UNITED STATES DEPARTMENT OF AGRICULTURE
Radio Service
OFFICE OF INFORMATION

CHATS WITH THE WEATHER MAN RELEASE Friday, December 9, 1932

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Reading Time: 10 Minutes.

ANNOUNCEMENT: And now draw your chair into our circle for another Chat with the Weather Man. The Weather Man has cut a wide swath for himself today. He is going to talk with you about rain --he is going to give you a little inside information on just what goes on up there in the sky when the clouds gather and the rain drops start to patter.

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Before I launch upon my story about the rain, I want to test you on a few facts about the weather.

First, I wonder if you know what a cloud is.

I ask that quite seriously. If a child said to you, "Where do clouds come from, and where do they go, and what do they have to do with rain?" just what would you tell him?

While you try to think up an answer to that question, I'll ask you a second and still more complicated question.

Just what causes rain? How do the drops form? Why do we have day after day of cloudy weather without so much as a sprinkle, and then, with scarcely a moment's notice, a terrific downpour?

Well, folks have puzzled over those questions since the days of Adam and Eve. If you can't answer them right off the bat, you won't be much worse off than most other folks. I wouldn't tackle them myself if I hadn't taken a little sight-seeing trip into the clouds with J. B. Kincer of the United States Weather Bureau. But after my flight with Kincer, I began to understand a lot of things about clouds and rain-making that I had never understood before.

Right at the start, I asked Kincer how much moisture the air has to have before it can make rain.

Well sir, right there I got surprise number one.

Kincer told me the air at almost any place in the world and at any time carries enough moisture to make a rain if air conditions are right.

I said, "Do you mean you would find enough moisture to make a rain in the air over the Sahara desert"

He replied, "Yes sir, you most certainly would. In fact, the trade winds blowing down across the Sahara carry more moisture than the winds in many of our

fairly rainy regions. But, while the winds are over the hot, burning desert, they hang on to their moisture like a miser to his gold. However, after they get on down into the tropics, the trade winds let that moisture fall in torrents."

That seemed rather strange. So I asked Kincer just how the wind decided when it would give us a little rain and when it wouldn't.

"Well," he said, "the air above the earth is just like a person. When a person gets warm he gets thirsty; he wants a lot of water to drink. Likewise, when the air begins to get warm, it begins to suck up water from the trees, and fields, and rivers, and lakes, and oceans. The warmer the air gets, the more water it can hold. If the air in this neighborhood today should register zero, it could hold only one-half grain of moisture per cubic foot. But if you heated the same air to a temperature of 60 degrees --- in other words, to a little below normal room temperature--- a cubic foot of air could hold 5 1/2 grains of moisture. As long as the air temperature stays at 60 degrees, a cubic foot of air can hold that 5 1/2 grains of water. But, as soon as you lower the temperature, the air has to let some of its load of moisture drop. If you warm up the temperature from 60 degrees to 80 degrees, the air's water-holding capacity rises from 5 1/2 grains per cubic foot to 11 grains."

That explanation made the rain-making process a little clearer to me.

I said, "So, to make rain, you simply cool the air. For instance, if the air right now is holding 5 1/2 grains of moisture to the cubic foot, we wont get rain as long as the air stays above 60 degrees. But, when the temperature falls below 60 degrees, it's time for folks to put up their umbrellas. Is that right?"

Kincer said, "Exactly so."

But, then, I began to get all balled up again.

If the cooling of the air causes rain, why don't we get a rain every night?

Kincer said, "We don't get rain every night because the ordinary change in temperature from day to night affects only a small mass of air near the surface of the earth. That change may be enough to cause dew---or, if the temperature near the ground is low enough to freeze the dew, the dew turns to frost. But, you never get enough change of temperature in a big enough body of air to make rain. To get rain, you have to move a lot of air from a warm region to a colder region."

Well, that explanation left me even more balled up than before. Wind usually blows from a cold region to a warm region. The cold air from the polar regions blows toward the equator. Heavy, cold air tends to flow into the light, warm air. So how do we ever get rain? While Kincer helps us out, by explaining that you have to think of the process as turned around and move the warm air into the cold air.

He says, "As a general rule, cold air flows into warm air just like water flows down hill. So, it's very seldom that a wind blowing along parallel to the earth's surface brings us a rain. However, remember that air can also move up. Remember, too, that the higher up in the air you go, the colder the temperature.

On top of a high mountain, you find snow the year around. Still higher up, you'd find the thermometer 50 degrees below zero even on the Fourth of July. Most of our rains are caused by warm, moisture-laden air rising up into that colder upper air.

Kincer then went ahead to explain just what causes the warmer air to move up into those colder regions.

First, I might mention the way the air rises to get over a mountain range. For instance, take the wind blowing inland from the Pacific Ocean. When the warm, moist winds from the Pacific reach the Sierra Nevadas, they have to rise. As the warm, moist air rises, it cools. After it cools down to the dew point, it begins to let some of its heavy load of moisture go as rain. As a result, folks on the west side of the mountains get lots of rain. But as the air crosses over the top of the mountain and begins to crawl down the other side, it begins to warm up. Since air always takes up moisture as it gets warmer and never lets any moisture go, folks on the east side of the mountains get almost no rain at all. The country just to the east of the mountains is mostly desert.

But, of course, rains aren't confined to the windward sides of mountain ranges. How does the rest of the country get rain?

Well, Kincer says most of our rains grow out of an air condition known as a "cyclone." When I say "cyclone," don't think I mean one of those violent windstorms that blow over houses. No, nothing like that. By "cyclone," I simply mean a condition where you find heavy cold air blowing, or hovering, around light, warm air like bees around a hive. The cold air keeps closing in on that light, fluffy warm air. The warm air begins to rise like a cork in a bucket of water. For every mile the warm air rises into that colder upper region, its temperature falls 15 degrees. Pretty soon, the warm air gets so cold it can no longer hold its load of moisture. It begins to let some of that moisture fall as rain---or hail, or sleet, or snow, as the case may be.

Now, no matter what causes the warm moist air to cool---no matter whether the warm air has to rise to get over a mountain, or whether it gets nosed up into the colder upper region by cold air at the earth's surface, the rain-making process is the same.

As the air cools down to the point where it can no longer hold all of its moisture, some of the moisture is forced, or squeezed, out as tiny drops of water. Those tiny particles float around in the air and form clouds. That's all in the world a cloud is--just a whole flock of moisture particles floating around up there together. As the warm air gets cooler and cooler, it squeezes out more and more of its moisture. The clouds get thicker and darker. As the wind blows those moisture particles around the sky, they butt their heads together and form small drops. Finally, the drops get so big and heavy they can no longer float around up there in the air and have to drop as rain. After the air warms up again, the rain stops, and the clouds melt away like snow under a hot sun.

And that's the way Kincer explained to me that age-old mystery about the rain and the clouds.

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ANNOUNCEMENT: That story about the rain and the clouds came to you in the series of talks known as "Chats With the Weather Man." We will join with the United States Weather Bureau to bring you another one of these Chats at this same time two weeks from today.

National Oceanic and Atmospheric Administration

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July 23, 2010