

ASTRONOMY-PHYSICS

# Cosmic Rays May Originate In Rare Super-Novae

California Scientists Suggest Briefly Flashing Stars May Emit These Extra-Galactic Rays as Well as Light

**C**OSMIC RAYS, the mysterious radiation which bombards the earth from all sides, may originate in the strange rare phenomena during which stars flare up with sudden bursts of energy that make them shine as bright as the planets.

This is the theory of cosmic ray origin advanced by Dr. W. Baade of the Carnegie Institution's Mt. Wilson Observatory and Dr. F. Zwicky of the California Institute of Technology in a report published in the *Proceedings of the National Academy of Sciences*.

The special "erupting" stars which Drs. Baade and Zwicky believe cause cosmic rays are called super-novae. Literally translated, novae stars would mean "new" stars but they are really temporary stars. After traveling through space for eons of astronomical time they suddenly flare up and reach a brightness which, on occasions, has rivaled that of the brightest of all stars, Sirius. Some super-novae in distant nebulae produce as much light as does the whole star system which contains them.

In the short space of a few years the shining splendor of the novae type stars fades away to their former obscurity.

Novae flare-ups are rare occurrences which last about as long in comparison with the millions of years in astronomical time as the fleeting flare of a rocket compares with a century.

## Radiate Half Their Mass

Super-novae stars, declare Drs. Baade and Zwicky, are ordinary stars which blow up like a bursting shell. The velocity of expansion of the star may, in some cases, be nearly that of the speed of light. Some stars, in the process, may lose over half their mass by radiating it away into space. Visible and ultraviolet light are known to come off in the star eruption. It is suggested now that cosmic rays may be emitted at the same time.

The Pasadena scientists ask that cos-

mic ray observers call attention promptly to any systematic intensity changes that last even a few days. If such information were obtained quickly enough astronomers could push the search for possible novae stars. Cosmic ray intensities fluctuating over a period of years in rhythm with the appearance of super-novae stars would be strong support for the new hypothesis.

Applying their theory of novae bursts to cosmic rays, Drs. Baade and Zwicky point out that in all the discussion about cosmic rays there is only one point on which all the investigators—Millikan, Compton, Regener, Hess and others—agree; cosmic rays originate outside the star system which contains the sun and its companion earth.

## Extra-Galactic Origin Fits

This general agreement on the extra-galactic origin of cosmic rays, declare the California scientists, fits their hypothesis of the emission of cosmic rays by super-novae stars. Cosmic rays do not come from within our own star system for the simple reason that no super-novae flare-up has occurred near the neighborhood of the earth during the twenty years in which cosmic rays have been studied systematically.

Moreover, the Pasadena investigators add, their theoretical deductions on the possible intensities of cosmic rays, which would come out of erupting novae stars, correspond to the observed intensities.

Astronomical calculations lead also to the belief that super-novae type stars should occur in any particular star system like our Milky Way once in 1,000 years on the average. Some time between 1934 and 2934, therefore, the scientists of the future—if they are still interested in cosmic rays—will probably have a chance to test the Baade-Zwicky theory. During the next thousand years one star in the system containing the sun should flare up and become a super-novae. If this happens, say Drs. Baade and Zwicky, cosmic ray intensities

should increase a thousand fold.

It will not be necessary, however, to wait 1,000 years for a test of the new hypothesis. There are about 1,000 star systems, or nebulae, which are comparatively near the earth. Every year, therefore, some one of these ought to have a star eruption. Such annual eruptions should be sufficient to change cosmic ray intensities on the earth by about one per cent. over a period of a few days.

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CHEMISTRY

## Mysterious Explosive Is Only Ammonium Picrate

**"SECRET** Naval Formula for Explosive D found in Airplane Wreck." So read the headlines following the crash of the airliner in the Catskill Mountains of New York state.

Thus was launched a drama for the press, involving all those things dear to an author's heart; a mystery explosive, a chemist capable of making that explosive, and "secret" naval documents.

Today the mysterious explosive D stands revealed as the Navy's simple symbol for a common high explosive used for making shells burst—ammonium picrate. The equally mysterious "naval documents" have turned out to be the specifications for making ammonium picrate (no great chemical feat) which were carried by the chemist of a company bidding on Naval contracts for its fabrication.

Ammonium picrate, leading actor for a day in the great naval mystery, comes from carbolic acid, or phenol, familiar to everyone in weak solutions as a disinfectant; or when moderately strong, as a poison.

Treat carbolic acid properly with nitric acid and sulfuric acid, and the result is picric acid, a yellow, crystalline solid. Picric acid by itself is a valuable but somewhat outmoded explosive. Every nation has its own secret method of making it. Thus the English make "lyddite," the French "melinite" and the Japanese "shimose."

Going a step beyond simple picric acid, ammonia is added to make the organic salt of picric acid, ammonium picrate. And therewith the "lone wolf" element nitrogen is brought into the final product.

Nitrogen present in the air man breathes is often called an inert ele-