

## ASTRONOMY

# Pluto Not Planet

**Dr. Gerard P. Kuiper's demotion of Pluto from planet to runaway moon of Neptune "clinched" by recent discovery that Pluto takes more than six days to complete a rotation.**

► PLUTO, considered to be a planet since its discovery in 1930, is actually a run-away moon of Neptune.

The demotion from planet to escaped satellite was "clinched" by the discovery of Pluto's slow rotation of about six and a half days, Dr. Gerard P. Kuiper of Yerkes Observatory told SCIENCE SERVICE. (See SNL, Jan. 28, p. 56.)

The earth is thus one of eight, not nine, planets, Dr. Kuiper said. There are no planets more distant from the sun than Neptune, he believes.

"It is now clear," he stated, "that the presumed perturbations of Uranus and Neptune must be due to minor errors in observations."

Perturbations, or disturbances in the motions, of the planets Neptune and Uranus first led Lowell Observatory astronomers to hunt for a distant planet beyond Neptune.

Discovery of Pluto by young Clyde Tombaugh was announced on March 13, 1930. (See SNL, March 22, 1930, p. 178-181.)

If Pluto were a planet, Dr. Kuiper said, it would have a fast rotation period, resembling that of all other outermost planets.

Photoelectric measurements of changes in Pluto's brightness, caused by light and dark markings on its surface, showed its slow rotation rate of 6.39 days.

The measurements were started by Dr. Kuiper using the 82-inch telescope at McDonald Observatory, Mt. Locke, Texas, run jointly by the Universities of Chicago and Texas.

They were continued by Drs. Merle F. Walker and Robert Hardie with the 42-inch telescope at Lowell Observatory, Flagstaff, Ariz., and results combined.

The slow rotation is "very strong confirmation," Dr. Kuiper explained, that Pluto once belonged to Neptune, and was slowed down when it was still one of Neptune's moons.

The "clinching" evidence supports three other arguments that previously had thrown suspicion on Pluto's right to a true place as a solar system planet, Dr. Kuiper said.

These are the high inclination and eccentricity of its orbit, its mass and diameter, and the known fact that Neptune had lost and then recaptured its two other moons, Triton and Nereid.

A fast rotation rate, a day or less as the other outermost planets have, would have rated Pluto a planet in spite of these arguments, Dr. Kuiper said.

"Pluto is so far from the sun its rotation could not have been slowed down very much by tidal friction from the sun," he

explained, and the planet Neptune must have caused the decrease in its period. Pluto's mean distance from the sun is 3,670,000,000 miles.

Changing Pluto from a planet to a lost moon of Neptune decreases the number of solar system planets to eight, but increases the number of known satellites from 31, including the earth's moon, to 32.

Because Pluto's orbit cuts inside that of Neptune, it could not have been formed as a protoplanet, or planet-in-being, Dr. Kuiper said.

If it had been produced as a planet at the same time as Neptune, it would have had the same sort of orbit, almost circular, and in the same plane as the orbits of other planets.

Instead, Pluto has a high inclination, or angle, of 17 degrees with that plane and also a high eccentricity.

Another argument for satellite origin, Dr. Kuiper said, is its mass and diameter, about one-thirtieth and 45% that of earth, respectively.

The diameter makes Pluto much too large to have been formed as an asteroid. The mass is about that of Neptune's two other moons, Triton and Nereid.

A third argument favoring Pluto's satellite origin, Dr. Kuiper said, is the known fact that Neptune must have lost all but one percent of its original mass. It was thus able to shed its satellites into space. Triton and Nereid were lost and recaptured. One of the three was lost, and that was Pluto.

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## BIOLOGY

## Tell Child's Sex Before Baby Born

► WHETHER the coming baby will be a boy or a girl can be told before birth in some cases. It could be told in all cases if doctors could find a safe way to get the fluid needed for the test.

The fluid is that which surrounds the baby in the womb, called amniotic fluid. In some cases a little of this fluid leaks some time before the baby is born, but in most cases it stays in the womb until birth when the bag of water ruptures.

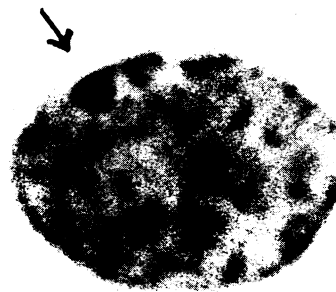
From fluids taken in the ninth month, before the baby was born, Dr. Landrum B. Shettles of Columbia University College of Physicians and Surgeons, New York, correctly predicted the sex of the coming baby in 40 out of 40 cases.

The prediction is based on the fact that

all cells of the body show sex differences. A cell component called chromatin is found in the nucleus of female cells but not in that of male cells. This was discovered by Dr. M. L. Barr and associates at the University of Western Ontario, London, Can. (See SNL, April 17, 1954, p. 246.)

The Canadian scientists pointed out then that, in cases where the true sex of an individual was in doubt, microscopic examination of a bit of skin could tell the person's true sex. They have since reported using this test in more than a score of cases of doubtful sex.

Since sex is determined from the beginning and since all cells of the fetus or infant have the same genetic constitution, then all



**FEMALE CELL**— Arrow points to the chromatin found in the nuclei of female cells, but not in those of male. When amniotic fluid is tapped, sex of unborn can thus be determined.

the cells of the amniotic fluid have the same genetic constitution, Dr. Shettles reasoned.

From its earliest accumulation, the fluid will have cells reflecting the sex of the unborn infant. Dr. Shettles' tests of the 40 fluids, made without his knowing the sex of the baby until later, confirmed this theory.

The big problem now, he says, is how to get this fluid safely, whether by puncture through the mother's abdomen or through the birth canal.

Being able to predict the sex of the baby in advance does not, of course, mean that anything can be done to change it.

Dr. Shettles' findings will be reported in detail in a forthcoming issue of the *American Journal of Obstetrics* and at the coming meeting of the Federation of American Societies for Experimental Biology.

Meanwhile he has learned through scientific colleagues that three Israeli scientists have made similar successful sex predictions in a smaller number of cases.

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