# SCIENCE NEWS

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## A NEW PLANET BEYOND NEPTUNE

CLOSE to the place in the sky where the late Percival Lowell predicted that there was a new and undiscovered planet, his successors at the Lowell Observatory have discovered the new member of the solar system. It is far beyond the orbit of Neptune, hitherto supposed to be the most distant planet. Lowell, who died in 1916, made his prediction on the basis of the way Uranus was being pulled out of its proper path by the gravitational attraction of a then unknown body.

The discovery was made with the new Lawrence Lowell telescope, completed about a year ago. The lens is a photographic one, thirteen inches in diameter and 63 inches in focal length. It was made by Carl Lundin, of the Alvan Clark Co., in Cambridge, Mass., makers of the lenses of many of the largest telescopes. Because it includes a very wide angle in the sky, this telescope, really a huge camera, is especially adapted to the search for a planet, and the Lowell astronomers have been working on the problem for nearly a year. They have had the new planet under observation since January 28, but it was necessary to watch it for many weeks to make sure that it was really a planet.

This is the first planet discovered since 1846. It was then that Johann Gottfried Galle, at the observatory at Berlin, discovered Neptune, using a prediction furnished by a young French astronomer, Urbain J. J. Leverrier.

At present the planet is in the constellation of Gemini, the twins, high in the western evening sky. Only a large telescope will reveal it, however, as it is of the fifteenth magnitude. Even on a clear, dark night, the unaided eye can not see objects fainter than about the sixth magnitude.

Further observations will be needed before astronomers learn as much about it as they know about the inner planets. According to Lowell's prediction it should be about one and one half times as far from the sun as Neptune, or about 4,000,000,000 miles, compared with the earth's distance of 92,900,000 miles. In size, it is undoubtedly larger than the earth's 7,918 miles diameter, and probably smaller than 32,932 miles, the diameter of Neptune. Its mass is probably less than half that of Neptune, which is about 17 times as massive as the earth. According to Kepler's law of the relation between planetary distances and periods, if it is one and one half times as far from the sun as Neptune, it would make one revolution in its orbit around the sun in 282 years, instead of 164 years, the period of Neptune. Being so far from the sun, the planet is probably very cold. No name has yet been assigned to it, but the discoverers have the privilege of giving it one.

## PERCIVAL LOWELL'S PREDICTION OF 1915

LOWELL published his "Memoir on the Trans-Neptunian Planet" in 1915, as Volume 1, Number 1, of the Lowell Observatory *Memoirs*. In making his prediction, Lowell used the general methods that led in 1846 to the discovery of the planet Neptune, until this year the outpost of the solar system. Lowell began his memoir:

"Ever since celestial mechanics in the skillful hands of Leverrier and Adams led to the world-amazed discovery of Neptune a belief has existed begotten of that success that still other planets lay beyond, only waiting to be found. Leverrier himself, with the far-sight of genius, was firmly of this view, though unfortunately over-sanguine of the happy date of its demonstration. In consequence since his time many attempts have been made to indicate the position of one or more of these unknowns, attempts for the most part of no scientific value because not founded on rigorous mathematical investigation. For so complicated is the problem that all elementary means of dealing with it lead only to error. The sole road to any hope of capture lies through the methodical approach of laborious analysis."

But Lowell's task was more difficult than that of his predecessors. As he said in his prediction: "We can not use Neptune as a finger-post to a trans-Neptunian as Uranus was used for Neptune because we do not possess observations of Neptune far enough back. A disturbed body must have pursued a fairly long path before the effects of perturbation detach themselves from what may be well represented by altering the elements of the disturbed. Neptune has not been known long enough to do this."

As the great astronomer spent hours in computations and study, he realized the complexity of his self-appointed task and envied the earlier mathematicians who dealt with less distant planets:

"That Leverrier's solution gave him limits which were erroneous shows how necessary to a full comprehension of the problem is the rigorous and more complete method of solution. This does not detract from the great analytical skill displayed by both Adams and Leverrier in their masterly attack on the problem. That alone deserved success. Why it attained it is nevertheless a cause for some surprise, for Leverrier left out terms bigger than two he retained. The explanation would seem to lie in the nearness of Neptune and the near circularity of its orbit. Neptune turns out to have been most complaisant and to have assisted materially to its own detection."

In his summary, Lowell gave the following scientific data which the astronomers used as a basis of their sky-searching that finally resulted in the confirmation of his discovery: "Mean longitude of epoch around 0 degrees: epoch 22.1 degrees; semi-axis 43.0; mass 1.00; excentricity .202; place of perihelion 203.8 degrees heliocentric longitude July 0, 1914—84.0 degrees; mean longitude of epoch around 180 degrees: epoch 205.0 degrees; semi-axis 44.7; mass 1.14; excentricity .195; place of perihelion 19.6 degrees; heliocentric longitude July 0, 1914—262.8 degrees; the unit of mass being 1/50,000 the mass

of the Sun. It indicates for the unknown a mass between Neptune's and the Earth's; a visibility of the 12–13 magnitude according to albedo; and a disk of more than 1 second in diameter. From the analogy of the other members of the solar family, in which excentricity and inclination are usually correlated, the inclination of its orbit to the plane of the ecliptic should be about 10 degrees. This renders it more difficult to find.''

## THE DISCOVERY OF NEW PLANETS

For the third time in the history of the world, the research of astronomers has revealed a new member of the solar system—the family of bodies, large and small, that revolve around the parent sun from which they were born many ages ago. To Percival Lowell, born in Boston on March 13, 1855, belongs the credit, though he died on November 12, 1916, and now rests in a stone mausoleum at the observatory he founded, close to the dome of the great telescope with which he did his work. It is at this observatory, at Flagstaff, Arizona, that his successors, under the leadership of V. M. Slipher, have located the new planet, close to the place in the heavens where the founder's researches predicted that it would be.

Curiously enough, Lowell was born on the seventy-fourth anniversary of the first modern planetary discovery—that of Uranus by Sir William Herschel on March 13, 1781. With a peculiar sense of the fitness of things, Dr. Slipher chose March 13, 1930, the eighty-fifth anniversary of Lowell's birth and the one hundred and fifty-ninth anniversary of the discovery of Uranus, to announce to the world that Lowell's predictions had been correct.

September 23, 1846, brought the eighth major member of the solar system to the attention of astronomers, and from that time to now no additions have been made. But this is probably not the last. It was the failure of Uranus to move exactly as expected that led astronomers to explain the discrepancies as due to the gravitational attraction of an unknown planet beyond. From these studies the position of Neptune was predicted and the planet was found. As many more years of observations of Uranus became available, still other discrepancies appeared, discrepancies which Lowell studied and used, as we now know, to such good advantage. As Uranus, Neptune and the new planet itself are studied in more detail, and have moved farther in their slow plodding course, other discrepancies, which are now vaguely glimpsed, will appear and still other planets—the ninth, the tenth and perhaps even the eleventh and twelfth, will be discovered. But each will be more difficult than the last, and it may be that the most distant planets will forever continue to move around the sun, unsuspected by man.

Sir William Herschel was a musician at Bath, in England, when he became interested in astronomy. He made a number of telescopes, all reflectors, with dish-shaped mirrors to bring the rays of light to a focus. Finally, on the night of March 13, 1781, he came home from a concert and, according to his habit, went out to the back of his house where he and his sister Caroline swept the skies. Then he was using a little telescope with a mirror only seven inches in diameter. Sweeping through the constellation of the twins, now high in the western sky, and the same group in which the Lowell planet has appeared, he saw something strange. Instead of a tiny point of light, like the thousands of stars that flashed across his view, this was a disk of light. Always modest, he did not suppose that he had found a new planet, the first such discovery ever recorded, but suggested that it might be a comet. But as the object was watched and watched, its character as a planet was established. This brought fame to Herschel as an astronomer; King George III, then on the throne, gave him a pension, and requested that he move to Slough, near Windsor Castle. Herschel gave up his music, devoting his life to a study of the stars and becoming one of the greatest astronomers of all times. The discovery of Uranus made this possible.

Incidentally, the name that Herschel proposed for the planet was not Uranus, but ''Georgium Sidus,'' in honor of the king. English astronomers later suggested that it be called Herschel, and this name was actually used for a time in England. Finally, however, the suggestion of the German astronomer, Johann Elert Bode, prevailed, and it was named Uranus, thus according with the mythological names given the inner planets.

Great as was Herschel's discovery, Uranus was literally waiting to be picked up by some keen eye. Bright enough to be just visible to the naked eye under good conditions when one knows just where to look, it could not have long avoided discovery as telescopes became more numerous. But the next discovery was of a different kind, for before it was seen in the sky, it was detected in a mass of figures in a long and involved calculation.

Uranus had only been observed a few years when it was found that it did not move as it should, according to Newton's laws. The pull of Saturn and Jupiter, its nearest and largest brother planets, was allowed for, but even so there was a discrepancy. By 1845 this was about two minutes of arc—about a fifteenth of the moon's diameter. This was the difference between where Uranus should be and where it was actually observed. A number of suggestions were made, one—a rather obvious one—being that it was due to the gravitational pull of a farther and unknown planet. But that any one could calculate from the discrepancy the location of the unknown planet seemed to many to be a hopeless task.

A 35-year-old French astronomer, Urbain Jean Joseph Leverrier, decided that he could do it. In September, 1846, he completed his laborious computations and wrote to Johann Gottfried Galle, then an assistant at the observatory at Berlin, the following:

''Direct your telescope to a point on the ecliptic in the constellation of Aquarius, in longitude 326°, and you will find within a degree of that place a new planet, looking like a star of about the ninth magnitude, and having a perceptible disk.''

On the night of September 23, Galle turned his telescope to this point. He had an accurate map of the

stars in this region, so all he had to do was to check each on the map against those in the sky. The extra one in the heavens then must be the planet. Within half an hour after he started looking, he found the stranger within 52 minutes, less than a degree, from the place that Leverrier had indicated. The telescope that he used is to-day preserved in the great German Museum at Munich. Galle lived to the age of ninety-eight years and died as recently as 1910.

Though Leverrier and Galle were the first to make the planet known to the world, an Englishman, John Couch Adams, deserves just as much credit as the Frenchman. In the autumn of 1845, this young student at Cambridge, then twenty-six, completed his calculations, with no suspicion of Leverrier's similar efforts across the Channel. He called at the Greenwich Observatory, in London, to present his results to the Astronomer-Royal, Sir George Airy. But that gentleman was at dinner when he called; the butler declined to disturb him. Adams left his paper, which Sir George acknowledged, but then pigeonholed.

By July, 1846, however, after Leverrier had published two preliminary papers on the subject, Sir George became interested, and asked Professor Challis, at Cambridge, to look for the planet. Challis, however, had no maps of the region and so he had to measure the position of a number of stars, night after night, to determine which was moving, for the planets move among the stars. But he had started too late, and while he was still searching, Galle won the race, and Adams, through no fault of his own, lost the honors that might have been his. Then it turned out that Challis had actually measured the new planet twice, the first time early in August, but had not analyzed his observations to determine which object was the planet. Further checking of older records showed that another French astronomer, Lalande, had actually noted it fifty years earlier, without knowing what it was.

The planet was named Neptune by the French, with a touch of sarcasm, it has been said, because England ruled the seas, and they were jealous of the apparent attempt of England to take their honors away from them by pushing the claims of Adams.

Neptune revolves once in its orbit around the sun in 165 years, so that since its discovery it has made just half a revolution. Uranus, however, with a year equal to eighty-four of ours, has made about two revolutions. If there were to be any gravitational pull by still another planet, the more rapidly moving planet would show it best. Sure enough, a slight discrepancy was noticed in the motion of Uranus that could not be explained by the attraction of any known body. It is only about five seconds, a twenty-fourth as large as it showed in 1845. Lowell took advantage of this discrepancy but his was a task more difficult than that of Leverrier or Adams.

The observations were not so easy, either. Lowell died in 1916. Finally, last year, after various delays, the Lowell Observatory obtained a new telescope, given by his brother, Dr. A. Lawrence Lowell, president of Harvard University. This has a photographic lens 13 inches in diameter, with a focal length of 63 inches, so that it is really a huge camera. Covering a wide area of the sky, it is especially adapted to the search for a planet, and after a year of study of photographs made with it, the planet was found. C. W. Tombaugh was the astronomer who first actually observed it, but to the entire Lowell Observatory staff, including its director, Dr. V. M. Slipher, his brother, E. C. Slipher, Dr. C. O. Lampland, K. P. Williams, T. B. Gill, G. H. Edwards and Dr. J. S. Duncan, professor of astronomy at Wellesley College, now visiting at Flagstaff, belongs the credit for the third planetary discovery.

## ITEMS

THE first discovery of activity by the Mediterranean fruit fly in Florida for the current year was made near Orlando, where the original infestation occurred, by agents of the U. S. Department of Agriculture. It is a very small infestation, being confined to two lone pieces of fruit from a sour orange tree, which is grown extensively for ornament and as a grafting stock for sweet oranges. It is enough, however, to indicate that last year's clean-up was not the final blow in the campaign and that there is still work for the eradication forces to do. Quarantine workers recently repelled an invasion of the fruit fly at the gates of California, though the insect did not come from Florida. Larvae were found in oranges on board a ship from Hawaii, where the fly has been firmly established for a number of years.

AN all talking picture in which the entire cast will consist of various animals and reptiles, and featuring the rattlesnake, is being planned for an early filming, according to an announcement made in an address at the Carnegie Museum, Pittsburgh, by Dr. Raymond L. Ditmars, curator of reptiles at the New York Zoological Gardens. Dr. Ditmars stated that the rattlesnake has the best "speaking" voice of all the animals and reptiles tested for the talking screen, and that the well-known warning sound of the rattlesnake has been broadcasted over the radio, being reported as clearly heard far at sea and recognized by thousands in America. The lion was said to have the poorest voice for "talkie" purposes of all the creatures tried before the microphone.

WHEN the storks of the village of Grünewalde fly north from Africa this spring they will find their old home on the schoolhouse, but they will hardly know the place. For the schoolhouse had to be reconditioned during the winter, and the nest had to be taken down. This incidentally gave naturalists a chance to examine a stork's nest of championship proportions, before putting it back on the roof. The nest was over six feet in diameter and not much less than three feet high, larger by half than an ordinary stork's nest. It could contain four men sitting on chairs around a table. Sticks as thick as an arm had been built into its walls, and the interstices filled with moss, straw, hay and reeds. In odds and ends of space not needed by the storks, upwards of 50 sparrow families lived.