# Cut from different cloth

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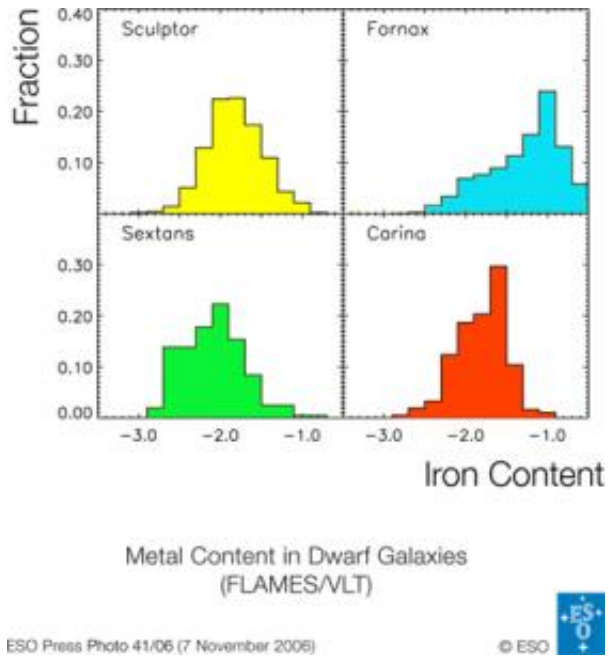


Distribution of the iron content (in logarithmic scale) in four dwarf neighbouring galaxies of the Milky Way (Sculptor, Sextans, Fornax, and Carina), shown as relative fraction, as derived from the FLAMES/VLT observations. There is a great diversity from system to system, which reflects their widely different star formation and chemical enrichment histories. There is, however, a common denominator: contrary to naive expectations, there is a dearth of stars with very low amount of iron, i.e. with a metallicity

A large survey, made with ESO's VLT, has shed light on our Galaxy's ancestry. After determining the chemical composition of over 2000 stars in the four nearest dwarf galaxies to our own, astronomers have demonstrated fundamental differences in their make-up, casting doubt on the theory that these diminutive galaxies could ever have formed the building blocks of our Milky Way Galaxy.

"The chemistry we see in the stars in these dwarf galaxies is just not consistent with current cosmological models," said Amina Helmi of the Kapteyn Astronomical Institute in Groningen, The Netherlands, and lead author of the paper presenting the results. "It shows that there is plenty of astronomy to learn in our backyard."

Our Milky Way Galaxy is surrounded by a number of dwarf satellite galaxies, which because of their loosely rounded shape are referred to as 'dwarf spheroidal' galaxies. Faint and diffuse, these dwarf galaxies are a thousand times fainter than the Milky Way itself, making them the least luminous galaxies known.

Modern cosmological models predict that small galaxies form first, and later assemble into larger systems like our Galaxy. Since the Universe initially only contained hydrogen and helium (most of all other chemical elements being synthesized inside stars), dwarf galaxies should have the lowest heavy element content. Not so, say the astronomers.

As part of a large observational programme, the Dwarf galaxies Abundances and Radial-velocities Team (DART), Helmi and her colleagues from institutes in 9 different countries used the FLAMES instrument on ESO's Very Large Telescope to measure the amount of iron in over 2000 individual giant stars in the Fornax, Sculptor, Sextans and Carina dwarf spheroidals.

The dwarf spheroidals Fornax, Sextans, Sculptor and Carina are named after the constellations in the region of the sky in which they are observed. The Fornax galaxy was one of the first to be discovered, in 1938, and one of the largest in the Milky Way's immediate neighbourhood. It lies at a distance of roughly 450 000 light years, around one-fifth of the distance to the Andromeda Galaxy, and emits light equivalent to 16 million Suns. Also discovered in 1938, the Sculptor dwarf spheroidal lies just 260 000 light years away. It has the luminosity of around 2 million Suns. Carina was discovered in 1977 at a distance of around 330 000 light years, with a luminosity equivalent to 400 000 Suns. Sextans is the most recently discovered of the galaxies, having been first spotted in 1990. It lies 280 000 light years away and has a luminosity equivalent to 500 000 Suns.

Their data unearthed fundamental differences in the dwarf galaxy stars' chemical

composition compared with those in our galactic halo, calling into question the merger theory as the origin of large galaxies' haloes. Whilst the average abundances of elements in the dwarf spheroidals is comparable with that seen in the Galactic halo, the former are lacking the very metal-poor stars that are seen in the Milky Way - the two types of systems, contrary to theoretical predictions, are essentially of different descent.

"Our results rule out any merging of the nearby dwarf galaxies as a mechanism for building up the Galactic halo, even in the early history of the Universe," said Helmi. "More detailed chemical abundance studies of these systems are needed, as this will tell us more about what happened at those early epochs in our local Universe".

Source: European Southern Observatory