

GAIA'S 2ND DATA RELEASE: 1.7 BILLION STARS!

It was less than a century ago, in 1920, that astronomers were famously debating the nature of so-called spiral nebulae. Some believed they lay inside our own Milky Way galaxy and were, perhaps, forming solar systems. Others thought they were large and distant separate galaxies. Thus the wisest astronomers of yesteryear couldn't be sure of the true nature of our home galaxy, the Milky Way. They couldn't know it is indeed one galaxy of billions in the universe. And they couldn't have imagined that now, just 100 years later, we'd have a space observatory like Gaia, whose goal is nothing less than to provide a 3D map of our galaxy.

This mission had its second data release this week, along with a host of virtual reality resources for scientists and the public. The European Space Agency said Gaia's data makes possible:

... the richest star catalog to date, including high-precision measurements of nearly 1.7 billion stars and revealing previously unseen details of our home galaxy.

The new data, which ESA called phenomenal, is based on 22 months of Gaia's charting of the sky.

Günther Hasinger, ESA's director of science, said:

The observations collected by Gaia are redefining the foundations of astronomy.

What's so amazing about Gaia's data?

Gaia gathers its phenomenal data in the most unglamorous of ways, via what's called astrometry. Gaia's job is to scan the sky repeatedly, observing each of its targeted billion stars an average of 70 times over its five-year mission. So, for example, we know our Sun and all the stars in the Milky Way are moving continuously in great orderly masses around the center of our galaxy. We know that ... but we didn't have many details about how each star moves. How could we? The data for so many stars are massive; collecting the data, storing it and analysing it requires today's spacecraft and computer technologies.

Over its five years life, again and again, Gaia will acquire data points on the positions of Milky Way stars. Thus astronomers have already been able to produce an illustration which shows median velocities of stars in our Milky Way.

And so we begin to see that, due to the movements of its stars, our Milky Way galaxy is rotating, including us.

And that's just one example of the type of insight Gaia's data can provide.

Gaia was launched in December 2013 and started science operations the following year. The first data release was published in 2016 containing distances and motions of two million stars. The new data release, which covers the period between July 25, 2014, and May 23, 2016, pins down the positions of nearly 1.7 billion stars, and with a much greater precision. **This equates to Earth-bound observers being able to spot a Euro coin lying on the surface of the moon.** Gaia is also gathering other types of data: These all-sky maps show the total brightness and colour of stars (top), the total density of stars (middle) and the interstellar dust that fills the galaxy (bottom).

There is really a lot here to think about, both for the public and for scientists.



Gaia's view of our home galaxy, the Milky Way

