

## Other worlds, other planets

A new planet-like object circling a nearby star, making two in the system, has been discovered by Dr. Peter van de Kamp, director of Swarthmore College's Sproul Observatory. He says the star, known as Barnard's star, shows a "striking analogy to the one planetary system that we know so well, namely, our own."

**There may** be even more than two planet-like objects in the Barnard system, perhaps as many as 10, but Dr. van de Kamp does not believe he could squeeze even a third one out of the observational data. Time, not a larger telescope, is the problem. In order to detect and analyze the very small wobbles, or perturbations, caused in the path of a star with one or more unseen companions, precise observations over long periods of time are needed.

Three other stars have been found to have planet-sized objects, making a total of five discovered, besides the sun's family of nine. They confirm theories that the universe abounds with billions of other planets circling other star-suns. Even by conservative estimates, many scientists have suggested that a hundred million of them have some form of life. Some may even have life as advanced or more advanced than earth's mankind, although not everyone agrees that human life on earth today can really be called advanced.

The two companions of Barnard's star are poor targets for any sentient life, however, since temperatures on either of them are likely to be at least a couple of hundred degrees below zero F.

**Barnard's star** has been under scrutiny at Sproul Observatory since 1938, and that scrutiny has been intense since 1963, when Dr. van de Kamp reported discovery of one planet-like object accompanying it in its travel through space. He called this first companion Barnard's star B.

It had an extremely elliptical orbit, and observations since then have shown the orbit to be even more egg-shaped than originally thought, as well as the indications of a secondary wobble. Using not a computer but only "hands and a slide rule," Dr. van de Kamp calculated that the same elongated orbit could be replaced by two nearly circular ones, with periods of 26 and 12 years, respectively. He will report his calculations in a forthcoming issue of *ASTRONOMICAL JOURNAL*.

He has designated the two objects Barnard's star B-1 and B-2. The star itself is the second closest to the sun, six light years away. It was discovered

in 1916 by E. E. Barnard, and has the largest known proper motion, the measured change in a star's position against the background of more distant stars.

**Some 3,100** photographic plates have been taken of this star, mostly since 1938, with Sproul's 24-inch refractor. If the mass of Barnard's star is assumed to be 15 percent of the sun's mass, then Kepler's third law of planetary motion requires the orbit of the unseen companions relative to the visible star to have radii of 4.7 and 2.8 times the astronomical unit, the 93-million-mile distance from sun to earth.

The radii of the observed perturbations are 0.034 and 0.014 times the astronomical unit, leading to masses of 1.1 and 0.8 times the mass of Jupiter for the companions B-1 and B-2, respectively. These objects, therefore, may be considered to be planets.

### TRANSURANIC COMPETITOR

## Another route to 104



LRL

*Harris: Two-millionths of an ounce.*

In 1964, a few radioactive atoms existed for three-tenths of a second in a Soviet laboratory, and G. M. Flerov and his colleagues, who detected it, announced the discovery of element 104. But the announcement was met with skepticism in the United States; scientists there were unable to duplicate the Soviet work, and it is still awaiting approval by the International Union of Pure and Applied Chemistry.

**Now, U.S.** scientists declare they have gone their own route to corral the elusive element.

At the American Chemical Society's national meeting in Minneapolis, Minn., last week, Dr. Albert Ghiorso, leader of a group of scientists at the University of California at Berkeley, announced that his team had positively produced element 104 in the laboratory.

Dr. van de Kamp says, "The sizes of their orbits around Barnard's star are closely comparable to those of Jupiter and of an average asteroid in our solar system."

**Two of the** discoveries of other planet-like objects outside of the earth's solar system were also made at Sproul. In 1943, Dr. Kaj Aa. Strand, now director of the U.S. Naval Observatory, found an unseen companion in the 61-Cygni system, and in 1960 Dr. Sarah Lee Lippincott reported detection of an invisible object of small mass around the star known as Lalande-21185.

The fifth known star with an unseen object "of definitely planet-like mass" accompanying it is L-726-8, reported this month by Dr. L. W. Fredrick and graduate student P. J. Shelus of the University of Virginia's Leander McCormick Observatory. The star's mass is less than one-thousandth's the sun.



LRL

*Team leader Ghiorso: No question.*

"There is no question about our discovery," says Dr. Ghiorso. His confidence is echoed by Nobelist and former co-worker Glenn T. Seaborg.

When the elements are arranged in the periodic table, based on atomic number (the number of protons in the nucleus), they show a tendency to repeat their properties at regular intervals. Following this pattern, then, the atoms of element 104 should behave like the members of a related group, and combine with chloride ions to form chloride compounds (SN: 4/13/68, p. 352). In 1966, the Soviets reported tests that claimed that the atoms they produced did form chloride, and that the chloride had a half-life of three-tenths of a second, the half-life the Soviets originally found for element 104 in 1964. But because the number of atoms was