

## HAPPY BIRTHDAY JAN OORT

April 28, 1900. **Jan Hendrick Oort** was born on this date in Franeker, Netherlands. He theorized the existence of the Oort Cloud, a vast comet cloud in the outermost reaches of our solar system. In addition, as early as 1932, he became one of the first to use the term dark matter. And, when it comes to expertise about our own galaxy, the Milky Way, few astronomers in the 20th century were more knowledgeable than Jan Oort.

Jan Oort was one of five children. His father, **Abraham Hendrikus Oort**, was a psychiatrist. Oort's parents always encouraged him to follow his passions, and so he decided to study physics at the University of Groningen in 1917.

Attending the lectures of astronomer **Jacobus Kapteyn** was a turning point for Oort. He was greatly inspired by Kapteyn's research and switched to studying astronomy. Kapteyn (1851-1922) went to the University of Utrecht to study mathematics and physics in 1868. In 1875, after having finished his thesis, he worked for three years at the Leiden Observatory, before becoming the first Professor of Astronomy and Theoretical Mechanics at the University of Groningen, where he remained until his retirement in 1921.



Kapteyn on the occasion of his 40th anniversary as professor in Groningen.

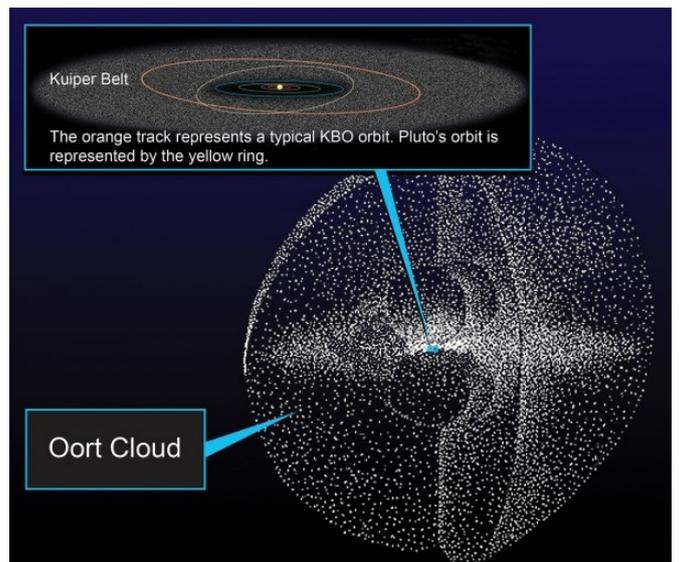
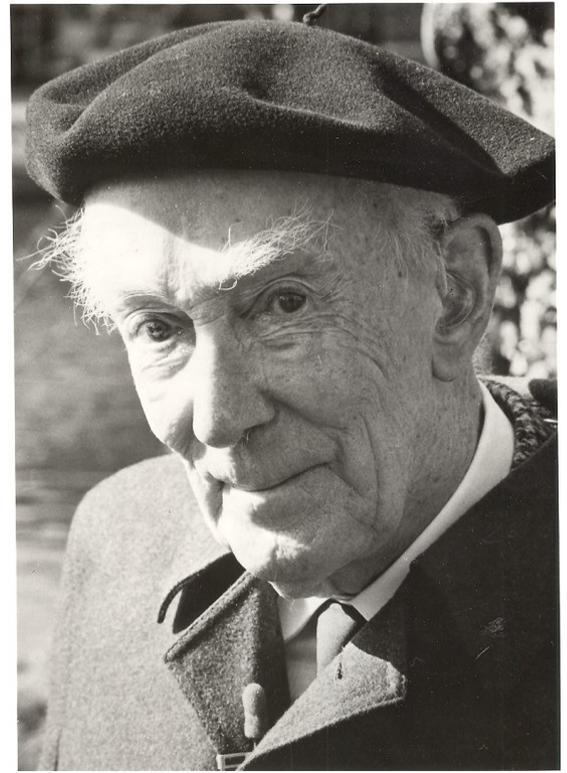
In 1906, Kapteyn launched a plan for a major study of the distribution of stars in the Galaxy, using counts of stars in different directions. **The plan involved measuring the apparent magnitude, spectral type, radial velocity, and proper motion of stars in 206 zones.** This enormous project was the first coordinated statistical analysis in astronomy and involved the cooperation of over forty different observatories. His book *First attempt at a theory of the arrangement and motion of the sidereal system*, was published in 1922, and described a lens-shaped island universe of which the density decreased away from the centre, now known as the Kapteyn Universe.

In 1924, Oort was welcomed to the Leiden Observatory, where he began studying high-velocity stars. Two years later, he defended his doctoral thesis on that subject. This was four years after the death of his friend and mentor, Professor Kapteyn. In 1926, astronomer **Bertil Lindblad** explained the stellar motion properties studied by Kapteyn to be the result of the rotation of the Milky Way. He explained it by proposing that stars closer to the centre of the galaxy revolve around the galaxy's centre faster than stars farther away from the centre. Jan Oort successfully proved and modified Lindblad's theory in 1927 after observing the velocities of many stars. During Oort's studies of star motions in 1932, **he noticed that many stars move faster than expected, given their location within the Milky Way. He then used the term dark matter – not as we use it today, but in the sense of ordinary stars that are either dim (or dark) or hidden from us behind other stars.**

Read more about Fritz Zwicky, Jan Oort and dark matter [here](#)

Oort continued developing the Lindblad theory, which came to be known as the Lindblad-Oort theory because of his multiple contributions and improvements to it. Oort became a professor at the University of Leiden in 1935. **Among other major accomplishments, the young professor determined that our sun is some 30,000 light-years from the center of our Milky Way galaxy, a number that still holds true today.** He also calculated that the sun orbits around the center of the galaxy once every 225 million years. In 1945, Oort was appointed Director of the Observatory of Leiden. He maintained this position until 1970.

1950 was a very important year for Oort, for it's in this year that he proposed the theory for which he is most known for today: the theory of the Oort Cloud.

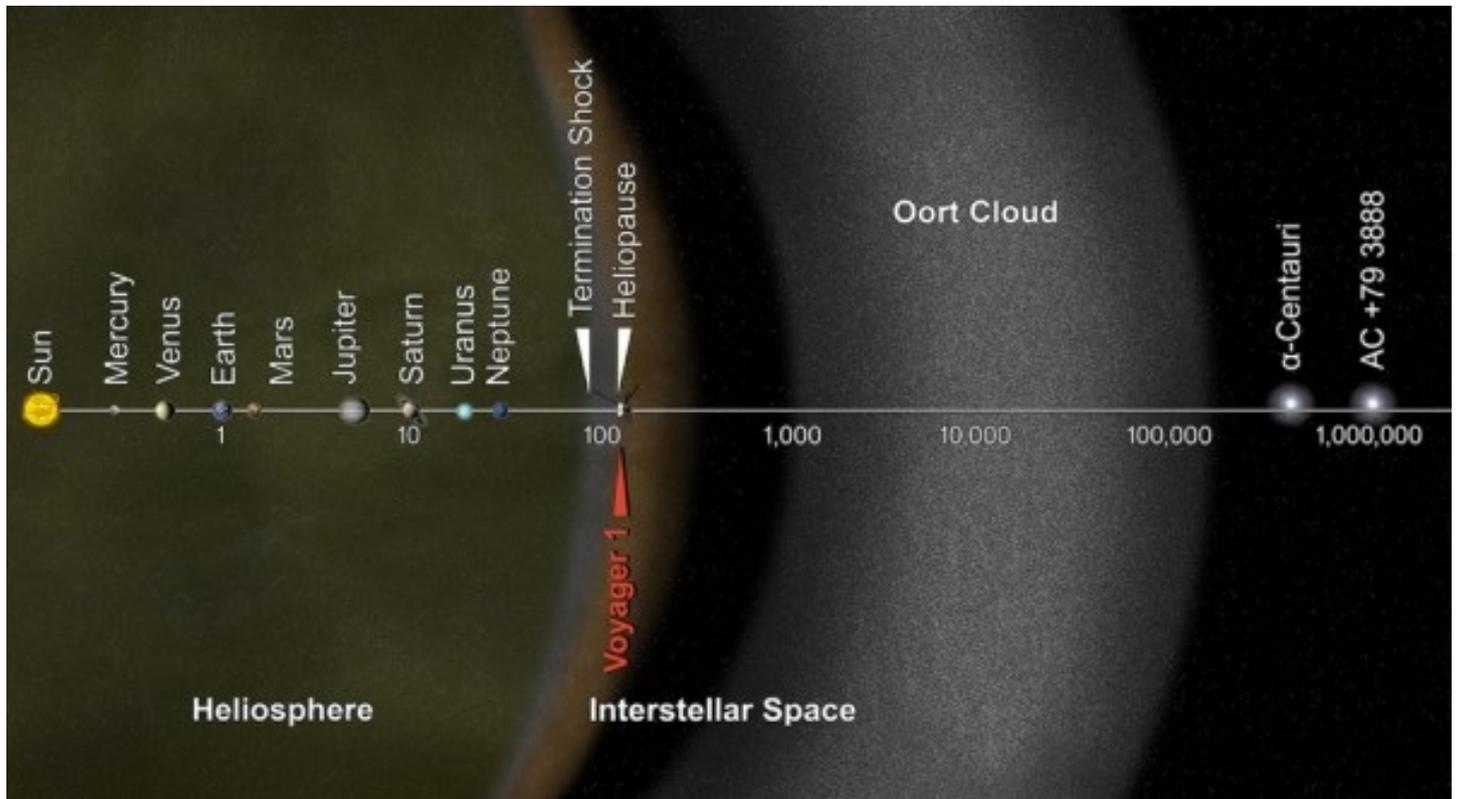


Artist's depiction of the Oort Cloud – the theoretical comet cloud surrounding our solar system

The Oort Cloud is also known as the Öpik-Oort Cloud in honour of **Ernst Öpik**, an Estonian astronomer who independently postulated its existence in 1932. The theory stemmed from astronomers' observations that there are two types of comets travelling through the inner solar system: some with relatively short periods on the order of about 200 years or less, and some longer periods, thousands of years long.

It was in 1950 that Jan Oort suggested that a reservoir of comets lies on the outer limits of our solar system, and that the long-period comets are sometimes knocked from their very distant orbits (perhaps by passing stars) to orbits that bring them near our sun. If it exists, this cloud of comets – the Oort Cloud – is made from material leftover from the formation of our solar system, four-and-a-half billion years ago. The comets within it lie as close as about 5,000 times up to about 100,000 times the Earth-sun distance (AU), a distance of up to 150 trillion kilometres away.

This Oort Cloud of comets is not an observed fact. It's still a theory. But it's a well-accepted theory by astronomers that has stood the test of time, and it's thought to explain the origin of long-period comets such as Comet Hale-Bopp.



This artist's concept puts solar system distances in perspective. The scale bar is in astronomical units, with each set distance beyond 1 AU representing 10 times the previous distance. One AU is the distance from the sun to the Earth, which is about 93 million miles or 150 million kilometers. NASA's Voyager 1, humankind's most distant spacecraft, is around 125 AU.

Prior to Oort's work on this subject, astronomers wondered for hundreds of years (or thousands of years, if you count history's earliest watchers of the skies) where the comets they observe come from. Astronomers in the 20th century knew that comets collide with other celestial bodies. They knew comets are vaporized when they pass too near the sun, and are sometimes ejected out of our solar system. And yet there are always new comets coming to our part of the solar system. The Oort Cloud answers this paradox of comets that seem to appear out of nowhere. Thus Jan Oort contributed greatly to astronomy, and many people today have heard of the Oort Cloud that bears his name.

Jan Hendrik Oort made significant contributions to the understanding of the Milky Way and also was a pioneer in the field of radio astronomy. He is acknowledged as one of the 20th century's foremost explorers of the universe, one who revolutionised astronomy through his ground-breaking discoveries. He determined that the Milky Way rotates and overturned the idea that the Sun was at its centre. He discovered the galactic halo, a group of stars orbiting the Milky Way but outside the main disk. His insights about the life of comets implied there was a lot more to the solar system than the region occupied by the planets.

He died in 1992, at 92 years old.

The Oort cloud, the Oort constants, and the Asteroid, 1691 Oort, were all named after him.

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