Is the Weather Cooked Up In Kettles or Spinning Dishpans?
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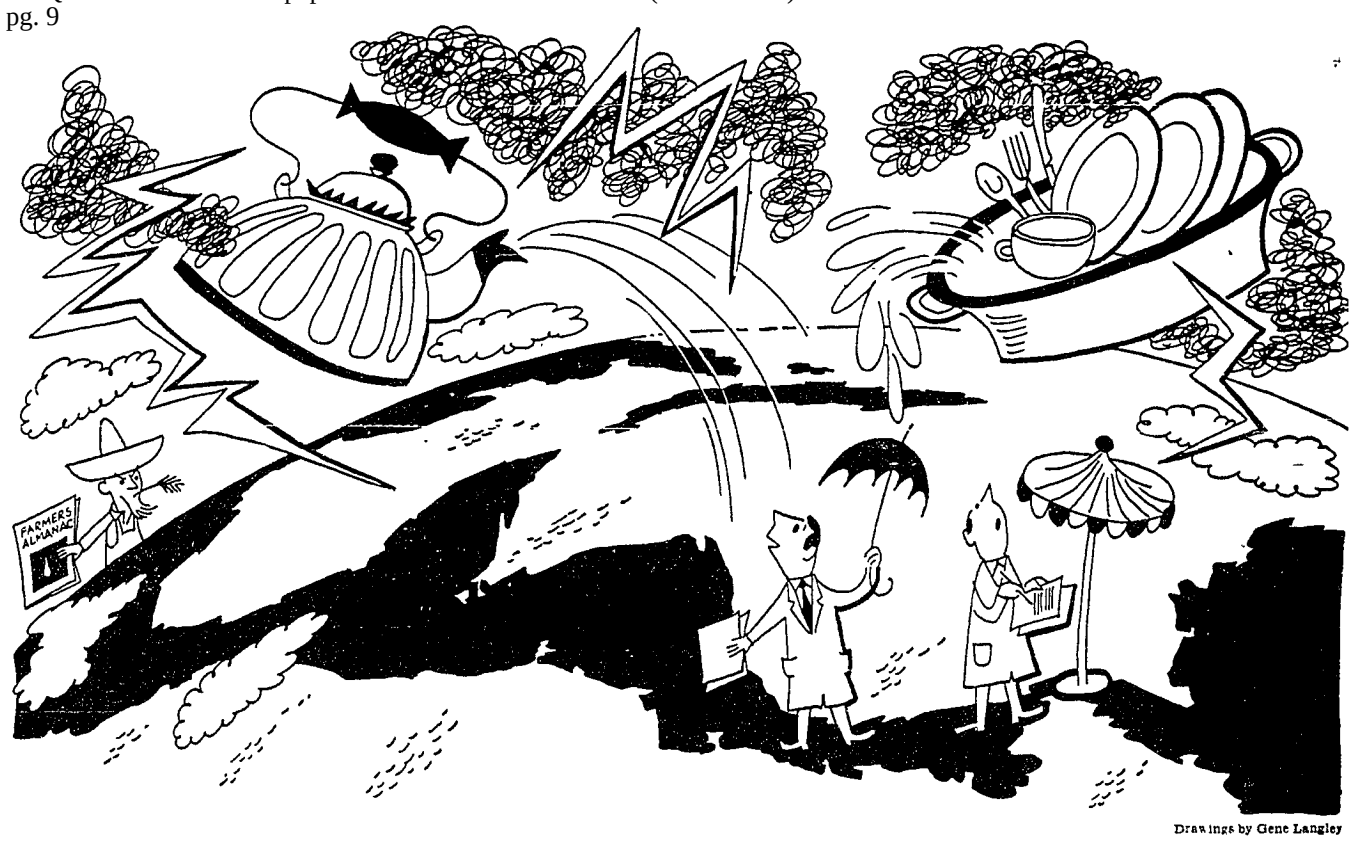
The Christian Science Monitor (1908-Current file); Mar 11, 1954;
ProQuest Historical Newspapers Christian Science Monitor (1908 - 1999)
pg. 9



Drawings by Gene Langley

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By a Natural Science Writer of The Christian Science Monitor

The meteorologists have a new problem

Is the weather brewed in a boiling water kettle or does it swirl from a spinning dishpan?

As posed by Prof. Victor P Starr at the Massachusetts Institute of Technology, this is a riddle of fundamental scientific interest. It underlies our understanding of the world's weather and the forecasting techniques that are based on it.

In answering this question, at least to his own satisfaction, Professor Starr is endeavoring to bring a new order out of the chaotic observations that weathermen have made over the centuries.

He is interested in the great wind systems of the earth and the secret of the atmosphere's ability to transform a sunbeam into meteorological energy—a transformation that takes place on such a scale that there is more energy released in the fall of an inch of gentle rain than in the blast of an atomic bomb.

After five years of meticulous study, Professor Starr has plumbed this secret and traced the courses of this energy as it is distributed over the earth.

He now subscribes to the dishpan theory of weather formation

Instead of looking at the circulations of atmosphere as similar to those in a water kettle boiling on a hot stove—where the equator is represented by the kettle bottom—Prof. Starr considers them to be more like those of water in a rotating dishpan which is heated on the rim and cooled in the center, just as the spinning earth is heated at the equator and cooled at the poles.

In developing this theory, Professor Starr has upset the previous notions of experts on the subject. Yet he is confirmed in his conclusions by an experiment at the University of Chicago in which the atmosphere was simulated by water in such a spinning dishpan and made to go through its paces in the laboratory. But that is getting ahead of the story.

Professor Starr has been supported by contracts with the Air Force Cambridge Research Center. His constant companion in the research has been Dr. Robert M. White who started as one of his graduate students and is now chief of the long-range forecasting section at the Air Force center.

When he first tackled the job five years ago, Professor Starr had little more than a hunch.

He suspected that some of the ideas then held about the way in which the weather operates were seriously in error, since they were based mainly on speculation without much study of actual data.

At the same time, he felt the challenge of a science that was still in the unordered state in which Johannes Kepler had found the science of astronomy at the turn of the 17th century.

For Professor Starr, the challenge took the form of an attempt to bring some meaningful order out of the mass of data that represented the accumulated weather experience of mankind.

To do this, he needed money, although not a great deal of it, since this sort of labor is mostly "think work." But it did call for more than the slim budget of MIT's meteorology department could provide.

Professor Starr outlined his idea to officials at the Cambridge Research Center. They were intrigued with its possibilities, for they knew that long-range forecasting never could be put on a sound basis until the basic mechanism of the weather was understood.

Upsets Older Theories

He was given a contract and a green light to follow his vision wherever it led.

Behind him were the inaccurate theories of four centuries. Before him stretched the prospect of several years of painstaking work.

From then until now, the story became one that is typical of the "adventure" of scientific research—a story of day-by-day routine. Hundreds of thousands of calculations had to be made, tabulated, and studied.

Under the careful study led by Professor Starr, the disordered numbers coming from the computing machines began to arrange themselves into significant patterns.

In this way, he and Dr. White have built up a picture of weather on a planetary scale which they are now ready to present for detailed criticism.

Basically, their idea is simple, although spelled out in complicated mathematics

The older theories look at the atmosphere as though it were like a kettle of water on a hot stove. The atmosphere is heated at the equator where the warm air rises to travel northward and southward and is cooled at the poles.

In a water kettle, the water heated at the bottom rises while the cooler water sinks down from the top This sets up a simple circulation.

In the atmosphere, the rotation of the earth introduced complications, but, fundamentally, its circulations were thought to be similar to those in the water kettle.

Basic Part of Circulation

Professor Starr has found that this is not the case, and that there is a greater difference between a rotating water kettle and a stationary one than had been believed.

Under the old theories, the storms and squalls of everyday weather were believed to be secondary effects of the over-all water kettle type of circulation

In Professor Starr's theory, the storms are a basic part of that circulation itself. In fact, these storms are the means by which the energy of the sun, transformed into meteorological forms in the tropics, is distributed over the earth.

He is backed in this view by experiments run at the University of Chicago by Prof. Dave Fultz. These experiments have shown that, even in the water kettle, storms are part of the basic "weather" mechanism when the kettle is rotating.

In this case, Professor Fultz used a rotating dishpan, heated on the rim and cooled at the center. This is a close enough resemblance to the real atmosphere to give substance to the Starr conclusions.

Thus, the net result of Professor Starr's work has been the discovery that the storms of daily weather run the great wind systems of the earth rather than the other way round.

For centuries, it has been believed that the opposite picture was too obviously true to be questioned. It seemed ridiculous to suggest that the wind currents encompassing a hemisphere were controlled and powered by storm systems that are tiny by comparison.

This "ridiculous" suggestion has now been found to be the case. **Robert C. Cowen**

Gordon N Converse, Staff Photographer

Dr. Robert M. White (left) and Prof. Victor P. Starr (right) are brewing up a storm in their laboratory dishpan. This is a simplified version of experiments developed at the University of Chicago, in which the weather over half of the earth is simulated by water circulated in a rotating dishpan which is heated on the rim (the "equator") and cooled at the center (the north or south "pole").