

sunrise they will remain in the hut. The roof overhangs the walls for about three feet around the entire building, and reaches to within eight feet of the ground. The window openings are thus protected from the rays of the sun, and to guard against the mosquitoes there is a permanent wire gauze screen of no fewer than seventeen meshes to the inch. There is a space about eighteen inches deep left open around the entire house immediately under the overhanging eaves. This opening is fitted with wire gauze similar to that provided for the windows, and every precaution against the entrance of the mosquito is taken by having similar wire gauze fitted into the ventilating panels let into the ceilings of all the rooms. There are double doorways to the house. The floor is composed of tongued and grooved boards. The outer walls are covered with felting, and are boarded on the outside with rabbeted planks. The roof is constructed of tongued and grooved boards covered with woven wire roofing-felt. It is not only waterproof but airtight, and prevents the escape of cool air, which at night will find its way into the air tank created by this form of roof. The physicians will not take any quinine or other precautions against the dreaded malaria. It is their intention to mix freely with the inhabitants. In Italy two million people have malaria every year, and of this number, fifteen thousand die. If the experiment proves successful, it is probable that similar houses will be built in Africa and India.

The mosquito always exists in malarial regions, as far as has been investigated. If patients suffering from malaria come into the region, then the mosquito becomes infected and spreads the disease. Whether the insect can acquire the parasite from any other source than man has not been settled as yet. It is not probable, however; so far as it is known, malaria has never been acquired primarily in uninhabited regions. Thus explorers after passing through a country that would naturally be supposed to be malarious seem to be immune until they reach the coast, where the mosquitoes are abundant, and the insects are able to obtain the parasites from those suffering from the disease. An example of this is shown in Reunion Island, where there was no malaria until 1869. In that year a party of colonists came from India, and some of them suffered from malaria. The result was that the disease became very prevalent upon the island. The malaria spreader is the anopheles mosquito. It is a curious fact that they rest on a wall with their bodies at right angles to the surface, instead of flat against it as is the case in the ordinary mosquito. The anopheles mosquito lays its eggs in stagnant water. If all the pools of stagnant water were removed, the pest would not breed.

Dr. Low has discovered that the terrible tropical disease of elephantiasis is directly traceable to mosquito bites, and not, as has always been held, to drinking impure water.

#### CURIOUS THINGS IN CLOUDS.

BY GEORGE J. VARNNEY.

There are many actions of kites, when either well up in the sky or in the process of mounting, that are both surprising and puzzling to most observers. For instance, when one of those white-topped, peaked and bulbous masses of summer cloud, the cumulus, passes over a kite, the latter rises and follows after it as far as the string will permit, and high fliers even pass up through these, and may soar hundreds of feet higher.

Sometimes in midsummer the cumulus extends to a height of eight or nine thousand feet, while its base may be two or three thousand feet above the ground. In spring and autumn these clouds, are very much lower, and their depth is not half so great; while in the winter the cumulus rarely exists, because of the cold.

As soon as a kite enters one of these clouds, it begins to gather moisture. In the chillier atmosphere above the snow-like peaks and domes the moisture freezes; and if the kite is quickly drawn down, its surface will have a beautiful covering of extremely small ice crystals. This will sometimes happen also with the nimbus. The experiment helps us to understand better the structure of clouds and the formation of rain and snow.

A block of ice, as it is taken to the icehouse, generally shows two or more layers differing in color and texture, having been frozen at different times and under different conditions of temperature and wind. Similarly, there are layers or strata of atmosphere, one above the other in the sky, marked by different temperatures and other features. A stratum of the atmosphere is usually about a thousand feet deep, sometimes much more. Generally, too, the air of these various strata is flowing in different directions, which we may note by the movement of the clouds peculiar to these elevations.

In the region next above the cumulus another form of cloud, the stratus, has its home. In these the colder, denser vapor is extended horizontally in long masses, more or less thin and splintery.

Far above the stratus floats frequently a cloud of more ethereal appearance, the cirrus. It is always somewhat in the form of a brush of long plumes, or of long, untrimmed horse tails tossed by the wind. These clouds are composed of exceedingly delicate feathery

crystals. As the cirrus is the highest of the clouds, so the nimbus, or rain cloud, is the lowest, its usual altitude being from five hundred to a thousand feet.

The different elevations of the several kinds of cloud depend chiefly upon the variations of the temperature in the atmosphere; all kinds being generally lower in winter than in summer. Indeed, in winter the nimbus may almost drag on the ground; being observed as a dense mist, often descending in the form called "drizzle" and "Scotch mist."

The beams of stratus lie horizontally, often piled beam upon beam, of various lengths; and, if not too far above the horizon, individual clouds appear as though at different levels; while the cumulus may spread out in thick fleece-like masses, and, instead of towering like mountains, approach the stratus form. Both these kinds of cloud sometimes lie in wavy lines, indicating in the respective stratum a rolling-wave movement of the atmosphere; while more frequently they will have an appearance that suggests a water surface broken by gusts of wind.

To determine the height of clouds, an observer at each of two stations a mile or more apart measures the angle and altitude of some point of a cloud, the identity of which is ascertained from conversation by telephone; while synchronism in the observations is secured by the beating of electric pendulums. This is the method used at the celebrated observatory at Upsala, in Sweden.

Another method for obtaining the elevations, practised at Blue Hill Meteorological Observatory, near Boston, Mass., is (if the cloud is a low one) to measure its angle from the observer, and ascertain the distance of its shadow on the landscape by a local map of large size; the angle of the sun being obtained usually from astronomical tables. Thus the elements of a triangle are in hand, and by these the height of the cloud is readily determined. Its velocity may be learned by timing the passage of its shadow from point to point of known distance.

Another Blue Hill method of measuring the height of low clouds at uniform elevation is to send up kites into and through them. The length of the kite line, and its angle at the moment when the kite disappears in the cloud, give approximately the height of its lower surface; and the records of the barograph (the recording barometer) and hygograph (the recording hygrometer), both connected with a diminutive clock, the instruments carried up by the kites, mark the upper limit of the clouds; and thus their depth is made known. This is found to vary, in different kinds of clouds, from hundreds to nearly three thousand feet. Still another method that is frequently convenient for determining the altitude of the nimbus, low stratus, and the lower limit of the cumulus, is the noting of their height on the side of a mountain. For learning the altitude of very high and uniform cloud strata, the only practicable method is furnished by their illumination at night, as by brilliantly lighted cities. The angle of a straight line from the observer to the brightest spot of the stratum, the distance of the source of illumination being known, we may readily ascertain the length of the vertical side of the right-angled triangle.

The mean height of the loftiest form of cloud, the cirrus, is found to be about twenty-nine thousand feet, though it has sometimes been observed at an elevation of forty-nine thousand feet—nearly nine miles. The mean altitude of cumulus clouds is about four thousand six hundred feet; but the top of the cumulonimbus, or thunder shower cloud, is rarely more than twenty-three hundred feet, while these often sink to six hundred feet when they enswathe hills of no great height, sometimes leaving their tops quite dry.

The average velocity of cirrus clouds is about eighty-nine miles an hour, while in winter they have sometimes been known to travel at the rate of two hundred and thirty miles for the same time.

#### EXPERIMENTAL FORMATION OF THE FLUORIDES OF SULPHUR.

Messrs. Henri Moissan and P. Lebeau have presented to the Academie des Sciences an account of their experiments in the formation of the fluorides of sulphur; these they have been successful in producing by the use of glass vessels, as Moissan has previously shown that glass is not attacked by fluorine gas when perfectly pure. A glass tube closed at one end is filled with fluorine by displacement, and after closing the end with a glass plate it is turned into a mercury trough. The fluorine acts but slightly on the mercury, forming a layer at the surface.

Into the atmosphere of fluorine is passed a fragment of sulphur, supported by a platinum rod. As soon as the sulphur comes into contact with the gas, it takes fire, being surrounded by a livid flame, and the mercury rises in the tube. The gas remaining after the combustion of the sulphur is not absorbed by water, and only partially by potash solution. The portion of gas remaining, after treatment with an alkaline solution, is very stable and is acted upon only by sodium vapor, etc.

In the preliminary experiments at least two new

compounds were obtained; first, a gaseous body not acted upon by water, but absorbed by potash solution; second, a gas not absorbed either by water or by alkaline liquids, but decomposed by sodium vapor. The experiment was repeated a number of times to observe whether both gases were produced, but the result was always the same, no matter what proportions of sulphur and fluorine were used.

One of the gases has been separated by treating with potash solution, and its composition and properties have been studied. The gas is a perfluoride of sulphur, as is shown by analysis. To obtain a considerable quantity of the gaseous mixture containing the perfluoride, a small copper vessel containing 5 to 6 grammes of sulphur is placed in a copper tube whose ends are closed by screw-caps. The tube communicates on one side with the electrolytic fluorine apparatus designed by M. Moissan, and on the other to a copper tube spiral for condensing the gas, this being surrounded by a freezing mixture of carbonic anhydride and acetone, giving a temperature of  $-80^{\circ}$  C. The other end of the spiral passes into a glass flask, in which circulates a current of nitrogen, this being passed into the apparatus for some time before the experiment. The current of fluorine is then passed for about two hours, after which the sulphur has almost entirely disappeared from the vessel, the copper not being attacked; the sulphur has combined with nearly all the fluorine. The spiral condenser is taken off and a copper tube attached to it, whose other end plunges into a mercury bath. When the temperature of the spiral rises, the mixture of fluorides, which has been liquefied or solidified, takes the gaseous form and is collected in a flask above the mercury.

A liter of the mixture is placed with a concentrated potash solution for several hours, thus absorbing all but the perfluoride of sulphur. This gas has the formula  $SF_6$ , and is colorless, inodorous and non-combustible. It solidifies near  $-55^{\circ}$  C. to a white crystalline mass. The gas is but slightly soluble in water or alcohol. Although rich in fluorine, it appears to be very inert, and its properties resemble those of nitrogen. It is not decomposed by potash in fusion, nor by chromate of lead; it is decomposed by the electric spark, and upon mixing with hydrogen and treating by the spark in a closed vessel, the volume is diminished with the formation of a solid which deposits upon the walls of the vessel.

The action of various bodies upon the gas has been observed. Chlorine or iodine have no action upon it; oxygen, under the action of the spark, decomposes it with the formation of woolly masses of a brown color, this being a mixture of the products of decomposition; if the spark is less strong, an oxyfluoride is produced. Sulphur at the temperature of fusion has no action upon it, but if superheated in a bell-glass, it decomposes it into products containing less fluorine; selenium has an analogous effect. Phosphorus and arsenic have no action upon the gas, nor have boron, silicon or carbon heated to redness.

Of the metals, sodium has no action, and its brilliancy is not tarnished in the gas, but at its boiling point the surface takes a grey layer and when the sodium vapor is produced in abundance, the combustion takes place with brilliant incandescence and the gas is rapidly absorbed. Calcium is only tarnished by the gas; magnesium takes a white layer upon exposure to it. The experimenters are continuing their researches upon this new product, and will take up the study of the second gas produced by the reaction.

#### DEATH OF DR. PAUL GIBIER.

Dr. Paul Gibier, the head of the Pasteur Institute in the United States, was killed in a runaway accident at Suffern, N. Y., on June 9. He was born in France in 1851, and after graduating from the medical university at Paris, became Assistant-Professor of Comparative Medicine. In 1885, the French government sent him to Spain to study the outbreak of cholera there; and in the following year he was sent to the south of France to study the same disease. In 1888, the same government sent him to Havana to study yellow fever. On his way home he stopped in New York. He returned the next year, 1890, and started the Pasteur Institute in this country, a specialty of which was originally the preventive treatment for hydrophobia. The anti-toxines were all within its scope.

#### AN ACETYLENE GAS EXPLOSION.

A Brooklyn inventor had been engaged for some time in building an acetylene gas tank to supply light to his home. After it was completed he turned on the gas and lighted a match to locate leaks. An explosion took place, he was lifted off his feet and hurled across the room, and he died a few hours later. The tank was blown through the ceiling and roof, leaving a hole about six feet square. This is one of the most serious accidents which has occurred in some time in the use of acetylene gas, and emphasizes the fact that amateur generators should be carefully tested before they are put to practical use. Too much care cannot be taken on this point.