seat, and the engine allowed to continue running at an idling speed, which is much slower than the average motorist would use for "warming up" purposes. The doors of the garage were closed, and after 20 minutes operation of the engine, the dog

lost consciousness and fell to the floor of the car. An analysis of the air at this time disclosed the pr sence of 1.3 per cent. of carbon monoxide, which is sufficient to cause unconsciousness and death in a few minutes. The automobile engine was allowed to run until it stopped from lack of air, which occurred at the end of two hours, when the percentage of carbon monoxide present in the garage atmosphere was indicated as 2.1 per cent. an almost instantaneously fatal amount.

The engine functioned six times as long as the dog retained consciousness, proving conclusively that the continued operation of an automobile engine in a closed garage is no indication as to the condition of the air and that the engine will continue to function long after the operator has lost consciousness. This experiment was conducted in a garage several times as large as the average one-car garage, and it is safe to assume that a dangerous concentration of carbon monoxide would result in a one-car garage in less than half the time recorded in this experiment. In other words, the dog would have lost consciousness in about ten minutes after the starting of the engine, which would have continued running for about one hour. The Bureau of Mines calls attention to the great danger of any one entering a closed garage for the purpose of shutting off a running engine. This frequently happens on occasions when a motorist starts his engine and leaves it running while he returns to the house for something he has forgotten. It is quite certain under such conditions that dangerous concentration of carbon monoxide will occur in a very short time if the garage is closed, and when the motorist returns he is likely to encounter an atmosphere sufficiently charged with carbon monoxide to render him unconscious in two or three minutes and to cause his death if he is not promptly rescued.

In spite of repeated warnings issued by the Bureau of Mines and other organizations interested in safeguarding human life, the newspapers continue to report deaths caused by the operation of automobile engines in closed garages. Bureau engineers wish again to emphasize the fact that carbon monoxide is given off by an automobile engine at all times and is extremely poisonous. When it is necessary to warm up the engine or to make adjustments with the engine running, all the doors and windows of the garage should be open, or better still, the car should be driven into the open air where the poisonous gases given off are quickly dissipated.

ITEMS

Science Service

RADIO authorities in Washington are not greatly impressed with the reported discovery by an English inventor of a mysterious "ray," said to be able to stop motors at a distance, blow up ammunition, or even kill men. Dr. J. H. Dellinger, chief of the radio section of the U. S. Bureau of Standards, said the story looked very much like others which had emanated from Germany and France several months ago, and which upon investigation had not been substantiated. He said he knew of no kind of radiation which could accomplish the results that have been claimed in recent reports of the invention of the English scientist. Dr. W. E. Tisdale, secretary of the physics division of the National Research Council, considered the story a probable gross exaggeration of a basis of fact. "Of course," he said, "it is possible to have radio control of motors."

A NEW photographic developer, at least equal to the world-famous "metol" of German origin, is the result of recent research by Professor Walter G. Christiansen, at the Harvard Medical School. The new chemical is a derivative of carbolic acid containing chlorine, and is closely related to metol. Numerous developing agents have been marketed during the past thirty years, but metol has come to the front on account of its speed and power of developing fine photographic detail. Metol naturally has become a standard developer throughout the world despite its high cost. While the discoverer of the new developer makes no advanced claims, there exists the possibility that the new agent may be less harmful than metol to the skin and nails of the photographer. In the commercia manufacture of metol these seems to be produced with it a poisonous by-product which makes it impossible for certain people to handle the developer solution with bare hands.

A METHOD for photographing the gall bladder has been devised by Drs. Evarts A. Graham and Warren H. Cole, of the Washington University Medical School. They have found that if a drug known as tetra-chlorphenolphthalein be injected into a vein, it appears in the gall bladder within three hours. This drug is opaque to X-rays, so that if X-ray photographs are taken of a person three hours after an injection, the gall bladder appears clearly outlined. Gall-stones can be located. Better photographs were obtained in the case of normal than with diseased organs, but this itself was of value in making a diagnosis.

A NEW plant immigrant from Korea is expected by forage crop specialists of the U. S. Department of Agriculture, to make some of the waste places of the country bloom, not like the rose, but like a field of good alfalfa. The name of the foreign grass is Korean lespedeza, and it is kin to the Japanese lespedeza, which is well domesticated on former waste land in the south. The Japanese lespedeza does not like long summer days, and consequently does not produce seed much farther north than the Ohio river, although it will grow there. The Korean variety, on the contrary, will come to seed well to the north. Like the Japanese, it thrives on poor soil and is expected to be of great economic importance.

AUTOMOBILES were found to skid less on wet pavements than on dry ones at a recent braking test participated in by several makes of cars under the auspices of the Society of Automotive Engineers and the National Bureau of Standards. The most dangerous surface was found to be one which was partially wet, especially if it were dirty and covered with a thin film of oil, but tires were found to hold on thoroughly wet and clean pavement rather better than they did on dry.