Sticks and Stones in Air We Breathe

Meteorology

Weather Scientists Discuss Air and Water

"NOT all we breathe is air. With every breath we inhale a million micro-sticks-and-stones and a host of other things that are no part of a pure atmosphere," said Dr. W. J. Humphreys, of the U. S. Weather Bureau, at one of the meetings in Des Moines.

"Where do they come from?" he inquired, and answered, "The heavens above and the earth beneath. Every wind that sweeps a desert catches up tons, and sometimes millions of tons, of pulverized rock to spread far and wide. Fragments of vegetable fiber litter the soil the world over and are wafted hither and yon as even the gentlest breeze may blow. Pollen of conifers, ragweeds, and a thousand other trees and plants we must take into our lungs from spring to fall every day we breathe the open air. And our bronchial tubes need chimney sweeps (luckily provided by nature) to get rid of their coatings of soot from kitchens, factories and forest fires.

"Even the ocean, through its evaporated spray, makes a salt mine of the air that we breathe. Then, too, lightning sprays nitrogen acids into the atmosphere, while soft coal and volcanic vents similarly add the sulphur acids—but all are too dilute really to bother us.

"Spores and microbes of many kinds we just have to inhale, for they are everywhere. And as if all this were not enough the earth, every now and then, explodes at some great volcano and hurls tons upon tons of rock powder into the air where it drifts far away for weeks, months or years, according to its degree of fineness and initial height attained.

"Finally, in addition to all this dust the world stirs up of its own, the atmosphere to its outermost limits is filled with the ashes, so to speak, of daily millions of incinerated meteors or shooting stars. That is how the earth got its konisphere or dust shell. If it had no atmosphere it would have no konisphere, but having an atmosphere it must also have a coexistent and coextensive konisphere."

Just as one may sleep warmly out of doors under a quilt, or shiver under a sheet, so the upper atmosphere, what scientists call the stratosphere, is kept warm over arctic latitudes by a thick layer of ozone. This was the explanation for a curious fact that has puzzled scientists, given by Dr. Humphreys.

The stratosphere is the layer of the atmosphere above the highest clouds, and unlike the lower layers, does not become colder with height. Temperature observations have been made of this layer by means of small balloons, equipped with recording thermometers. They reveal the curious fact, said Dr. Humphreys, "that the stratosphere is coldest over equatorial regions and becomes gradually warmer with increase of latitude, the extreme difference being around 35 degrees Fahrenheit—coldest over the warmest earth and warmest over the coldest earth."

Though a full explanation has not yet been made, Dr. Humphreys thinks that it is due to the ozone. Observations have shown that there is less ozone over equatorial than over arctic regions, a fact that is itself yet unexplained. But the ozone absorbs radiation from the earth, and reradiates part of it back again. Therefore, where there is more ozone, more heat is sent back, and so the upper atmosphere there is warmest.

MEASUREMENTS of the exact way in which the temperature of the Gulf Stream varies from one side to the other may aid in forecasting weather in the eastern United States, Prof. Charles F. Brooks, of Clark University, believes.

Recording thermometers have been placed on ships crossing the Gulf Stream at five different places in the Straits of Florida. Details of the temperature, alternating masses of warmer and cooler water, daily ranges in temperature and rapid changes of distribution are all written on the thermograph record, said Dr. Brooks.

"High temperature, speed, magnitude, and location makes the Gulf Stream the best known of all ocean currents," said Dr. Brooks. "The habitability of northwestern Europe is commonly ascribed to the high temperatures of the Gulf Stream, though this current is only part of the warm flow that ameliorates European climate. The importance of the Gulf Stream and the other warm waters of the western Atlantic has still to be fully appreciated. These warm seas are the progenitors of storms and the sources of rainfall.

"The speed of the current, 1 to 4 knots, is a notable aid and hindrance to navigation, though less so nowadays than in the periods of sailing ships. The commerce of the busiest ocean feels the movement, the warmth and the storms of the Gulf Stream. Even aerial navigation is disturbed by the bumpy air over it."

Relations between summer atmospheric pressure over the Pacific, and the temperature of the following winter of the upper Mississippi valley, that may develop into a method of forecasting mild or severe winters, were announced by Prof. Thomas A. Blair, of the University of Nebraska.

The winters in this region differ widely in temperature, said Prof. Blair. Some are almost continuously cold, while others are moderate with only brief cold periods. Methods of predicting in advance the severity would be of great value.

In a study of records for the past sixteen years, Prof. Blair has found that the severe winters are preceded by a belt of summer excess air pressure across the Pacific, including usually the west coast of the United States, the Philippines, Japan and Hawaii. In the autumns there are large areas of excess in the North Pacific. Warm winters, on the other hand, are preceded generally by a pressure deficiency over the Pacific belt, though sometimes it is farther north, including Alaska and Siberia, with pressures higher than normal at Honolulu and Manila.

Further study of these relations may lead to a method of accurate forecasting.

DESPITE the opinion of oldest inhabitants that the weather nowadays "ain't like what it was when I was a boy," the huge territory west of the Mississippi that formed the Louisiana Purchase enjoyed the same sort of climate in 1804 and 1805 as today. A century and a quarter ago exactly, at Fort Mandan, North Dakota, near the present city of Bismarck, the temperature at sunrise was four degrees below zero Fahrenheit, according to G. K. Greening, of the Weather Bureau at Sioux City, Iowa. The thermometer that recorded this temperature was the only one in the whole territory from the middle Mis-

Brightest Comet in Years Discovered

Astronomy

But Will Not Be Visible to Naked Eye

WILK'S comet, which was discovered on Dec. 20, by an astronomer in Poland, will not become conspicuous to the naked eye, even though it is brighter than any comet discovered for several years. This announcement was made to Science Service by Dr. A. O. Leuschner, director of the Students' Observatory of the University of California, following a preliminary calculation of the comet's path by E. C. Bower and F. L. Whipple.

These figures show that when the comet was discovered, it was 85,000,000 miles from the earth, and that it is now moving away from us. However, it is moving towards the sun, and on that account will brighten. This counteracts the greater distance from the earth, and so it will continue about the same brilliance for a few weeks. It is now about the eighth magnitude, too faint to be seen with the unaided eye even under best conditions, but a small telescope will reveal it. After January 8, it will be so close to the sun as to be lost in its glare. On January 22, it will reach perihelion, when it will be closest to the sun, at a distance of about 60,000,000 miles. After that it will probably appear to astronomers in the southern hemisphere for a few weeks.

When discovered, the comet was near the bright star Vega, seen low in the northwestern sky for a few hours after sunset, or low in the northeast for a few hours before sunrise. Since then it has been moving south and eastward, passing near Albireo, the bottom star of the northern cross, on Dec. 28. On Jan. 5 it will pass the constellation of Delphinus, or "Job's coffin", a diamond shaped group of faint stars seen in the west above the bright star Altair, in the eagle, just after sunset.

The calculation of the path was made with the aid of observations at Heidelberg, Germany; Yerkes Observatory, Wisconsin, and the University of California's Lick Observatory at Mt. Hamilton. In order to compute a comet's orbit, three positions are required, somewhat similarly to the way in which three points determine a circle. Any number of circles can be drawn to include a single point. Any number of circles, with a diameter at least as large as the distance between them, may be drawn so as to include two points. But only a single circle can be drawn so as to include three given points not on a straight line.

Wilk's Comet

Since the laws of a comet's motion around the sun are pretty well known the three observations of its position permit the calculation of its path. But the farther apart the observations are, the more accurately can the path be determined. The orbit calculated at Berkeley was from some of the earliest observations, over a period of less than two days. They gave figures accurate enough to enable the comet to be followed with the astronomers' telescopes without trouble, but a later, and more accurate determination will be made after observations have extended over several weeks.

The final orbit will tell whether the comet is really a new one, or an old one that has returned. Dr. Leuschner said that its orbit seems to show some resemblance to several others in the past, but that this cannot be settled definitely until a more accurate orbit is calculated.

This is the fifth comet discovered during 1929. It was not the first comet to be discovered by Prof. Wilk, for in November, 1925, he found one which was discovered independently by L. C. Peltier, an amateur astronomer of Delphos, Ohio. Consequently, it was named the Wilk-Peltier comet.

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Sticks and Stones—*Continued*

souri valley to the Pacific Northwest, so far as present records show, said Mr. Greening.

This famous thermometer, which was unfortunately broken a little later, was carried by a man with the appropriate name of Meriwether. He was Captain Meriwether Lewis, who, with Captain William Clark, led the famous Lewis and Clark expedition which first opened up the Northwest to civilization. Their records contain the first weather diary of this part of the country, said Mr. Greening, and are still preserved at the hall of the American Philosophical Society in Philadelphia. In addition to the weather records, which show the weather in 1804 and 1805 to have been similar to that of the present, many other valuable data about the territory were first set down.

Seen on any clear moonless evening after twilight as a faint beam of light in the western sky, the zodiacal light has long been an object of study by astronomers and physicists. Dr. E. O. Hulburt, of the U. S. Navy's research laboratory, suggested its connection with magnetic storms that sometimes affect the earth.

Recalling observations made 75 years ago by a navy chaplain, Rev. George Jones, Dr. Hulburt pointed out that most abnormalities of the zodiacal light, such as fluctuations, unusual brilliance or distribution over the heavens, followed magnetic storms. This, he thinks, indicates some connection, and suggests that the particles which cause the zodiacal light, by scattering light from the sun in some manner, originate in the atmosphere of the earth. The partly broken atoms high in the atmosphere may cause the phenomenon under the combined effect of the pressure of sunlight, the gravitation and magnetism of the earth.

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