UNITED STATES DEPARTMENT OF AGRICULTURE
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PROGRAM Chats by the Weather Man. RELEASE Wed. Feb. 9. 1927

ANNOUNCEMENT: Station_____, broadcasting the regular Wednesday evening Chats by the Weather Man, released by the U. S. Department of Agriculture. Thunder and Lightning are the specialties for tonight. Just imagine you can hear that thunder roll.....

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"What makes it thunder, Dad-dy?"

It was my small son, Bobby, speaking. Practicing his favorite indoor sport of asking questions. I knew the question was coming as we'd had one of those rare Winter thunder storms about sundown and it had left him with a flock of questions to ask. Then, too, he remembered my week-old promise to go into the matter of thunder and lightning at the first opportunity. Bob's a lad who misses few opportunities to ask questions. You folks out there know the kind I mean.

From the look on her face, I could see the Missus wouldn't be entirely deaf to my reply, either. She's as interested in the weather as in fire sales, so every time I make a weather talk for the boy, I speak for her too.

"Well-----", I began wisely, and took a couple minutes more to scrap the last spoonful of dessert from the dish. Stalling for time, you know. This "what makes it thunder" question isn't exactly an easy one to answer.

My wife finished her dessert -- folded her napkin neatly -- and waited.

Bobby had finished a second helping and was ready for action. He likes a bit of interesting conversation after his meals. So, "what makes it thunder?" he repeated.

"Daddy probably heard you the first time", Mother said. "Give him plenty of time. He doesn't think as fast as I do, you know".

"Ha! Ha!" I laughed. "Why don't you ask your mother what makes it thunder, son?" Then I decided to answer his question myself.

"You see", I began, "in order to understand why it thunders, you must first know why we get lightning. I'll really have to begin with lightning, then. You've noticed that thunder storms usually come when the weather is hot and sultry. Now and then we get those storms, however, even in the winter time. But not so often. So, when the air is hot and sultry -- and has been for several days -- the great blue vault of the sky becomes spotted here and there with great mountains of cloud. These are called summer cumuli and they're

snow-white on the sunlit sides and blue gray on the shady sides.
If you watch these clouds closely during the sunny day, you'll find that one of these vast woolpack cloud masses grows faster than its neighbors and raises its great billowing top miles above the surface of the earth. Before long, rain begins to fall."

"At first there isn't much rain", Bobby broke in, "huh --- Daddy?"

"Yes", I answered him. "But when the rain starts falling, everything is changed. It's like a great circus that performs for us in the sky. It was all calm before --- but now everything is wild and strong and windy. The peaceful, beautiful summer cloud becomes a black, mad tempest.

"Have you noticed that as soon as the rain starts falling, the towering cloud reaches its greatest height? And have you noticed that the wind seems to pull out from this cloud a great curtain, thin and dark, that extends far ahead of the storm?"

"I have", said my wife.

"Well, that's the messenger of the thunder storm", said I. "It precedes the storm and its white color soon changes to darker as the black clouds roll up behind it. The sun is hidden. It is very hot. But the cloud shades the sun and makes it actually cooler than it would be otherwise. A great stillness hangs over the earth."

"You feel like something is going to happen and you don't know what", said Bobby.

"That's it", said I. "Then, if you'll look into the dense part of the big cloud, you'll see flashes of lightning tearing through. Then the faint rumble of thunder is heard. As the storm comes on, you feel a soft, cool breeze blowing directly into the coming shower. This soon passes and a strong, outblowing gale drives dust and leaves before it as the storm approaches. Big drops of rain patter on the leaves and tap-tap on the roof. Perhaps a little hail clatters down. Then the rain comes in driving sheets -- the lightning flashes -- the thunder roars. Soon the worst is over. Half an hour, perhaps, and it is done. The clouds grow thinner. The thunder echoes off into silence. The rain stops and the sun shines through the clouds onto a fresh, green earth. There's a refreshing, cool zest in the air. A rainbow arches a beautiful bridge over the horizon over which come the fairies of fair weather."

"But <u>what makes</u> this thunder?" my wife insisted.

"I see you <u>must</u> have it", I returned, "so here goes. As I told Bobby a minute ago, we must begin with the lightning. So here's the theory many scientists accept. I'll go slowly.

"To have a thunder storm in the first place, the air must be <u>moist, humid</u>. Next, this water must be got out of the air in the form of rain. That is done by forcing the air up to higher levels. Here's how <u>that's</u> done. In a thunder storm, there's a powerful uprush of air in the midst of the cumulus

cloud I mentioned a short while ago. This uprush of air is caused by uneven heating. Warm air expands and grows lighter -- then rises. See? It's usually very warm before a thunderstorm. Now, the heated soil heats the air next to it. This air expands with the heating -- becomes lighter -- and rises. The lighter air is thus pushed to high levels. Any slight breeze causes a great disturbance in the different air layers. In fact, a great stirring goes on as the warm and cold air change places. This is the force behind a thunderstorm.

"But this warm air, rising, has to exert a great force against the colder air above it. This force is equal to about 8 to 14 pounds per square inch. The expansion of the warmer air against the colder, requires a lot of work. As the work is done, the warmer air grows colder. And so the warm air soon cools to what we call its dew-point. At that point, the water in the air no longer remains as vapor, but condenses and becomes raindrops.

"Now scientists say that as the water vapor condenses into rain, the water loses its heat of vaporization. Bobby won't understand that. We'll have to explain it some other time. So let it go for the present. Now, all the inner portion of the great thunder cloud is warmer than the air at the same level on the outside. This makes a sort of heated chimney. And up through this chimney, the air rushes with great speed and force.

"Then rain forms in the towering cloud and cools the lower air through which it falls. This cooled air drops to lower and lower levels. Soon it falls to the earth as the dust-raising gale I mentioned before. The cool air that comes down with the rain, rushes forward on the ground as a wind, and stays down. The warmer air that is driven up, becomes the forward portion of the storm, furnishes the rain, and stays up.

"Now we come to the lightning. I told you that the cloud is a great chimney through which great currents of air rush upward. I also said that rain is formed in this cloud, didn't I? As these small raindrops are blown hither and thither in the cloud, they continually meet other drops, join, and become larger. These drops are broken up by collisions and by the wind, and at each breaking, small drops are torn off. These tiny drops are blown to higher levels. It is known that this breaking up of rain drops electrifies them. The large drops are charged positively, and the smaller drops, negatively. The big drops, with their positive charges, gather together because they are heavy, in the lower part of the cloud. The tiny, negatively charged drops, are blown to the upper part of the cloud as spray. As the charges grow, a great force tends to bring the opposite charges together. This tendency to discharge -- for the two opposite charges to unite -- grows greater and greater until finally we get a spark of lightning. This flash passes, usually, between the upper and lower portions of the cloud. The flash sometimes passes to the earth. Lightning usually lasts only a fraction of a second. Sometimes it's flickering, because there are a number of discharges following each other along the same path. The flow of electrical current is short, but very powerful -- sometimes tens of thousands of ampers. Its path through the air is often several miles long, but very slender. Some scientists believe that even the greater flashes are no thicker than a lead pencil.

"The discharge heats the air suddenly to a very high temperature. It also smashes the air atoms to pieces. This causes a great explosion -- or an outblow of air -- all along the path of the lightning flash. This explosior sets the sound waves we call thunder in motion".

My wife had been listening carefully and with interest. But everything had been so quiet -- while I was talking -- that I was suspicious. Looking over to Bobby, I saw he was fast asleep.

"He went to sleep when you got talking about hot and cold air. He could not understand that, and so took the shortest way out," said my wife sweetly.

"Of course the poor little chap couldn't understand it", said I. "He's too young yet for that. Guess you'd better put him to bed, anyhow. He's had an exciting day".

And, as mother prepared to take Bobby upstairs to his room, I found the evening paper and prepared to give my full attention to the day's tidings.

National Oceanic and Atmospheric Administration

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