

to-day radiation received on the earth.

In conclusion, the speaker suggested the desirability of adding half-a-dozen more solar observatories to the three now maintained by the Smithsonian Institution.

"I think," he stated, "there is a great probability that if such additional solar stations were in operation they would furnish information of major value to

meteorology. I believe that with the solar data that would then be available, and using the rich store of information regarding terrestrial factors now familiar to meteorologists, great progress would ensue. The neglect of solar variation, which seems to be a major factor in weather, cannot continue if meteorology is to progress as it should."

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OPTICS

## Least Light We Can See

Two to six trillionths of the energy it takes a flea to jump the height of a man's ankle is involved in the minimum visible light-flash.

► THE SMALLEST amount of light capable of stimulating the retina of the human eye has been measured and calculated. It is between five and 14 quanta, Dr. Selig Hecht, professor of biophysics at Columbia University, stated in a lecture before the Temple University chapter of the Society of the Sigma XI, national science honor society.

Measurements of this least light that we can possibly see have been the subject of two years of very careful experiments in Dr. Hecht's laboratory, on the trained eyes of seven skilled observers. As actually measured, the "minimum flash" represented an energy expenditure of between two and six ten-billionths of an erg.

An erg is a well-known physical measure of energy: it is the small amount that is sufficient to lift a weight of one milligram one centimeter in height. Or, to put it in livelier terms, imagine a flea weighing ten milligrams jumping to the height of a man's ankle. That would represent the expenditure of 100 ergs. Two to six trillionths of the energy in such an imaginary flea-power jump is therefore involved in the minimum visible light-flash.

"These incredibly small amounts of energy represent between 58 and 148 quanta of light, and when they fall on the cornea of the eye, we can see them," Dr. Hecht told his audience. "This number of quanta falling on the cornea cannot represent the number which actually is employed in vision because about 4% of it is reflected at the cornea, about half of it is absorbed by the lens and other ocular media, and of the rest, about 80% passes right through the retina without being absorbed. If corrections are made for all these factors—all of them having been well established by

separate measurements—the range of 58 to 148 quanta at the cornea becomes 5 to 14 quanta of light actually absorbed by the retina."

The structure of the retina, the speaker continued, is such that it is most probable that the stimuli involve the striking of one light-sensitive cell by each quantum. Further, it seems most probable that within each such cell the effect is produced by the impingement of the light-quantum on a single molecule of visual purple, the photosensitive substance that translates light from the physics of quantum measurement to the biochemistry of physiological sensation.

"Judging by the structure of the retina, the nature of light, and the chemistry of visual purple, it is hard to conceive of a biological system which could be more sensitive than this," Dr. Hecht remarked. "Certainly there are no physical systems which even approach it."

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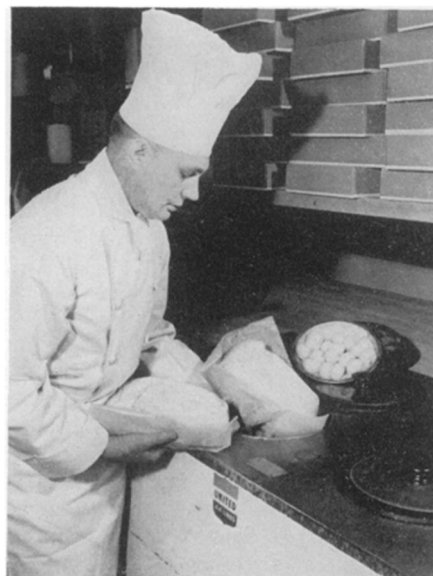
NUTRITION

## Pastry Dough May Be Next On Frozen Foods List

► HOUSEWIVES of the future may bring home from the grocery store frozen, ready-to-bake pastry dough as well as frozen berries or other fruit for the pie for dinner, it appears from an announcement by United Air Lines.

Not that the air line company has entered the frozen food field, but Fred Raich, pastry cook in its Chicago flight commissary, has taken what may be the first step toward frozen pastry dough on the shelves of tomorrow's grocery stores.

At the time he joined United in 1938, Chef Raich, who came to this country



**ICE-BOX MIX**—A sweet-roll dough, which can be stored for at least 90 days before baking if kept at temperatures between 12 and 16 degrees above zero Fahrenheit, has been developed by Fred Raich, shown in this picture, who is pastry cook in United Air Lines' Chicago flight commissary. Rolls made from this dough taste the same as those made from non-frozen mixes.

from Austria in 1923, was vitally interested in the "retarded method" of keeping pastry dough overnight by placing it in temperatures ranging from 38 to 44 degrees above zero Fahrenheit.

He experienced further with this "ice box dough." Doughs, with a high fat content, he discovered, could, when frozen, be kept in a perfect state of preservation for at least 90 days. As a result, much time can be saved, since he now makes up single, large batches of sweet roll dough instead of small quantities every other day. This dough, when baked, is said to taste the same as rolls from non-frozen dough.

Dough for bread or dinner rolls does not stand up quite as well under the freezing process, Mr. Raich explains, because it lacks sufficient fat to protect completely the wheat structure within the dough. This causes the necessary fermentation process to break down when such dough is baked.

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A chestnut tree near the foot of Mt. Etna in Sicily measures approximately 200 feet in circumference; this is the largest tree trunk measurement known.