

ASTRONOMY

# New Flaming Super-Nova; Second Within Fortnight

The Seventeenth That Astronomers Have Ever Known, Brilliant "New Star" is Too Distant for Unaided Eye

A SECOND super-nova five hundred million times as bright as the sun is announced by Dr. Fritz Zwicky of the California Institute of Technology. (See SNL, Sept. 11).

Discovered on a photograph taken at Palomar Mountain on Sept. 10, the new super-nova, like that found on August 29, is in a remote extragalactic system, in this instance NGC 1003 in the constellation of Perseus, at a distance of at least seven million light years.

In spite of its enormous luminosity, the super-nova is so distant that it appears as only a faint telescopic star of magnitude 10.5. The date of its outburst is unknown.

Photographs of the spectrum of the new star, taken at the Mount Wilson Observatory of the Carnegie Institution of Washington by Milton Humason on Sept. 12, show the broad bands characteristic of super-novae. Further confirmation of the remarkable character of the star was obtained by Dr. Walter Baade of the Mount Wilson Observatory staff. Dr. Baade, by determining the distance of the spiral system of stars within which it occurs, found that the intrinsic brightness of the super-nova, at the lowest estimate, is absolute magnitude minus 16.2, or about ten times that of all the rest of the stars in the spiral system of which it is a member.

## Too Far Away

The suggestion made by Dr. Baade and Dr. Zwicky in 1934, that the explosive outbursts of super-novae may possibly play a part in producing cosmic rays, probably cannot be tested in the case of either of the two super-novae. Their distances are too great for any noteworthy effect to be expected.

Nevertheless, observers of cosmic rays will carefully examine their records covering the appearance of these new stars, since the nature and amount of any possible effect is still uncertain.

The discovery of the new super-nova was made through use of the 18-inch Schmidt telescope, a small instrument with a wide and roving eye. Perched on Mt. Palomar in southern California,

it is a sort of pilot for the giant 200-inch telescope now building which in a few years will see deeper into space than any other aid to human vision.

By discovering two super-novae, the 16th and 17th the world of astronomy has known, within a fortnight, this Schmidt telescope in the hands of Dr. Zwicky has become a famous instrument. It promises to make many more discoveries.

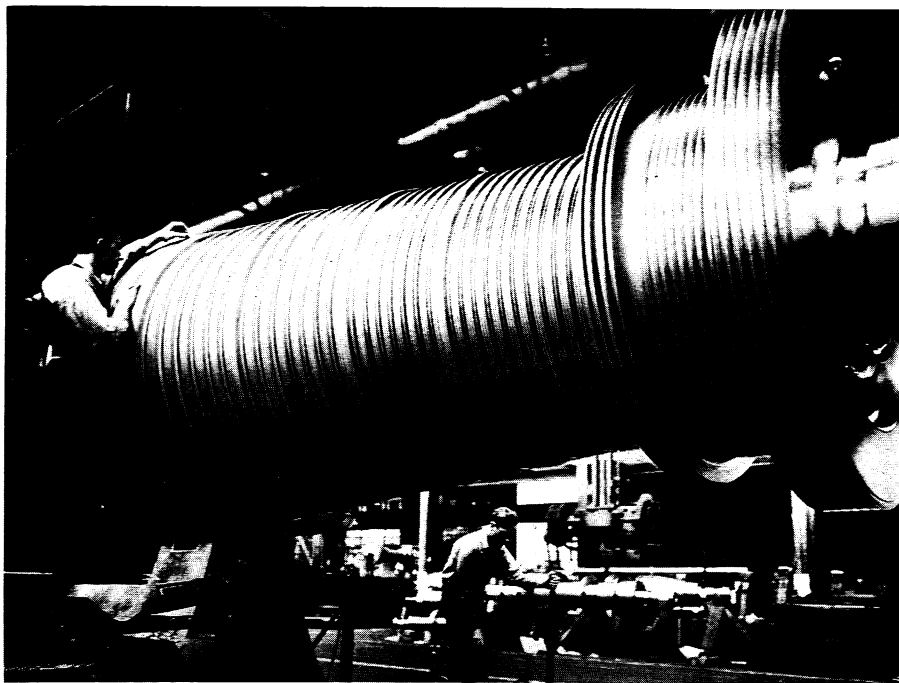
In its work of discovery, the Schmidt instrument is teamed with the famous 100-inch telescope of the Carnegie Institution's Mt. Wilson Observatory near Pasadena. The Schmidt instrument scans the sky for interesting events. It covers a portion of the sky many hundreds of times larger than does a large reflecting instrument and many pictures can be

made in a single clear night. It is also less sensitive to atmospheric disturbances.

Once the discovery is made by means of the Schmidt instrument, then the heavier astronomical artillery comes into action. The great 100-inch telescopes and lesser mirrors make detailed studies. This was the course of discovery in the case of the two distant, flaming "new" stars that have exploded with such brilliance that they are to astronomers today's most intriguing objects in the sky.

Famous among the rare super-novae of the past is Tycho's star, which appeared in November 1572 and was for some days visible in daylight and brighter than Venus at her best. Another temporary star, observed by Kepler in 1604, was as bright as Jupiter and remained visible for two years. These were much closer to the earth than the super-novae just discovered by Dr. Zwicky and were therefore seen by the unaided eye.

More frequent are temporary or "new" stars giving out less light. These ordinary novae are not in the same class with the super-novae. But they attract much attention, both on the part of lay observers of the stars and the astrono-



FOR STEAM "WINDMILL"

Ready to be "bladed" is the above 50-ton piece of steel built to serve as the hub for a giant steam turbine in Kansas City, Kansas. One of the heaviest single-piece rotors ever cast, hundreds of blades for the turbine will be set around its outside along the grooves visible in the photograph. Westinghouse is the builder, East Pittsburgh, Pa. the location of the factory.

mers. Nova Herculis which burst forth shortly before Christmas 1934 was a spectacular ordinary nova.

Scientists speculate on what remains of novae when they fade away. One suggestion is that they become stars consisting of neutrons with no ordinary matter in their make-up. The neutron is one of the basic building blocks of matter and it was discovered in 1934. Such a spent star of neutrons would be extremely dense. The earth's mass on

the same density would be a ball less than two miles diameter.

The outburst of a nova transcends in magnitude all other known physical catastrophes. Astronomers do not know just what happens. Favorite among theories is that there is a tremendous release of energy within the atoms of matter composing the star. Another suggestion is that novae occur when two stars collide.

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#### RADIOLOGY

# X-Rays Kill Living Cells By Suffocation; Cancer Clue

## Radiologists Hear That Heat Aids X-Ray in Killing Cancer Cells; X-Ray Gives New Test for Life

**X**-RAYS kill living cells by suffocating them, it appears from studies reported by Drs. Hillyer Rudisill, Jr., and J. Hampton Hoch, of the Medical College of the State of South Carolina, at the Fifth International Congress of Radiology, meeting at Chicago.

The findings, in the opinion of the investigators, also show why cancer cells are more susceptible to X-rays than normal cells, and may "supply the successful answers to the question, Why cancer?"

Yeast cells were the guinea pigs in the studies. When these cells are X-rayed, the investigators found, certain coenzymes essential for the breathing process of the cells are inactivated by the nascent hydrogen and hydrogen peroxide produced by the X-rays. Once the coenzymes are inactivated they cannot play their part in the complicated mechanism by which cells get their oxygen, and thus deprived of oxygen the cells die. The inactivated coenzymes cannot be reactivated.

Cancer cells, like actively growing cells such as are found in embryonic tissues, have a "greater speed of life" than normal cells, Dr. Rudisill pointed out. It is this, he believes, which accounts for their greater sensitivity to X-rays and radium.

Nothing is known of how the cell produces the coenzymes that help it to breathe, Dr. Rudisill observed, and the substances which normally protect the coenzymes from destruction are also unknown. Investigation of these two

points, he believes, are likely to answer the question of why cancer develops.

### Heat May Hasten Killing

Applying heat to the area that has been X-rayed should hasten the destruction of cancer cells, while chilling the area X-rayed should lessen the danger of skin burns from the powerful rays.

These tips, of probable value to physicians treating cancer and other conditions with X-rays, were gained from studying the effect of another kind of rays, ultraviolet, on a protein like egg white. The study was reported by Dr. Janet Howell Clark of Baltimore.

Dr. Clark studied the effects of radiation on proteins because these chemicals are found wherever there is living matter, so the way they react to radiation gives a good indication of how living tissue, normal or cancerous, may react.

The effect of the rays on proteins depends, Dr. Clark found, on the nature of the protein, whether it is in acid or alkaline solution, and the salts present. One change, called denaturation, occurs in all protein solutions when exposed to radiation, regardless of temperature, alkalinity or acidity. Denatured protein cannot act as a constituent of a living cell.

Denaturation must be followed by an increase of temperature before the next change, visible flocculation, takes place.

Denaturation of the protein in a living cell may be enough to kill the cell, but this is not yet definitely known. Fur-

ther study is needed to clear up this and other important points about the effect of radiation on cell life. Experiments have shown, however, that when cells are kept at low temperatures after radiation they show less injury than cells kept at higher temperatures. This, Dr. Clark suggested, may have applications in X-ray and radium treatment.

### Test of Life

An X-ray test of life was reported by Dr. J. G. Dillon of Moscow to the Congress.

The test may have legal significance, since it gives definite proof, according to Dr. Dillon, as to whether or not an infant apparently born dead actually lived after birth, even if only for a short time.

An X-ray life test, Dr. Dillon said, "makes it possible to have a permanent document possessing the force of court decisions."

The test is made by taking an X-ray picture of the infant's body. If the picture shows the presence of air in the stomach, it is considered proof that the baby lived.

The test is based on the theory that the stomach and digestive tract can play a part in breathing, or respiration, along with the lungs. Dr. Dillon presented scientific evidence in support of this theory, and stated in conclusion:

"Thus if air in the stomach is the result of inhalation it is clear that the presence of air in the digestive tract of a new-born serves as proof of the extra-uterine respiration and hence a proof of the infant being born alive."

An X-ray examination of the stillborn in any stage of its life before birth, Dr. Dillon continued, never shows any traces of air in the digestive tract. On the other hand correctly made X-ray pictures of dead infants that were breathing even a very short time always disclose presence of air in the stomach or other part of the digestive tract, no matter how small its quantity may be. Such air, in Dr. Dillon's opinion, is not swallowed air, but air that was actually drawn into the infant's body by a sort of stomach breathing.

### Neutrons Effective

Neutrons are five times as effective as X-rays in destroying breast cancer of mice, Drs. John H. Lawrence, Paul C. Aegersold and Raymond E. Zirkle of Berkeley, Calif., reported.

Neutrons are the new atomic particles without electric charge discovered in 1932. Unlike X-rays, Dr. Lawrence ex-