

GENERAL SCIENCE

Sumer Is Icumen In

*Lhude sing cuccu!
Groweth sed, and bloweth med,
And springth the wude nu—
Sing cuccu!*

(Anonymous, circa 1250)

By BARBARA TUFTY

See Front Cover

► THE SUMMER SKY is a peaceful sky, say the poets—azure and serene. But scientists say it is laded with thunder and storms. Now the sun shines directly on this Northern Hemisphere, fills the atmosphere with heat and forms turbulent air currents.

Moisture evaporates from the earth's surface, then condenses in cooler, higher altitudes. The air becomes unstable, and high in the sky form the fat, billowy thunderheads of summer.

The lightning season is opening in full force again. For every tick of the clock, one hundred huge bolts of lightning, like those seen on this week's front cover, shatter the earth—giving this tired old world a shocking quota of 3,152,600,000 lightning strokes each year.

Each bolt can be awesomely powerful. A single lightning flash can discharge its energy at one hundred million volts—enough to furnish about five hundred million horsepower, or drive about two million cars.

Lightning bolts can be as long as several miles, but they are slender—about one to six inches in diameter. In their intense flight through the air, they manage to snatch nitrogen from the atmosphere and bring it down to fertilize the soil. Lightning transforms about 100 million tons of "free" nitrogen of the air into what is called "fixed" nitrogen, without which farmers would have a harder time growing their crops, or gardeners their flowers and grass.

Yet lightning claims greater death tolls in the United States than either tornadoes or hurricanes—rates are as high as 600 each year.

The main stroke of lightning shoots upward, not down. During a storm, blades of lightning dart down to contact the earth. Then a blinding flash of light shoots upward at more than a million miles a minute.

The Green Earth

The summer earth is overlaid with green. Now each blade, leaf and chlorophyll filament is busy storing energy from the bright sun, and a rich flow of sugar and starches is beginning to stream from the upper parts of plants to the roots and bulbs below ground for winter storage.

Woodlands are at their peak of dense, dark foliage. Their leaves have lost that first shiny light green, and now are darker colored, for the epidermis cell walls are becoming thicker and older. Just as the skin of a person grows tougher during his life,

so leaves become toughened during their brief summer lifetime.

Fragile spring flowers of wind anemones and violets have given way to pitcher plants, dock and deadly nightshade. Frail fiddleheads of the ferns have uncurled, and forests stand knee-deep in the tall three-pronged brake, the spleenwort, maidenhair and other ferns.

Dark green mosses creep across rocks and up trees, and the liverwort families humbly spread out close to earth.

White Summer Fields

The fields on a summer noon are white with yarrow and Queen Anne's lace. The crucifers, those flowers with their four petals in the shape of a cross, open their tiny blossoms and pungent scent—the mustards, cresses, wild turnips and horseradishes. Clover spreads its hot fragrant carpet over open spaces. And everywhere, the ubiquitous dandelion nods its foaming head, to the delight of children and the curse of gardeners. One man's weed is another man's pleasure.

Along country roads, the weeds grow lanky and become covered with dust and spots of oil. The vetch and blackberry brambles, the wild grape and honeysuckle cover



All-American Rose Selections

1964 WINNER — *Saratoga*, shown above, a pure white, unblemished rose, was named a winner of the All-American Rose Selections along with the *Granada*, a red, pink and yellow hybrid rose. The *Saratoga* was developed by E. S. Boerner.

rusty tin cans and paper scraps—reminding us that Nature is a tidy creature.

The summer noise is the noise of insects. The buzzing of bees, chirping of crickets, whine of mosquitoes, panting of wasps, chewing and chomping of ants and termites make a steady background hum. Click beetles snap as they arch their backs and flip themselves over. Honey bees drone as they fan the entrances to their hives, literally wearing out their fragile wings. The death watch beetle taps its head against the sides of its wooden burrows, possibly to call its mate, but presumably to presage a death. A popping noise is made by the big June beetle blowing air through its spiracles.

Entomologists and bug-listeners agree that, with few exceptions, the noisiest outpourings of insect sound are produced by the cicadas and the large class of insects called Orthoptera—the katydids and grasshoppers, locusts and crickets.

Then there are the insects that make no noise except the fanning of their wings, as quiet as the breathing of a sleeping infant. These include Nature's more spectacular insects, the Lepidoptera—the multi-splendored butterflies which unfold their bright scaled wings from the chrysalis for a few brief sunlit days on earth.

Nighttime, when the noise of many insects fades with the dusk, the silent fireflies and feathery moths are symbols of summer.

Another steady outpouring of summer sound comes from the ornithological kingdom—the birds. Now the nests are empty, egg shells lie on the ground, offspring have tried their wings, and the noisy crowd expends its energy by singing, warbling, cawing, cajoling, mimicking, croaking, warning.

The woods, fields and backyards move with flickering feathers of song sparrows, robins, catbirds, wrens, blackbirds, woodpeckers, jays, bobolinks and crows—while in the lazy summer sky, a buzzard floats becalmed.

Vacation for Humans

The summer means a time for hard living and working for plants and animals, but one species of earth mammal tries to make it a time for vacation. The summer activities of *Homo sapiens* can be considered as the most varied, complex, and upon occasions humorous of all other forms.

Along the marshes in summertime can be observed small boys, shirts out, sneakers wet, followed by a dog. Often boys can be discovered with fishing poles beside streams, or playing baseball in an empty lot. They enjoy building a tree house, or sometimes they just sit on the back porch and spit watermelon seeds into the hard-packed yard.

Men tend to follow this pattern with variations, but they often find Sundays are best spent in a hammock strung between two

trees, an unread book resting on a sleeping chest, a silent lawnmower nearby.

For the restless ones, there are always the roads and highways, beckoning and calling as strongly as the seas or mountains call the explorer. A dash in the car to some picnic spot, to some scenic route or some beach seems as compelling and as much a symbol of summer to some people as a red rose.

Civilization has its own index of summer. The profusion of sun tan lotions, poison ivy pills, heat prostration remedies, sandals, insect sprays and fly swatters that appear on drug store counters is about as sure a sign of summer as any advent of a bee.

The vast mechanisms of civilization to turn summer heat to winter cool fill warehouses with air conditioners, fans, air-cooled easy chairs, wading pools, swimming pools, skin divers' fins and goggles, tents, fishing equipment and other paraphernalia devised to accompany man in his summer habitat of beaches, woods, mountains, sea, golf

courses, tennis courts or his own backyard.

Summer Solstice

The summer enters North America officially when our side of the earth is in shadow—at 10:04 p.m., EST, June 21. This is called the summer solstice, and the day is the longest day of the year. At this exact minute, on the other side of the earth, the rays of the sun are falling directly perpendicular upon the imaginary line of the Tropic of Cancer.

At 23 degrees and 27 minutes geographically from the equator, the Tropic of Cancer is the farthest north that the sun travels. From now on, as the earth tips back again, the sun starts the downward journey to cross the equator and to reach the southernmost point on earth, the Tropic of Capricorn.

Technically, the days now start to shorten and the nights to lengthen as the sun starts toward its winter home—but for the non-technical person, summer is just beginning.

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GEOPHYSICS

Glacial Ice From Everest

► NEW INFORMATION on how the sun works may be an important by-product of the U.S. conquest of Mt. Everest.

The Everest mountaineers collected 40 samples of glacial ice for Dr. Willard F. Libby, Nobel Prize winner and professor of chemistry and geophysics at the University of California, Los Angeles. Dr. Libby will determine the tritium content of the samples in an effort to find out whether some of these radioactive hydrogen atoms are brought to earth by solar flares.

Mt. Everest was chosen for sampling because its annual frozen rains are followed by dust storms which mark the layers of each year's ice formation. The layering provides a way to take accurate samples.

Tritium, which occurs in all rainfall, is produced by the action of cosmic rays on hydrogen in the upper atmosphere. Solar flares are a second source of tritium, the UCLA authority believes.

These flares are giant explosions on the surface of the sun. They occur in conjunction with sunspot activity on an 11-year cycle. Thus, if the tritium content of the layers of rainwater coincides with years of high sunspot-flare activity, it will indicate that flares bring tritium to the earth's atmosphere.

"Proof of this theory would aid us in understanding the energy mechanisms on the sun's surface," Dr. Libby said. "Such knowledge is important to our space program."

The present theory holds that tritium is formed only in the sun's hot interior, but it would take longer than tritium's radioactive life to reach the surface. To explain the large amount of tritium found in rainwater, the solar flare theory has been devised.

"This new theory was strengthened when a recent Discoverer satellite returned to earth full of tritium after a solar flare," Dr. Libby said.

To give some idea of the magnitude of the project, Dr. Libby said that he will be seeking a tritium concentration of one atom in a billion billion atoms of glacial water. He hopes to have the first samples from Everest in late June and results by September.

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GEOPHYSICS

Movement of Surface Water Due to Wind

► WIND is the main means for movement of surface water over the world.

This conclusion is based on measurements of the amount of tritium, or heavy weight hydrogen, in water samples taken during the 1958-61 nuclear test moratorium.

Nobelist Dr. Willard F. Libby, professor of chemistry at the University of California, Los Angeles, reported that the artificial tritium added to the atmosphere from bomb detonations before tests stopped in August 1958 was observed as it became distributed in surface waters and in the atmosphere. Measurements were made by noting the tritium content of water samples taken during the moratorium.

Other geophysical conclusions reached, according to Dr. Libby, include:

It is now possible to measure the thickness of the layer of surface water that mixes quickly with rain in the midwestern U.S. as well as the fraction of river run-off that is fresh rain.

It is also possible to measure the total bomb tritium released offsite up to the resumption of testing and the number of atoms still in the stratosphere.

The tritium from the tests conducted since the resumption of nuclear testing in September 1961 points to the probability that large amounts are being stored in the stratosphere for longer times than for the 1958 tests of the USSR.

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General Dynamics

BALANCE TEST—Joe White, a volunteer "astronaut" at General Dynamics/Astronautics, San Diego, seemingly poised in the air, is about to tumble from a narrow wooden rail during a balance test. The test is one of several given volunteers prior to riding in the manned revolving space station simulator. Observing are Dr. Bernard D. Newsom, chief of aerospace medicine (right), and R. L. Urmstron, senior research engineer.