I DIDN'T KNOW THAT!
WEATHER

by Robert F. Clarke
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I DIDN'T KNOW THAT: WEATHER

by

Robert F. Clarke

Everyone does talk about the weather, and the focus of this issue is not to serve as a text, but to give a sampling of the great mass of information and lore concerned with this universal topic of conversation. Some of these isolated bits may need more explanation, and would be better understood by reference to one or more of the books listed at the close of this issue or at your library. As with the format of previous I Didn't Know Thats, the following paragraphs are not arranged in any particular sequences or categories.

Enveloping the earth is a layer of gases and water vapor several miles in thickness which is termed the atmosphere. The name comes from the Greek words "atmos," meaning vapor, and "sphaira," which means sphere. This layer has the characteristics of an extremely thin soup, with a wide variety of components, as well as weight, density, elasticity and compressibility. The rotation of the earth and the sun's radiation cause phenomena in this layer which we call "weather."

Spring Fever is the vague feeling of mind-wandering, restlessness, and disinterest. It has been defined as "a vastly increased interest in things other than work."

In the U.S.A., between 1880 and 1935, more than six million windmills were sold by about 20 manufacturers. Their primary job was to pump water. Electric pumps took over this job after the REA began in 1935 and, by 1970, only two companies produced windmills.

Benjamin Franklin used a kite to demonstrate that electricity from a lightning bolt could be captured. Using a Leyden jar, which can store electricity, he brought the jar in contact with the kite string. Although the kite was not struck by lightning directly, there was enough electric energy in the air to charge the jar.

Kites are used by the U.S. Weather Bureau to study winds and atmospheric pressure high above the earth. "Jalbert" kites are flown from the Colorado Rockies to an altitude of 16,00 feet or more.

Dr. Robert Clarke is Emeritus Professor of Biology at Emporia State University and Editor of the Naturalist. His only qualification for authoring this issue on weather is that he has experienced it longer than most.
In the Northern Hemisphere, Spring moves northward about 15 miles per day, but 100 feet in elevation is equal to about 30 miles on level land in a north-south direction, so this correction must be taken into account.

Shoveling snow can be extremely dangerous. It is hard work and there are many deaths each year due to heart attacks brought on by this exertion.

One acre of grass releases about 2,400 gallons of water to the atmosphere through transpiration and evaporation. It is the equivalent of a 70-ton air conditioner.

An acre of Red Maple trees in a moist habitat can give off the equivalent moisture of a 28 inches per year rainfall.

During the drought in the 1950s, two-thirds of the 115,000 Kansas farmers had to find off-farm employment; and Oklahoma farm families were moving off the land at the rate of 4,000 per day by 1957.

It appears that a major drought occurs in the Great Plains or the Southwest about every 30 years, based upon past records.

The lowest possible temperature, absolute zero, is a theoretical point at which all molecular movement stops.

In case you don't know what rain is, it is defined as precipitation of liquid particles with diameters larger than .02 inch.

Cyclones are winds that circulate around a center, rotating counterclockwise north of the equator and clockwise south of it. Tornadoes and hurricanes are examples.

Death valley in California, reached 134°F (57°C) on July 10, 1913.

The coldest recorded spot on earth was Vostok, Antarctica, where, on August 24, 1960, the temperature dropped to -127°F (-88°C). In the U.S.A., Prospect Creek, Alaska, recorded -80°F (-62°C) on January 23, 1971.

A hailstone fell in Potter, Nebraska, that weighed 1½ pounds.

Unionville, Maryland, recorded a rainfall of 1.23 inches in one minute.

Snowfall amounts in the United States have been recorded as 76 inches in 24 hours at Silver Lake, Colorado; 390 inches in one month at Tamarack, California; and 1,122 inches in one season at Paradise Ranger Station, Washington.

Greatest average U.S.A. rainfall is at Mt. Waialeale, Kauai, Hawaii of 460 inches.
Wind chill factors are equivalent temperatures of combining wind speed and temperature. As the wind increases, the temperature that you experience becomes considerably less than that recorded on the thermometer.

In the Atlantic Ocean, air moving from the north toward the equator to replace rising heated air is deflected to the west by earth's rotation, giving rise to constant winds from the northeast in a wide band from North Africa to the West Indies. Columbus and, later, traders using sailing ships took advantage of this push in the right direction; thus, the name "trade winds." Return to Europe was by utilization of the more northern "prevailing westerlies."

A sample of dry, pure air contains about 78 percent (by volume) nitrogen, 21 percent oxygen, one percent argon, and a variable amount of carbon dioxide around 0.03 percent.

The ability of air to absorb water vapor varies depending on the temperature of the air. Warmer air contains more water vapor than the same amount of cooler air. When air contains all of the water vapor that it can hold at a given temperature it is saturated. After this, if the air is cooled, the water vapor condenses and leaves the air as precipitation, either as rain or snow.

A column of air from the earth's surface to the top of the atmosphere exerts a pressure on the earth's surface equivalent to a column of water 34 feet high or a column of mercury, 30 inches high.

Pressure and density of the air decreases with increasing altitude; there is no distinct upper limit to the atmosphere, for it gradually merges into empty space.

Until about 1914, atmospheric pressure was recorded in units of length (inches or millimeters of mercury). Since then, a new unit, the millibar (mb), has come into use. Normal pressure at sea level is roughly 30 inches (760 millimeters) of mercury, which corresponds to 1013 millibars.

An aneroid barometer is an air-tight metal box from which some air has been removed. Variations in atmospheric pressure cause the box to contract or expand, moving an indicator on a calibrated scale. This instrument is used when the mercury barometer is not feasible. A change in the graduations on the aneroid barometer and becomes an altimeter, to indicate altitude.

Dew-point temperature is the temperature to which the air must be cooled, with the moisture content constant, to become saturated. The closer the dew-point is to the actual temperature, the greater the likelihood of fog or clouds.
Relative humidity is expressed as a percent (a ratio) of the moisture content of the air to the amount of moisture that air could hold if saturated at that same temperature.

A human hair varies in length with moisture in the air. When the air is dry, the cells are close together; as humidity increases, moisture gathers between the cells, increasing the hair's length. Advantage of this phenomenon was used to construct a hair hygrometer, which used a hair, connected to an indicating hand on a calibrated dial, to measure changes in humidity.

Wind velocities are expressed in miles per hour (mph) or knots. Knots are used for nautical measurement and a knot is longer than a mile. Thus: 1 meter/second = 3.6 km/hour = 2.24 mph = 1.94 knots.

Latitudes around 30° in the Atlantic Ocean are in the area of “highs.” Winds in these high areas are generally calm or very light. In the early days of New World exploration and exploitation, Spanish sailors gave the name “Horse Latitudes” to this region because their ships, lacking sailing wind, often were becalmed so long that the horses on board had to be thrown overboard in order to prolong the shrinking supply of drinking water.

Modern weather forecasting is aided greatly by use of radar and satellites, which allows constant monitoring of air mass movements.

Cloud formations are limited to 10 international types, arranged according to height above the ground: high (cirrus, cirro-stratus, cirro-cumulus), medium (alto-stratus, alto-cumulus), low (strato-cumulus, nimbo-stratus, stratus), and by vertical development (cumulus, cumulonimbus).

Luke Howard, a London chemist, is responsible for the cloud classification that we use today. He named four types: cirrus, because the thin wisps reminded him of hair; stratus, because they spread out like a sheet; those that gathered into a heap, cumulus; and the ragged, shapeless, threatening cloud, nimbus (which means “cloud”). These join in descriptive pairs that form the ten categories of cloud types, such as “cumulo-nimbus,” the huge “thunderheads,” and “alto-stratus,” a dense sheet of bluish or grayish color.

Fog is formed when the air near the earth's surface is cooled below its dewpoint. It is, essentially, a cloud touching the earth. It is called a fog when visibility is less than one kilometer (5/8 mile); if visibility is greater, it is a mist.

Hail is precipitation of ice balls or lumps 5 mm or larger in size. It falls almost exclusively in violent thunderstorms and is very rare at temperatures below freezing at the earth's surface.
A scale for wind speed by observation was introduced by Admiral Beaufort in 1805. It is still in use internationally and measured wind velocities are converted to Beaufort numbers in order to have a uniform standard. Although originally intended for use at sea, the following scale uses only the land characteristics under "observations."

<table>
<thead>
<tr>
<th>Beaufort number</th>
<th>Wind velocity (m.p.h.)</th>
<th>Description</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Less than 1</td>
<td>Calm</td>
<td>Smoke rises vertically.</td>
</tr>
<tr>
<td>1</td>
<td>1-3</td>
<td>Light</td>
<td>Direction shown by smoke drift, but not by vanes.</td>
</tr>
<tr>
<td>2</td>
<td>4-7</td>
<td>Light</td>
<td>Wind felt on face; leaves rustle; wind vanes moved.</td>
</tr>
<tr>
<td>3</td>
<td>8-12</td>
<td>Leaves and twigs in motion. Wind extends a light flag.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>13-18</td>
<td>Moderate</td>
<td>Raises dust and loose pages and moves small branches.</td>
</tr>
<tr>
<td>5</td>
<td>19-24</td>
<td>Fresh</td>
<td>Small trees in leaf begin to sway.</td>
</tr>
<tr>
<td>6</td>
<td>25-31</td>
<td>Strong</td>
<td>Large branches begin to move. Telephone wires whistle.</td>
</tr>
<tr>
<td>7</td>
<td>32-38</td>
<td>Strong</td>
<td>Whole trees in motion.</td>
</tr>
<tr>
<td>8</td>
<td>39-46</td>
<td>Gale</td>
<td>Twigs break off. Progress generally impeded.</td>
</tr>
<tr>
<td>9</td>
<td>47-54</td>
<td>Gale</td>
<td>Slight structural damage occurs. Chimney pots removed</td>
</tr>
<tr>
<td>10</td>
<td>55-63</td>
<td>Strong Gale</td>
<td>Trees uprooted. Considerable structural damage.</td>
</tr>
<tr>
<td>11</td>
<td>64-75</td>
<td>Strong Gale</td>
<td>Damage is widespread. Experienced round the edge of hurricanes and tornadoes.</td>
</tr>
<tr>
<td>12</td>
<td>above</td>
<td>Countryside is devastated. Winds of this force are encountered only near the center of hurricanes, typhoons, etc.</td>
<td></td>
</tr>
</tbody>
</table>
Along the coast in summer the land is at a higher temperature than the water during the day and colder at night. Air rising over the hotter area causes air to move from the cooler area. This makes for a breeze from the sea during the day and off-shore at night. This same sort of phenomenon gives rise to upslope breezes on mountains during day and downslope at night.

*Waterspouts* are tornadoes that form at sea.

Every point on earth gets the same amount (\(\frac{1}{2}\) year) of daylight each year; because, by symmetry, for each day longer than 12 hours in summer there is a corresponding winter day that is shorter by the same amount.

In one month, July 1861, Cherrapungi, India, received 366 inches (over 30 feet) of rain, as a result of a terrifically heavy monsoon.

Large bodies of water act as heat reservoirs. Thus, Michigan winters are not as severe as those in Wisconsin, for the westerly winds cross Lake Michigan, which acts as a heat reservoir.

Although it is the sun that controls the weather and all life, the earth receives only one-millionth of the energy emitted from the sun's surface.

Sometimes air descends so rapidly from the Alps and the Rockies that it arrives in the foothills as a warm, dry wind, causing a rapid rise in temperature. In the Alps this is known as the *foehn*; at the foot of the Rockies as the *chinook*.

Because of its inclination, the earth is not heated all over equally by the sun; the equatorial region always gets more radiation than the poles. The heated air at the equator rises and the cooler (heavier) air moves from the poles to take its place. Thus, the pressure is greater at the poles than at the equator. As the equatorial air moves northward (or southward) at high levels, it cools rapidly. Becoming heavier, it returns to earth at 30° latitude, fanning out north and south. The part that goes south builds up high pressure on the south side and becomes an east wind. The part that goes north becomes a west wind. Also, the southward wind from the Pole acts as an east wind at the surface. At 60° latitude, it meets the northward-drifting west wind that had started out at 30°. This latter wind tends to be forced upward over the colder air and moved back toward the equator. Instead, therefore, of uniform easterly winds at the surface over the Northern Hemisphere, there are three different belts, or cells; easterly winds from the equator to 30°, westerly from 30° to 60°, and easterly again at 60° to the Pole. Thus, we have a high pressure, dry-air mass coming to earth at 30° latitude. It is this moisture-seeking, rather than moisture-bearing, air that causes the deserts of the earth to be located at 30°.
The sea can be a heat reservoir, receiving heat in summer and repaying the heat in periods of cold. For example: a 60-foot layer of the ocean 2°F above normal will retain half its excess heat for about 200 days, one-quarter for about a year, and at the end of two years still be very slightly above normal.

Our weather is an interaction of many factors, all of which are liable to variation. It is asking for trouble to rely all of the time upon easily remembered "rules of thumb," which have wide appeal.

The word weather refers to the more or less instantaneous conditions in the atmosphere or the trend of these conditions over a relatively short period of time. The word climate refers to the mean or normal conditions over a long period of time, such as 20 or 30 years or so. Thus, although the wind, temperature, humidity, cloudiness, etc., are subject to incessant variations, the climate in a given place is more or less invariant.

Among the tongue-in-cheek, quack weather forecast instruments was the "mule barometer." This was a picture of a mule with a string tail which was hung out of the window. Weather was told by the following: "If tail is dry--Fair; If tail is wet--Rain; If tail is swinging--Windy; It tail is wet and windy--Stormy; If tail is frozen--Cold."

Relative humidity can be measured by use of a psychrometer, an instrument which passes air over two thermometers, one of which has a dry bulb and the other a wet bulb. The difference in the thermometer readings can then be read as percent relative humidity by consulting a prepared table.

Clouds are made up of a myriad of solid, usually dust, and liquid particles. These particles stay aloft because of the lift of ascending air currents, which feed and form the cloud. In the evening, these lift currents abate because of the cooling earth. The particles (cloud) begins to descend, but the air warms up because of compression and the water particles evaporate and vanish long before they reach the earth's surface. This is what usually happens to fine-weather clouds. However, if the convection rise is particularly strong and the tiny particles join to form large drops, some may fall to earth as rain.

Air rises upward in the vicinity of a well-developed thunderhead, frequently exceeding 20 miles an hour (1,760 feet a minute).

Large hailstones that have been cut in half show an onion-like layering, which indicates that the stone was built up by dropping and raising again a number of times through the thunderstorm.
Future global weather may be seriously affected by modern technology. Carbon dioxide from burning fuels, auto exhausts, and other gases are causing a "greenhouse" effect, raising the temperature of the atmosphere. If nothing is done to stop this, the earth's temperature could rise 8°F in 40 years, melting polar ice caps and raising sea level by a foot or more, inundating coastal areas.

*Rings* around the sun or the moon are formed by refraction of light through ice crystals. They have long been used to predict rain. Of course, this does not always occur, but the probability is greater after you have seen a halo (ring) than before.

A *rainbow* is produced by sunlight being broken up into its constituent colors by falling rain drops--as a prism does. A person on the ground must have his back to the sun in order to view the rainbow. It appears on earth as an arc, but if you went high enough in an airplane, it would appear as a full circle. The center of the rainbow is always opposite the sun and is below the horizon equal to the amount the sun is above it. Therefore, more rainbow will be seen in early morning or late afternoon, and around noon only in the winter months. Rainbows are never seen around noon in the tropics.

Crickets can give an indication of the air temperature. Count the number of chirps in 14 seconds and add 40. You'll be close.

Ever see puddles ahead on a highway during the daytime and when you get there, no puddles? These *mirages* occur when a thin layer of very hot air forms on the pavement. The air layer above this hot layer is much cooler, perhaps 30°F or so. Light is defracted and the rays are bent upward, forming a "mirror" between the cool air and the ground. It is the sky that you see reflected in this "mirror." Mirages may occur in large sandy or bare areas which give the illusion of a big body of water, even with waves and islands.

A drop of water that is doubled in size will increase eight times in weight.

Lightning discharges free nitrogen from the surrounding air, which then comes to earth and is available to plants. As much as 100,000,000 tons of nitrogen are spread over the earth each year as a result of lightning.

How far away is a lightning flash? Since sound travels about a mile in 5 seconds, count the seconds following the flash until you hear the thunder: 10 seconds would indicate 2 miles and a 2 or 3 second interval tells that the lightning was a half-mile or so.

Lightning is not a single streak, but is made up of a "leader" that darts in 100 foot leaps to the ground, an extremely short intense-high-voltage surge goes up the path from ground to cloud, followed by a longer (1/10 to 1/1000 second) bolt returns to earth, in many cases causing damage to the object "hit."
Static electricity discharges in the atmosphere may be seen as St. Elmo's Fire. These are small electrical "brush" discharges which are seen on the masts and spars of ships. Looking unearthly, they have generated numerous yarns. The discharges are seen when the air is tense with electrical energy and are usually associated with fronts.

Tornadoes usually travel from southwest to northeast, and at between 25 and 60 miles an hour. The spinning vortex has winds that rotate counterclockwise and may have a velocity of 500 miles an hour.

Violent storms can be extremely costly in terms of lives and property lost, witness a few examples:

October 31, 1876, India: a cyclone and tidal wave covered 3,000 square miles and killed 215,000 people.

February 19, 1884, U.S.A.: Tornadoes tore a path from Mississippi through Indiana, killing 800.

March 18, 1925, U.S.A.: Missouri and Illinois hit by tornadoes, with 792 killed.

September, 1928, Florida: A hurricane caused Lake Okeechobee to overflow, killing 1,836.


September 20, 1974, Honduras: The northern part of the country was swept by Hurricane Fifi, killing 8,000 and making 100,000 homeless.

Hurricanes are cyclonic storms produced in tropical water with wind strength above 75 miles an hour. Most hurricanes occur during the months of June through October, with most in August, fewer in July, and about half of August's number in each of June, September, and October. Since most all of our hurricanes develop in the West Indies and move either up the Atlantic coast or into the Gulf of Mexico, July and August would not be the best months to plan a Caribbean cruise.

The Gulf Stream, a warm current flowing northward not far from the Atlantic coast, does not affect the east coast weather very much because the prevailing winds are offshore. It is different in Great Britain, where the Gulf Stream turns southward after crossing the Atlantic. Now, the winds are from the sea and are warmed appreciably before getting to the British Isles; if this were not the case, people in London may be living in igloos.
Snow acts as an insulating blanket because there is a great deal more air than ice present; the air acting as an insulator, keeping the soil beneath the snow at a rather steady temperature just below the freezing point while air temperature is considerably below zero.

Most snowfalls in the United States occur when the temperature is between 24° and 30°F.

The coldest part of the winter occurs around the end of January and the first part of February, although the shortest day (winter solstice) is December 22.

Of all weather indicators, clouds are probably the best.

The colors of the sky depend upon the amount of moisture and dust particles in the air, the sun's rays being broken up and scattered by a prism effect. When there is less moisture and fewer particles, the sky is blue; with an increase, it may become yellow or red. A red seen in the morning indicates a large amount of moisture and/or dust in the air.

Sunspots, signs of solar activity, affect the weather because of the dependence of the earth on solar radiation. These sunspots vary in number with a regular cyclic frequency. And can be used with some justification for forecasting certain weather.

At times, earth's weather has been affected by large volcanic activity. Clouds of volcanic dust have covered large areas for days, even years, following such eruptions as Pelée, Martinique, in 1902; Katmai, Alaska, in 1912; and Colima, Mexico, in 1903.

Edmund Halley (1656-1742) of comet fame, was the first to give a satisfactory explanation for the cause of the planetary movement of the air.

In the Middle Ages, and into the Renaissance, a person desiring to learn what weather might come had to depend upon his own traditional "weather signs" or could purchase a forecast from an astrologer.

The science of meteorology arose in the 17th century because the accurate measurement of conditions could be made by the introduction of Galileo's thermometer in 1607 and Torricelli's barometer in 1643.

The ancient Greeks thought that the moon controlled all things moist, and that dew was the son or the daughter of the moon.

An idea of the Romans persisted into the Renaissance that the damaging effect of lightning was due to a "thunder-stone," which consisted of "brimstone and other metallic substances."
Large air masses regularly surge from Canada or the tropics as cold or warm entities. When the two unlike masses meet, a *front* is formed. If the cold mass moves along the ground, pushing up the air ahead of it, it is termed a *cold front*; when the warm air causes a retreat of the cooler air ahead of it, it is a *warm front*. Characteristic weather patterns occur before, during, and following the passage of one of these fronts. The chart below summarizes each:

**BRIEF SUMMARY OF FRONTAL WEATHER**

<table>
<thead>
<tr>
<th>Ahead of Cold Front</th>
<th>Ahead of Warm Front</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where you are:</strong></td>
<td>In warm air</td>
</tr>
<tr>
<td><strong>Pressure:</strong></td>
<td>Falling rapidly</td>
</tr>
<tr>
<td><strong>Temperature:</strong></td>
<td>Warm</td>
</tr>
<tr>
<td><strong>Wind:</strong></td>
<td>Strong southwesterly</td>
</tr>
<tr>
<td><strong>Clouds:</strong></td>
<td>Altocumulus, some cumulus</td>
</tr>
<tr>
<td><strong>Weather:</strong></td>
<td>Swelling cumulus, showers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passing Cold Front</th>
<th>Passing Warm Front</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where you are:</strong></td>
<td>In frontal zone</td>
</tr>
<tr>
<td><strong>Pressure:</strong></td>
<td>At lowest point</td>
</tr>
<tr>
<td><strong>Temperature:</strong></td>
<td>Beginning to drop</td>
</tr>
<tr>
<td><strong>Wind:</strong></td>
<td>Shifting, gusty south to west</td>
</tr>
<tr>
<td><strong>Clouds:</strong></td>
<td>Cumulonimbus or stratocumulus</td>
</tr>
<tr>
<td><strong>Weather:</strong></td>
<td>Heavy, brief showers, gusty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Behind Cold Front</th>
<th>Behind Warm Front</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where you are:</strong></td>
<td>In cold air</td>
</tr>
<tr>
<td><strong>Pressure:</strong></td>
<td>Rising rapidly</td>
</tr>
<tr>
<td><strong>Temperature:</strong></td>
<td>Falling rapidly</td>
</tr>
<tr>
<td><strong>Wind:</strong></td>
<td>Strong from northwest</td>
</tr>
<tr>
<td><strong>Clouds:</strong></td>
<td>Stratocumulus, clearing</td>
</tr>
<tr>
<td><strong>Weather:</strong></td>
<td>Snow flurries, or rain, then clear, cold</td>
</tr>
</tbody>
</table>

| **Where you are:**  | In frontal zone     |
| **Pressure:**       | At lowest point     |
| **Temperature:**    | Beginning to rise   |
| **Wind:**           | Shifting east to south |
| **Clouds:**         | Nimbostratus, cumulonimbus |
| **Weather:**        | Heavy rain or snow, sometimes fog |

<table>
<thead>
<tr>
<th><strong>Behind Warm Front</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where you are:</strong> In warm air</td>
</tr>
<tr>
<td><strong>Pressure:</strong> Rising slowly</td>
</tr>
<tr>
<td><strong>Temperature:</strong> Becoming warm</td>
</tr>
<tr>
<td><strong>Wind:</strong> South</td>
</tr>
<tr>
<td><strong>Clouds:</strong> Scattered cumulus, hazy</td>
</tr>
<tr>
<td><strong>Weather:</strong> Warm, humid, occasional precipitation</td>
</tr>
</tbody>
</table>
Although observations of frontal phenomena have been made for centuries, it was after World War I that V. Bjerknes's frontal theory explained the significance and utility of study of the conflicts between the polar and tropic air masses.

Weather is likely the most common topic of conversation everywhere.

*Cold fronts* bring a narrow band of bad weather or a summer thunderstorm; *warm fronts* bring more lasting rains.

All weather changes are brought about by temperature changes in the atmosphere.

On the average, there is more than 50% cloudiness in the sky.

Microscopic bits of material, such as soil, ash, or clay, form the nuclei upon which water vapor forms crystals that become snow flakes.

Rainfall can be induced by artificially "seeding" potential rain clouds with dry ice or silver iodide crystals and water.

The atmosphere is composed of four layers, the lowest, which is next to the earth, is about five miles thick at the poles and about 11 miles thick at the equator. It is in this layer that most of our weather occurs.

One chinook wind raised the temperature from -6°F to 37°F in 15 minutes.

Jet Streams occur about four miles high. They form wavy paths at the top of the troposphere about 300 miles wide. The velocity is in excess of 50 miles per hour in summer and 100 in winter, often much in excess. They travel eastward and affect the weather below.

In the Northern Hemisphere, because of the earth's rotation in an "easterly" direction, winds moving north or south shift to their right; south of the equator, winds shift to their left.

Summer and winter average temperatures seldom differ more than 18°F over open ocean areas.

North of the equator, winds near the ground always shift clockwise as a front passes.

As low pressure cells move eastward, warm fronts occur before them, usually being replaced by cold fronts.

On the average, over 200 people are killed by lightning in the United States each year--most of which could be avoided by taking simple precautions.

About 125 tornadoes occur annually in the United States.
Clouds reflect sun's energy back into space, allowing only part of it to reach the earth, about 25% on overcast days.

On September 8, 1900, a hurricane hit Galveston, Texas, covering the city completely with water, resulting in 6,000 deaths and about 25 million dollars in damage.

The violent winds of a hurricane surround a calm "eye," which averages about 20 miles in diameter.

In most years, a period of unseasonably warm weather occurs in October and November which has been given the name, "Indian Summer."

An anonymous verse of folk signs seems to sum it all up:

Last night the sun went pale to bed,
The moon in haloes hid her head,
The boding shepherd heaves a sigh
For see! a rainbow spans the sky;
Hark how the chairs and tables crack!
Old Betty's joints are on the rack;
Her coms with shooting pains torment her,
And to bed untimely sent her;
Loud quack the ducks, the peacocks cry,
The distant hills are looking high;
How restless are the snorting swine!
The busy flies disturb the kine.
Low o'er the grass the swallow sings;
The cricket, too, how sharp he sings!
In fiery red, the sun doth rise,
Then wades through clouds to mount the skies.
"Twill surely rain--I see with sorrow,
Our jaunt must be put off tomorrow."

(from Weather or Not, 1966, by Florence W. van Straten. Dodd, Mead and Co., NY, 237 pp.)
References


(Check on the following in your library)
