

ASTRONOMY

Milky Way Explored

► **NEW PROOF** has been found that the Milky Way Galaxy, to which the sun and earth belong, is a huge spiral with three arms.

Using bright, blinking stars, such as the North Star, Dr. Robert P. Kraft of Mt. Wilson and Palomar Observatories, Pasadena, Calif., is mapping the galaxy as far as 16,000 light years away. A light year is the distance light, traveling 186,000 miles a second, covers in a year, or six million million miles.

Dr. Kraft reported that the sun appears to be in the middle "arm," separated from the outer one by 3,000 light years and from the inner one by roughly half that distance.

The kind of stars used by Dr. Kraft are called "cepheid variables" because they blink rhythmically. Some have longer blink periods than others. Believed to be "young" stars, they pulsate from swelling and contracting, presumably because of internal instability. More than 600 bright cepheids are known in the Milky Way, and they are believed located in the arms.

The blinking stars can tell the distance because their brightness and blink period are related. The longer the period, the brighter the star.

Studies of cepheids in star clusters have shown that those having the same period

are equally bright. If another cepheid has the same period as the North Star (closest cepheid to earth, some 1,700 trillion miles away) but is only one-fourth as bright, the difference in brightness is due to its being farther away. Since brightness varies inversely with the square of the distance, the fainter star must be twice as far away as the North Star.

Astronomers have earlier estimated the shape and size of the Milky Way by studying the spectral characteristics of bright blue stars of the OB type and of red giant stars in the spiral arms.

By looking at the spectrum of a star, astronomers can figure out how bright it is, regardless of how far away it is. After subtracting possible absorption of some of the light by dust in space, the astronomer has enough information to figure the distance to the star.

Another method used by radio astronomers to find the facts about the galaxy is measuring the apparent velocities of hydrogen gas in the spiral arms.

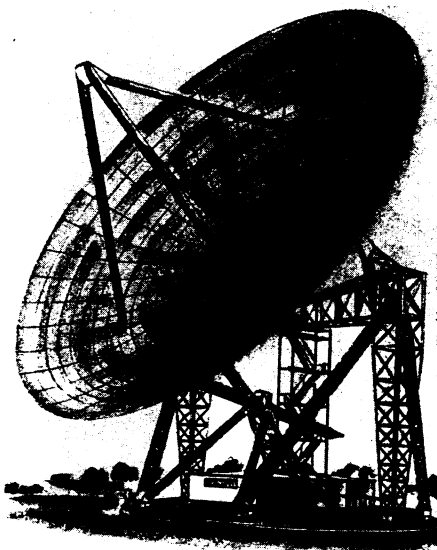
From the velocities in any given direction, the distance can be found. However, the radio astronomer has to rely on the optical astronomer for the "length of the ruler" to use for his measurements.

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and operating the necessary world organization.

The Kurtz scheme drew lively interest at the Electronic Industries Association convention in Chicago. It was estimated that War Safety Control, if adopted, would probably double or triple the \$10 billion electronics industry in short order.

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BIGGEST RADAR DISH—This is how the 150-foot dish antenna for the Stanford radar telescope will look behind the Stanford University campus when completed later this year. The biggest of its kind in the U. S., it will send and receive signals to study the sun and planets.

RADIO ASTRONOMY

Huge Radar Will Be Used to Probe Planets

► **STUDIES** of the other planets in the sun's system will begin sometime this year with the largest radar telescope in the United States.

Stanford University and Stanford Research Institute, supported by the Air Force's Cambridge Research Laboratories, will cooperate in beaming man-made signals to heavenly bodies and receive the return signals.

In this manner signals were recently bounced off Venus by the Goldstone tracking station, Pasadena, Calif., to give new information about that planet and improve the knowledge of distances in space.

The 150-foot telescope, located behind the Stanford campus, will be second only to the 250-foot steerable dish at Jodrell Bank in England. A million-watt power supply is used by the telescope's transmitter built by Ling-Temco's Continental Electronics Manufacturing Company, Dallas, Texas.

It is the most powerful transmitter ever built to operate in the 20 to 60 megacycle frequency range.

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PUBLIC SAFETY

War Safety Control

► **AN ELABORATE** plan for "War Safety Control," based on a gigantic global electronic intelligence system, has been plotted by a New York management consultant who says now is the time "to declare scientific war on war, itself."

The copyrighted report was submitted by Howard G. Kurtz, senior associate with Handy Associates, Inc., to the Foundation for Instrumentation Education and Research, New York.

Mr. Kurtz's formula for a "war-proof world" involves a system of transmission, surveillance and detection equipment, internationally administered. The system would keep an all-seeing electronic eye on military, industrial and economic matters around the globe. War threats, when discovered, would be checked promptly by deterrent forces.

War Safety Control, Mr. Kurtz said, can thus be based on "the most basic world community . . . the universal community of physical fear."

He lays part of the blame for present insecurity and inaction on "an unconscious reluctance to want to bring an end to the threat of war, killing the goose that lays the golden defense budgets."

Mr. Kurtz does not champion disarmament. "A world in which all nations are made safe against each other, and all nations are independent, is not a 'disarmed' world," he said.

But he believes new arsenals of "non-lethal weapons" can be developed to help air and ground forces stop war threats without hurting anyone. Tranquilizing gases and other chemical weapons could be used to subdue armies, or even entire populations, until the situation was under control.

Alarms would be signaled by the complex control system if, for example, a carload of strategic materials was sidetracked from its scheduled factory destination, or a factory began to discharge unusual suspect wastes into a river. Any unusual circumstances implying possible war conditions would be detected immediately.

Mr. Kurtz calls on the United States and its President to take the lead in evolving the "bold new grand strategy," with responsible roles assigned to the State and Defense Departments and the U. S. Information Agency.

"By going forward on this concept we can take giant, forceful world-wide impact strides forward unilaterally without having to wait to negotiate our foreign policy with the Kremlin, as we have done for so long," he asserted.

His report, "The Future Research Challenge: Control of World Crisis," includes a signed statement from 20 prominent figures in science, education and industry who see "no insurmountable barriers" in forming