ASTRONOMY

Other Worlds

No human eye will ever see them, but far beyond the outmost limits of our solar system there are other planets of other suns.

By MARTHA G. MORROW

➤ THERE ARE other "worlds" than ours! Not just the nine children of the Sun, the planets of the Sun among which the Earth is numbered.

There are other planets of other suns, heavenly bodies that astronomers believe worthy of the name "planet." Giant planets they are, satellite to stars a million times more distant from us than the 92,870,000 miles which separate us from our own Sun.

No human eye will ever see them as we view Venus or Jupiter or Mars or Saturn in the night sky. Only through the effect of these distant, dark bodies upon the stars to which they owe allegiance were astronomers able to discover their existence.

There are even some who say: "They are not planets. They are only a special kind of star. The only planets are those in our own solar system." While others object to calling them other "worlds," holding that the word "world" should be reserved for our inhabited earth and not used even for the other planets of our solar system which may or may not be the abode of life.

A few months ago a young man who had come from Denmark only a few years before stood in the speaker's rostrum of the American Philosophical Society in Philadelphia and told his fellow scientists that he had evidence of a third object associated with the double star 61 Cygni. This astronomer is Dr. K. Aa. Strand of Swarthmore College's Sproul Observatory.

Orbits Not Smooth

Studying the double star in Cygnus, the Swan, young Dr. Strand discovered that the orbits, or paths in space along which the pair of stars move, were not exactly smooth. The only explanation for the irregularities in the star paths, reasoned Dr. Strand, must lie in the presence of a third body. It had to be massive enough and close enough to one of the components of 61 Cygni, as the double star is named, to drag the star slightly out of its orbit by gravitational pull, he believed.

The unseen third member making up this star, Dr. Strand's calculations indicated, is an object far smaller than any known star—only one-sixtieth the mass of the sun. This would give the first known extra-solar planet a mass about 16 times that of Jupiter, the largest planet in our system. This dark object is thought to swing around the star which is its sun once every 4.9 years.

A similar companion for a double star in Ophiuchus, the Serpent Bearer, was announced early this year by Dr. Dirk Reuyl of the University of Virginia, and Dr. Erik Holmberg of Lund University, Sweden. From the measurements of photographs made in the quiet of the Leander McCormick Observatory, under the direction of Dr. S. A. Mitchell, they tracked down an invisible partner for 70 Ophiuchi. It completes its course approximately every seventeen years and is believed to be only about one-hundredth the size of the sun. This body then is even smaller than the one discovered in the system of 61 Cygni and boldly called by Dr. Strand a "planet."

Another Planet

More recently still another "planet" has been reported by Dr. Reuyl from McCormick Observatory photographs, a body three-hundredths of the mass of the sun. It is the attendant of an inconspicuous single star known by its catalogue name of Cincinnati 1244.

The search for planets is still in its initial stage. Some astronomers are not yet convinced of the existence of these "planets." Particularly is the existence of a small companion to 70 Ophiuchi being questioned. But just as it is impossible to see these silent partners of a star and thus prove their existence, so it is difficult to disprove such a companion for any system. The study of planets already reported is being continued and checked.

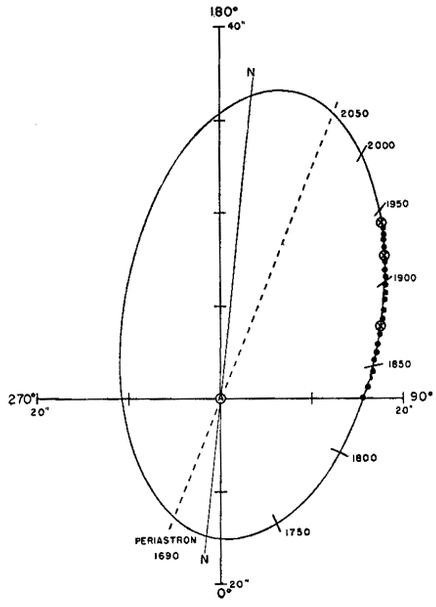
Should these newly discovered objects rightly be called stars or planets? Until recent times and the development of telescopes which could better penetrate the veil of space, such bodies went undetected. Now we know of their existence, what are they like?

The term "planet," usually applied only to bodies of the solar system, may be reinterpreted to include all astronomical bodies, in orbital motion around a more massive luminous primary (not necessarily the sun), which shine by reflected light.

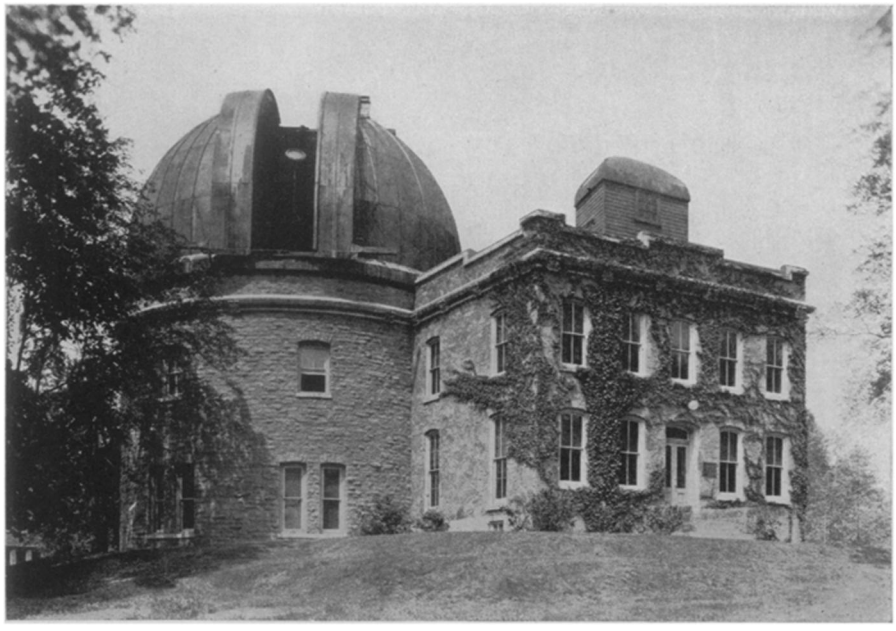
Travel Around Stars

Study of the periodic variations of 61 Cygni and 70 Ophiuchi from their prescribed orbits and that of Cincinnati 1244 from uniform linear motion indicate that the small stellar companions do travel around much larger stars.

Large stellar masses such as a million times that of the earth, Sir Arthur Eddington pointed out, must necessarily be luminous stars. Working on the relation between the mass and luminosity of a star, he explained that an extremely hot interior is necessary to support the enormous internal pressure. Heat, radiating to the surface, keeps the body violently luminous. A mass a hundred thousand times that of our planet will prob-



ORBIT—The egg-shaped path is the computed apparent motion of the fainter member of the double star, as it revolves around its bright sister located in the center at A. Each (X) represents photographic observations. It was noted that this path was not exactly smooth, the star being dragged slightly out of its path, Dr. Strand reasoned, by the pull of a planet.



SCENE OF DISCOVERY—Evidence of a planet outside our solar system was first produced at the Sproul Observatory by Dr. K. Aa. Strand of Swarthmore College. Still unseen, the new planet's presence has been determined from studies of its companion, 61 Cygni, a double star.

ably not be so hot inside, nor shine so brightly. For masses less than ten thousand times that of the earth the escape of heat will be so small, according to Eddington's calculations, that the bodies will appear dark.

Investigating the surface of the planet attached to 61 Cygni, Dr. Henry Norris Russell of the Princeton University Observatory estimates that the surface may be hot enough to appear feebly self-luminous against a black background. But the light which it reflects, the veteran astronomer believes, would be so much greater that it would actually be shining by reflected light.

You may already have begun to wonder if there is life on these newly-discovered planets. A definite answer certainly cannot be given when the possibility of even seeing these bodies is quite hopeless at such great stellar distances, but the chances are that life as we know it does not exist there.

No Evidence Available

With the exception of Mars and Venus, the other planets of our own solar system are either too hot or too cold for life such as ours. The kind of life with which we are familiar requires water and oxygen, but so far no positive evidence has been found of their existence on any of the other planets.

Much speculation has been made as to the type of life, if any did exist, to be found on Mars, and trips to investigate this planet have been proposed. But since we know so little about Mars, which sometimes comes within 35,000,000 miles of the earth, our chances of securing definite information about these extra-solar planets are very slight.

More To Come?

Perhaps the discovery of these planets is only the beginning of the discovery of many planets circling around other stars than ours. Some believe additional planets of our own system remain to be discovered. Fourteen years ago Pluto, the ninth planet of the solar system, had not yet been found.

Locating a planet is usually not accidental, but the results of years of research. Occasionally a planet, by its influence on a neighboring body, invites discovery for years before it is finally found.

The planet Uranus, discovered late in the eighteenth century, refused to follow the orbit computed for it, and by the middle of the nineteenth century it had strayed from its course two minutes of arc, an enormous amount in the eyes of astronomers. Deciding a distant, undiscovered planet must exist, two astronomers independently calculated its probable location.

An Englishman named John Couch Adams finished first, but could awaken little interest in his findings. Upon completing his calculations slightly later, Urbain Joseph Leverrier had the inspiration of writing J. G. Galle at the University of Berlin to direct his telescope to a certain point in Aquarius, the Water Bearer, where he would find a new planet. Within a half hour Galle found the planet less than a degree from the designated place. This new planet, never visible without a telescope, was Neptune.

Pluto The Latest

All of us will remember the excitement attending the discovery of Pluto in 1930. Percival Lowell, certain that yet another planet belonging to Neptune was influencing the orbit of Uranus, spent years searching for it, and after his death, the hunt was continued. Finally, in January, 1930, Clyde Tombaugh, a young man not yet in college, but working at the Lowell Observatory, thrilled at finding on a photograph the tiny image of a new planet in the constellation of Gemini. After discovery of Pluto, earlier plates were examined, and, ironically enough, the new planet was found on a plate taken in 1915 at the Lowell Observatory itself. It was also present on early Mount Wilson, Harvard, and Heidelberg photographs.

All five of the planets with which we are most familiar—Mercury, Venus, Mars, Jupiter and Saturn—were known to the ancients. The early Greeks called them planets, meaning wanderers.

The first discovery of a planet on record—Uranus—was made in 1781 by Sir William Herschel. In the constellation of Gemini, the Twins, he saw an object which could be distinguished from the stars by its disk and reported it as a comet. That it was actually a planet did not become known until almost a year later when its orbit was found to be circular and to lie beyond Saturn.

Due to the recent discovery of the extra-solar planets, new fields of speculation have been opened for the astronomer, the mathematician, the physicist. The search for other planets has just begun.

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● RADIO

Saturday, Aug. 28, 1:30 p.m., EWT

"Adventures in Science" with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. L. C. Graton, of Harvard University, who recently visited Mexico's new volcano Parieutin, will tell about the results of his trip.