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.

Science News Letter, September 25, 1937

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. Further 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 discloses 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. Aebersold 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-

plained, neutrons can penetrate dense substances such as lead but are absorbed by lighter materials such as tissue which is rich in hydrogen. Since their discovery, it has been hoped that they would prove a potent weapon against cancer, but proof of this has so far been lacking.

Dr. Lawrence and associates compared the killing or growth-checking effect of neutrons and X-rays on wheat seedlings, drosophila eggs, fern spores, a transplantable breast cancer of mice and whole normal mice. The neutrons were more effective than the X-rays in every case, but in different degrees. They were two times as effective on drosophila eggs, five times on wheat seedlings, four times on normal mice, five times on the breast cancer, and two and one-half times as effective on fern spores.

The results of these studies seem to indicate that neutrons may be able to single out from the rest of the body and destroy the cells of some kinds of cancers.

Bronchial Disease Yields

About half of a group of 55 patients suffering from a troublesome bronchial disease were relieved, and some apparently cured, for periods ranging from one to five years after X-ray treatments, Drs. Maurice Berck and William Harris of New York City reported.

The disease is known medically as chronic suppurative bronchiectasis. Paroxysms of coughing with copious expectoration and fetid breath are the chief symptoms. The condition is one in which the bronchi or a single bronchus have become dilated, often as a result of infection.

X-ray treatment of this disease was carried out on a group of patients over a period of five years at Mt. Sinai Hospital, the physicians reported. The improvement in about half the cases varied from "moderate to practically complete cessation of symptoms."

Radium Detective

A radium detective which aids in the discovery of lost or stolen radium was described by Dr. Robert B. Taft of Charleston, S. C. Radium is so expensive that the loss of even a small amount is a matter of considerable concern.

"Radium gets into strange places," Dr. Taft commented. "I recently aided a radiologist who was rowing around in a boat trying to detect his radium in a pond."

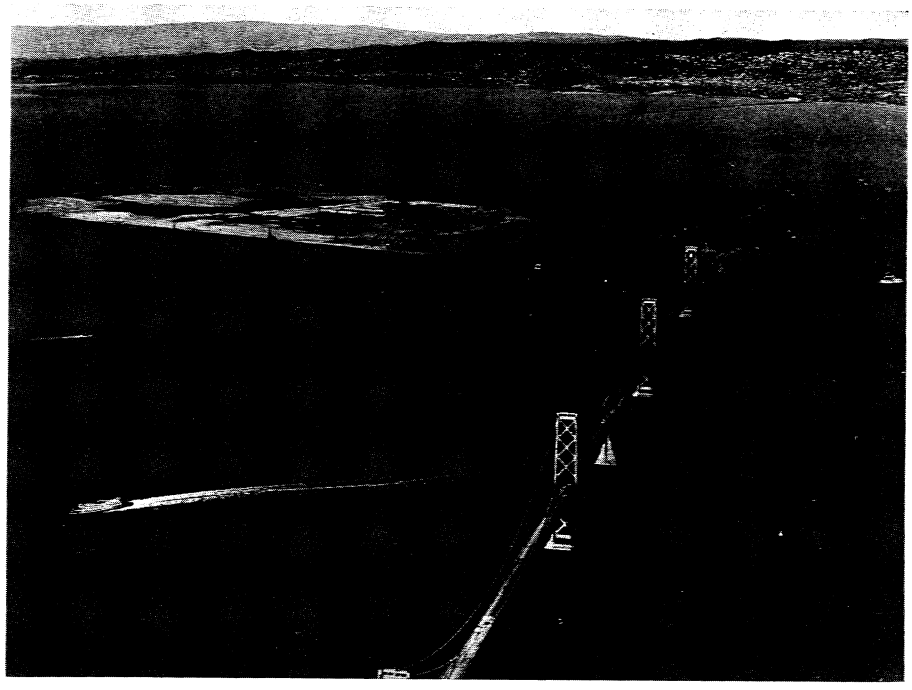
"Much of the work of seeking the radium in former times was done with an electroscope. Now the Geiger-Muller counter, an instrument for detecting small amounts of Gamma and some other rays, which is a sealed tube containing a gas compressed at sub-atmospheric pressure, is proving highly successful as a radium detective.

"The entrance of any radiation into the tube breaks down the space between the electrodes, causing an impulse which may be magnified to operate a loud speaker. These counter tubes are so super-sensitive they can even record cosmic rays.

"Radium may be detected through water, through dirt and stone and brick. We experimented in an indoor swimming pool, and found that the counter showed the presence of radium.

"To find the radium with the counter you simply walk around the suspected area and when the tube shows a double amount of activity over the usual detection of cosmic rays, counting the impulses in the tube leads to the discovery of the metal."

Radium, because of its value, is sometimes stolen. The radium detective may help recover it in such cases, too, but Dr. Taft warned against seeking the radium openly in suspected houses, saying that failure to find the elusive metal might lead to lawsuits.



NEW ISLAND

From the muddy waters of San Francisco are already appearing, at left, the mile-long man-made island which will mark the site of the Golden Gate International Exposition of 1939.

ENGINEERING

Build Mile-Long Isle In San Francisco Bay

THIRTY million cubic yards of black bay sand have been sucked from the bottom of San Francisco Bay and pumped into a giant seawall enclosure to make the site of the Golden Gate World's Fair of 1939.

The result is a man-made island a mile long and nearly a mile wide, located between the towering Golden Gate Bridge and the seven-mile San Francisco-Oakland Bridge.

"Treasure Island," as the Exposition site has been named, was reclaimed from the shoals of the largest land-locked harbor in the world. Work on the island began in February, 1936, when United States Army Engineers, in cooperation with Exposition workers, started America's largest dredging job. Eleven giant dredges, 1,000 men, and a daily 24-hour schedule were employed for a year and five months to suck 100,000 cubic yards of sand each day from shoals beneath the Bay and pump it into a huge square rimmed by a stone seawall more than three miles around. The island rests on a shoals area from six to twenty-five feet under water, and