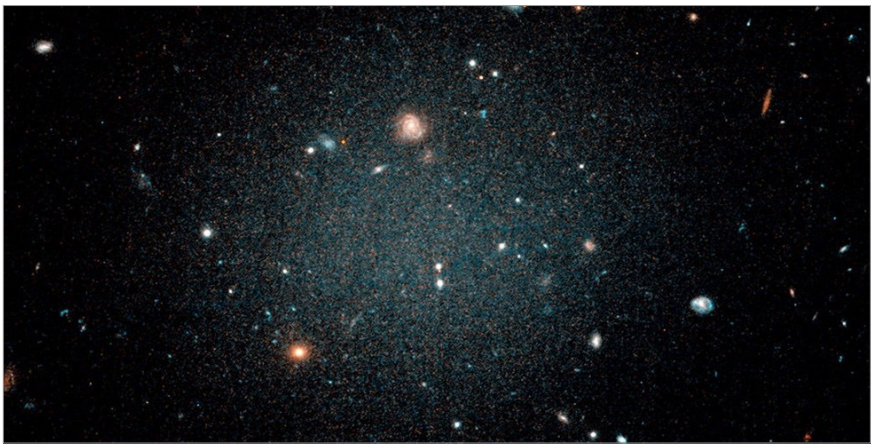
INSTITUTE OF ASTRONOMY
PUBLIC OPEN EVENING

— 23 October 2019 —

Galaxies without Dark Matter?



The galaxy NGC1052-DF2, which is around thought to contain almost no dark matter. NASA/ESA/P. van Dokkum (Yale University)

Dark Matter, the mysterious substance which makes up 85% of our Universe, is thought to provide the 'skeleton' around which galaxies can form. But new (and controversial) results may have found evidence for galaxies which do not contain dark matter at all.

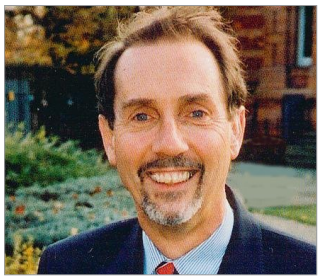
The first of these galaxies is named DF2 (see image above). A team led by Pieter van Dokkum of Yale University measured the mass of DF2 by observing globular clusters of stars orbiting the galaxy. The faster the orbits, the more massive the galaxy -- but the team found that the clusters were orbiting very slowly, implying the galaxy is a real lightweight (compared to similar galaxies which are full of dark matter). DF2, it seemed, barely contained any dark matter at all.

Some astronomers, however, are not convinced. A team led by Ignacio Trujillo of the Instituto de Astrofisca de Canarias has pointed out that if the DF2 is closer than we think (40 million light years, instead of the original estimate of 65 million light years), the galaxy starts to look a lot more like a bog-standard, dark matter-dominated system.

The original team countered by finding a second galaxy apparently free of dark matter, known as DF4. But yet again, Trujillo's team argued that DF4 was closer than previously thought, and wasn't so strange after all.

Now, new results from the Hubble Space Telescope may have settled the debate. Shany Danieli (Yale University) found that the larger distance to DF4 was correct, and it therefore contains no dark matter. So are these new measurements good enough? “Yes, that’s our hope. We’d love to move to discuss what these galaxies mean, rather than whether our measurements were correct,” Danieli says.“That said,” she added, “we fully agree with everyone that ‘extraordinary claims require extraordinary evidence”‘

TONIGHT'S SPEAKER



Robin Catchpole

Are we alone?

Our weekly welcome

WELCOME to our weekly public open evenings for the 2018/19 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

The talk is followed by an opportunity to observe if (and only if!) the weather is clear. The IoA’s historical Northumberland and Thorrowgood telescopes, along with our modern 16-inch telescope, will be open for observations. In addition, the Cambridge Astronomical Association will provide a floorshow outdoors on the Observatory lawns, relaying live images from their telescopes and providing a commentary. If we’re unlucky and it’s cloudy, we’ll offer you a conciliatory cup of tea after the talk (with perhaps some more astro-information in the lecture theatre for those who want to stay on).

If you have any questions, suggestions or comments about the IoA Open Evenings please contact Matt Bothwell at bothwell@ast.cam.ac.uk.

The talk schedule for this term can be viewed at: www.ast.cam.ac.uk/public

Shedding light on the cosmic dark ages

The first 19 elements of HERA, on-site in South Africa

Looking back in time to the early Universe normally requires amazingly complex technology. Instruments like the multi-billion-dollar James Webb Space Telescope have to be designed and engineered with remarkable precision, using the most space-age materials.

Sometimes though, it's nice to be different. HERA, the Hydrogen Epoch of Reionization Array, will be able to look back to the earliest stars in the Universe, using materials that can be bought off-the-shelf in any normal DIY store.

Each HERA dish is around 15 metres wide, and is constructed from PVC pipes covered in a fine mesh -- similar to chicken wire. The actual receiver for the radio waves is suspended above the 'dish' using three telephone poles.

“HERA was designed to be very cost-effective, and so we did try and use material you can get at the hardware store,” said David DeBoer, HERA’s project manager.

HERA will be used to detect radiowaves emitted by the thin wisps of hydrogen gas that existed before stars and galaxies. This period is known as the 'epoch of reionisation', and is one of the biggest mysteries in modern cosmology.

“Trying to understand the evolution of the neutral hydrogen that pervaded the early universe is really the last unexplored space on our cosmic map,” says Chris Carilli, chief scientist at the National Radio Astronomy Observatory. “Here be dragons.”

First all-female spacewalk a success

Jessica Meir and Christina Koch aboard the ISS. Credit: NASA

NASA astronauts Christina H. Koch and Jessica Meir cemented their place in history this week, by taking part in the first spacewalk in NASA history to feature only women. The two astronauts have been training together since 2013, part of the first class to contain a 50/50 mix of men and women.

The two astronauts stepped outside the ISS last Friday to repair a failed power controller.

Speaking at a teleconference, astronaut Jessica Meir said "You know, for us, this is really just us doing our job. It's something we've been training for, for six years, and preparing for. And so, it didn't really, you know -- for us, it's just coming out here and doing our job today. And we were the -- we were the crew that was tasked with this assignment.

At the same time, we recognize that it is a historic achievement, and we do, of course, want to give credit to all of those that came before us. There has been a long line of female scientists, explorers, engineers, and astronauts, and we have followed in their footsteps to get us where we are today. We hope that we can provide an inspiration to everybody, not only [Inaudible], but to everybody that has a dream and has a big dream and that is willing to work hard to make that dream come true -- something that all of us that have made our way up here have done all throughout our lives."

Joke of the Week

Q: What does an astronomer blow with gum?
A: Hubbles