

NATURE'S LABORATORY

"We are the mimics. Clouds are pedagogues."

-- Wallace Stevens

Clouds are portals into the imagination. What child hasn't once looked heavenward, pointing out a billowy bear or a cottony dragon. In a way, every cloudy afternoon is its own cartoon, each cloud playing out a new cast of characters as they boil and churn from one improbable shape to the next. Only a cloud, perhaps, could find its way from a turnip to an octopus in a moment's breath. And if you take the time to study them, they are as fascinating as they are enchanting.

The blue yonder above is known as the atmosphere, a layer of air almost 350 miles high that encircles planet Earth. It consists of 78 percent nitrogen, 21 percent oxygen, and one percent other gases, all of which are kept from blowing into space by Earth's gravity.

To better understand the atmosphere, scientists have divided the atmosphere into layers, each of which is distinguished by different heights and characteristics. The layer closest to Earth is the troposphere, which extends outward 5 to 9 miles. This is where clouds, and thus weather, occur. Above that, extending 31 miles high, is the stratosphere. Throughout this atmospheric level, airline jets ply the skies. Farther out lies the mesosphere, a layer about 54 miles high. Here, meteors burn up and vaporize before hitting Earth. Farther still lies the thermosphere at 372 miles high. In its proximity to solar radiation from the sun, the thermosphere can attain temperatures of more than 1,500 degrees C. The outermost layer, where the atmosphere and outer space merge, is known as the exosphere.

Clouds form in the troposphere when atmospheric cooling causes water droplets or ice crystals to accumulate. If the clouds condense and last long enough, rainfall or snowflakes form. And if they can attain sizes large enough to pass upwelling air currents, rain or snow fall plummets to earth, replenishes streams and lakes, and drenches city streets and unsuspecting passersby.

In 1803, English scientist Luke Howard named the types of clouds based on their shape. Their names stemmed from Latin words: *stratus*, meaning "layer", form horizontally in layers; *cirrus*, meaning "curled", are wispy and curly; and *cumulus*, meaning "to heap up", are lumpy.

Highest in the sky are cirrus clouds (white, delicate, feathery "mares' tails"), cirrostratus clouds (translucent stretches that blanket the sky, often to indicate approaching storms), and cirrocumulus clouds (small patchy clouds often likened to fish scales).

Lower in the sky, altostratus clouds (drab, blue-gray, opaque cloud cover) and altocumulus clouds (much like cirrocumulus clouds, but lower in the sky) make an appearance.

Closest to earth, stratus clouds (fog-like clouds that hover close to the ground, often responsible for drizzles), stratocumulus clouds (dark, gray, wavy clouds that cover the sky), and nimbostratus clouds (dark, low, ragged rain clouds responsible for heavy rain or sleet) fill the sky.

Throughout the sky, some clouds develop vertically, mainly cumulus clouds (low, billowy clouds much like cotton balls) and cumulonimbus clouds (ominous thunderheads). The anvil-like top of a cumulonimbus clouds is called an incus.

Sometimes, long cloud streamers seam the skies. These clouds, known as contrails, are an airplane's equivalent of a snail's slime trail. They are trails of vapor left behind in an airplane's wake.

Nephology, the study of clouds, is full of strange terminology. For instance, a scud is a tattered patch of cloud that gets broken off a main cloud by the wind. Virgas, on the other hand, are wisps or trails suspended from clouds, usually made of rains that evaporate before reaching the earth.

Hands On: A cloud's domain is in the air. But how do you see air if it is invisible to the human eye. To demonstrate air exists, fill a sink with water and have ready a clear plastic cup. Turn the cup upside down, then drop it straight into the sink. Take note of the water's level within the cup. No matter how far you plunge the cup into the water, the apparently empty space won't fill up with water. That is because its already full — of air! Air has mass and takes up space.

Punch a hole in the bottom of the plastic cup and repeat the experiment. This time the cup will fill with water as you plunge it under water. Now that the air has a place to escape to, the water replaces the air in the glass, pushing the air out through the hole.

Not all science requires experiments. Observation is another skill important to develop. Since clouds differ and are hard to describe, purchase a field guide on weather or borrow

one from the library. Lie down in the backyard with a sketchpad on a notably cloudy day and try to sketch the different types of clouds you see. Then compare them to your field guide and try to label each one properly. Also take note of prevailing winds, temperatures, and any weather patterns that preceded your observations or developed later that day.

With practice, you'll soon be able to name clouds on sight. Read up on each type to see what each cloud can tell you about the developing weather. Recognizing clouds won't help in forecasting the weather a week in advance, but it might help you decide what the day has in store, even if an umbrella is a good idea.

Lastly, lie down and enjoy the clouds as they lumber by. You might be surprised at how fast, or even how slow, they can move sometimes. And you never know what the next cloud might reveal itself to be.

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