

cur at the right time to bring the planets together for a second or third time. But, he adds, "the two planets will tarry a while longer and go through the steps of a triple conjunction again in 1981." Two conjunctions, he explains, will come close together early in the year, and the third will follow after a longer interval.

Dr. Herrick questions statements by other astronomers in recent scientific publications about the rarity of the event. It has been supposed that centuries would elapse before the next one, and that the last before this was 258 years ago. The Rev. Dr. J. Stein, S.J., Director of the Vatican Observatory, stated in an article in the November 1940 issue of *Popular Astronomy*:

"The conjunctions, as is well known, occur about every 20 years, but triple

ones are very rare. The last of these was observed in the year 1682-3, the last but one in the year 1425." Similar dates were given by Rudolf Brandt, of the Sonneberg Observatory in Germany, in a recent article, and also by others.

According to Dr. Herrick, these figures are in error. "The last one occurred," he states, "not in 1682-3, but in 1821-2; and this date may be verified by reference to the first volume of the *Astronomische Nachrichten*, oldest of the astronomical journals, wherein a series of observations of Jupiter and Saturn made by Littrow show clearly that a conjunction took place while the two planets were retrograding, something which occurs only when there is a triple conjunction."

Science News Letter, February 15, 1941

PHYSICS—ASTRONOMY

Atomic Physics Important As an Aid to Astronomy

By Furnishing Explanation of How Stars Are Fueled,
Physics Was Responsible For One of Greatest Advances

BY FURNISHING an explanation of how stars are fueled, atomic physics has been responsible for one of the greatest advances in astronomy during the past decade. Big telescopes are not the only means by which the science advances.

So declared Dr. Harlow Shapley, director of the Harvard College Observatory, speaking at St. Louis University, under the auspices of Sigma Xi, national honorary fraternity for the promotion of scientific research. He is now repeating the lecture at colleges and universities from Oregon to Louisiana.

He credited Dr. Hans Bethe and his colleagues at Cornell University with the proposal of a plausible method by which, it can be presumed, the stars turn the matter of which they are made into energy, and broadcast it into space.

"It has long been a serious problem," he stated, "to explain why the sun exists at present, and why it radiates at apparently the same rate as it did in Paleozoic times. The ancient plants and animals apparently lived under conditions similar to our own—two hundred million years ago.

"We have long known that if the machinery for transforming matter at

the appropriate rate, and at the temperatures existing in the stars, could be found, we could account for the energy source of radiation. The deuterium process, which burns the ever-present hydrogen into helium ash by way of heavy hydrogen; and the carbon stove mechanism, by which the hydrogen goes into the helium ash by way of the transformation of carbon atoms—these two mechanisms appear to be the chief agents in supplying energy for running the universe."

However, the problem is not yet fully solved.

"A great advance has been made," he continued, "but some problems are left over. Where, for example, did the hydrogen come from?" He did not give the answer.

To explain astronomical puzzles of the star clouds, systematic star motions and the bunching of peculiar types of stars and of stellar systems, Dr. Shapley suggested that there is, even in the vicinity of the sun, some controlling "arm structure." This also seems to be manifested in the dominance of a spiral shape in other galaxies, or milky systems. Perhaps our own milky way has such spiral arms.

"Progress toward unravelling the mys-

RADIO

Dr. Russell M. Wilder, of the Mayo Clinic, chairman of the Committee on Food and Nutrition of the National Research Council, will tell of the new vitamin-enriched bread which will soon be available to give Americans more strength for defense and peace as guest scientist with Watson Davis, director of Science Service, on "Adventures in Science," over the coast to coast network of the Columbia Broadcasting System, Thursday, Feb. 20, 3:45 p.m. EST, 2:45 CST, 1:45 MST, 12:45 PST. Listen in on your local station. Listen in each Thursday.

teries of the structure of our galaxy is made through studies of star colors, star counts, the distribution of obscuring matter, the spectral classification of faint stars and, indirectly, through the distribution of the external galaxies. Their presence or absence in a field of stars is a rough measure of the amount of absorbing material. Such material, if present, may affect measures of star colors, distances and numbers.

"Something like half a million external galactic systems have now been photographed in the Harvard survey of that part of the universe within reach of the large telescopes. Most of them are more distant than twenty million light years and nearer than two hundred million light years. The detailed studies of the distribution of external galaxies is leading slowly to knowledge of the general 'metagalactic structure,' and bears therefore upon the problems of the expanding universe, age of the stellar systems and the theory of relativity as it applies to the structure of the universe."

Dr. Shapley also showed his audiences new motion pictures of solar storms, taken at the Harvard station in Colorado.

Science News Letter, February 15, 1941

INTERESTED? in Science



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