

Horizontal Rainbows Due to Droplets

Meteorology

Rainbows in the sky are familiar to everybody, but if you are fortunate enough, you may some time be able to see a horizontal rainbow on a calm surface of water. You are most likely to see it following a fog, and if you are particularly fortunate, you may even see a cluster of several horizontal rainbows.

In the *Journal of the Franklin Institute*, Dr. W. J. Humphreys, professor of meteorological physics at the U. S. Weather Bureau, describes the formation of these strange phenomena, and tells of two people who have seen them in clusters. The bow seems to be right on the surface of the water, and in the case of the cluster, one appears right behind another.

The cause, says Dr. Humphreys, is a layer of tiny droplets of water, resting on the surface of the body of water, but prevented from merging into it by a thin film of oil on

the surface. The sun is in back of the observer, and the rays of light are refracted back to the eye by the tiny droplets of water on the surface, just as they are by the drops of water in the sky in the case of the usual rainbow. If the sun is overhead, the horizontal bow appears as a circle. If lower, it is an ellipse, surrounding the observer. If at an angle of 42 degrees above the horizon, it is a parabola, while at a lower angle of the sun it is a hyperbola. All of these curves are what the mathematician calls "conic sections," that is, the curves formed by the intersection of a plane with a cone.

The cluster of several bows is formed by reflections from the actual surface of the water, as the sheet of droplets may not be quite in contact with the water surface.

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Student Experiments With Space

Psychology

Alice in Wonderland fell into a topsy-turvy world, but the world that Miss Jane Goldschmidt, of New York, a senior specializing in psychology at Smith College, has recently discovered with the aid of a pair of prism glasses, is almost as bewildering.

How would you like to reach for a glass of water and meet only empty space—to think straight doors were curved—or to see rainbows around the heads of all your friends? This is what happened to Miss Goldschmidt when she set out to investigate the habit of space perception.

Psychologists say that the ability to tell what objects are far away and what objects are nearby is a habit which must be acquired. In infancy the world seems only a confusing blur of color and line. Gradually, however, by reaching for things and in other ways, we learn to see the world in three dimensions, and thus form the habit of space perception.

Miss Goldschmidt decided to investigate the habit further. For three days she wore a pair of prism glasses which moved everything she saw to the left. Straight lines became curved, and everywhere light was bent or refracted as it passed through the prisms into rainbow bands of color. To this new situation, Miss Goldschmidt's old habits of space perception were poorly adapted. She reached for a pencil and felt only

her desk. She walked towards a door and struck the wall. Soon, however, she began to form new habits, and could reach for things with hope of success. To learn to walk downstairs took longest of all, but in three days she was completely adjusted to her new world.

When she took off the glasses she had the same difficulties as when she had put them on. All the curves, errors, and bands of color were still present, but reversed. It took her a day and a half to feel at home again.

One of the most interesting results came when she touched a straight surface which, through the glasses, appeared curved. It felt curved as well. This seems to indicate the primacy of sight over touch—a point which has long been debated among psychologists.

This is the first time that the prism glasses experiment has been tried continuously, and Miss Goldschmidt's findings will soon be published. She intends to continue the study of psychology next year at Columbia University.

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The recent finding of a skull and more than 10 bones of an armored dinosaur was the first discovery of this prehistoric monster within the United States.

Vaccine Fails in Cattle

Medicine

Unfavorable results were reported from one of the latest experiments made in this country with the Calmette vaccine against tuberculosis. This protective vaccine, developed by the French scientist, A. Calmette of the Pasteur Institute, has been the subject of heated controversy among scientists in this country and abroad. It was concluded from this latest experiment that the Calmette vaccine does not protect cattle which have been intimately exposed to tuberculous animals, reported the investigators, Dr. W. P. Larson of the University of Minnesota, S. J. Stanard, Commissioner of Agriculture, and W. A. Evans, at the meeting of the American Association of Immunologists.

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Tree Rings—Continued

the rings in a remarkable manner. Various specimens were compared together ring by ring till identity was found in the distribution of large and small rings. This gave a continuous sequence of about one hundred rings.

"Other specimens were then compared, trees cut a little later or a little earlier; a part of each would tie in to the hundred rings already known and the remainder would extend the known sequence a little forward or backward as the case might be. In this way, little by little, the prehistoric sequence was extended until now it is 586 years long. In a similar way recent collections from inhabited villages of the Hopi Indians have extended our modern dated rings a century and one half back to the year 1260 A. D.

"Thus, at the present stage of this study, we have 670 years covered by modern rings accurately dated and 586 years represented by rings in the prehistoric sequence. Between these two series is a gap, probably not large, perhaps under 200 years, whose exact duration must be determined by specimens yet to be found. When this gap is filled, not only will we have a superb climatic and solar history of 1254 years, plus the extent of the gap, but also we shall secure a most interesting bit of human history from the rings of trees, for we shall then have the exact dates of buildings of thirty or more of those splendid prehistoric ruins already famous in Southwestern archaeology, and we may have a new clue to the prediction of floods and droughts."

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