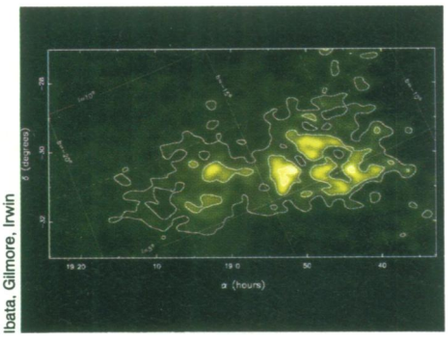
Ill-Fated Milky Way Neighbor Found



Ibata, Gilmore, Irwin

False-color image of newly discovered dwarf galaxy. Foreground stars from our galaxy have been removed in this enhanced image. Elongated galaxy appears divided into two main clumps.

Peering through a veil of dust and scattered starlight, English astronomers report finding the closest known galaxy to our own. The faint galaxy, a dwarf resident of the constellation Sagittarius, appears to lie just 50,000 light-years from the Milky Way's center. The Large Magellanic Cloud, until now considered the Milky Way's nearest galactic neighbor, lies more than three times as far.

In addition to its proximity, the Sagittarius dwarf has other intriguing properties, says Michael J. Irwin of the Royal Greenwich Observatory in Cambridge, England. The galaxy's clumpy, elongated shape suggests that the Milky Way's gravity has already stretched it considerably, he notes. Over the next few hundred million years — a blink of an eye, astronomically speaking — our galaxy will most likely devour the dwarf and gravitationally steal its stars, Irwin adds.

Theorists have proposed that the Milky Way and other galaxies evolve through such cannibalism. Observations of the newly discovered galaxy may allow astronomers to see such activity "right in our own backyard," Irwin says. The finding also suggests that the Milky Way has captured other small satellite galaxies in the past and that their remains await detection.

Irwin and colleagues Rodrigo A. Ibata and Gerry Gilmore of the University of Cambridge reported their findings this week at a joint meeting of the Royal Astronomical Society and the European Astronomical Society in Edinburgh.

Early this year, Ibata approached Irwin with a puzzle. A group of stars that Ibata had assumed were part of the Milky Way's bulge — the region surrounding the galaxy's center — were receding from Earth much faster than stars known to reside there. Spectra of this stellar group, taken over several years with the Anglo-Australian Telescope in Coonabarabran, revealed that they all had about the same velocity and weren't moving at the same rate as stars in the bulge.

Irwin suspected that the star group might in fact belong to another galaxy, perhaps a previously unidentified satellite of the Milky Way. To check this, the Cambridge team examined red and blue photographic plates of the Milky Way and its surroundings taken with the U.K. Schmidt Telescope in Coonabarabran.

The team found that the region containing the puzzling star group had several features in common with the eight galaxies known to be tiny, spheroidal satellites of our galaxy. For example, both this patch of sky and the satellites contain a large population of bloated, middle-aged stars and a substantial number of older stars about to end their lives as compact objects called white dwarfs.

Based on this evidence, "I immediately jumped to the conclusion that this was a dwarf spheroidal galaxy," Irwin says.

The Milky Way's dwarf satellites shine about one-hundred-thousandth as brightly as our galaxy. The newly discovered Sagittarius dwarf lies about 75,000 light-years from the sun and radiates about as much light as 20 million to 100 million suns, a luminosity roughly halfway between that of two classic dwarf satellites, Sculptor and Fornax. The Sagittarius dwarf lies on the opposite side of the galactic center from Earth, making observations a challenge.

To determine the dwarf galaxy's shape and extent, the team had to estimate the amount of light from foreground stars in the Milky Way and subtract it. Stretching across a 10° patch of the southern sky like a giant comet tail, the low-density dwarf galaxy currently recedes from us at 153 kilometers per second.

The team suggests that the galaxy is still on its first orbital pass around the Milky Way. The dwarf's low density and elongated appearance indicate that it can't resist the Milky Way's gravitational tug much longer, Irwin says.

"If the team is right, we're seeing the final stages of the demise of an entire galaxy," comments astrophysicist Douglas N.C. Lin of the University of California, Santa Cruz. Lin also notes that this galactic gobble promises to occur far more quickly than the gradual eating away of the Large Magellanic Cloud that he described last year (SN: 6/12/93, p.374).

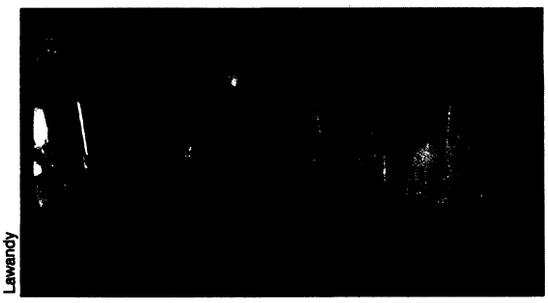
Lin calls evidence for the Sagittarius dwarf compelling but not definitive. However, he notes that its apparent location coincides roughly with that of a puzzling group of globular clusters, densely packed collections of stars. Such clusters rank among the oldest groupings of stars in our galaxy, but these particular ones appear slightly younger. If these globulars actually belong to the Sagittarius dwarf rather than the Milky Way, it could account for the age discrepancy, Lin says.

In that case, the Milky Way should soon claim the clusters for its own.

—R. Cowen

Boosted light: Laser action in white paint

There's nothing like a coat of fresh paint to brighten up a room. But you wouldn't expect an intense, room-filling glow to emanate from the paint.



Lawandy

A green laser pulse excites a pure dye dissolved in a liquid to make the solution light up (left). A laser pulse of equal intensity sent into the same dye mixed with tiny particles of titanium dioxide suspended in a liquid produces a much stronger, room-filling glow (right).

Now, researchers have discovered that certain dyes, when dissolved in a liquid also containing tiny particles of titanium dioxide (a key ingredient of white paint), generate light similar to that produced by a laser. In essence, the randomly distributed titanium dioxide particles act together to amplify light emitted by dye molecules that are excited by a laser or some other external energy source.

"It was quite startling to see this," says physicist Nabil M. Lawandy of Brown University in Providence, R.I. Lawandy and his coworkers report their discovery in the March 31 NATURE.

The researchers already have a number of applications in mind for their "paint-on laser," ranging from display screens to the removal of discolored skin resulting from tattoos or birthmarks.

Normally, lasers require a source of energy, a material — such as a ruby rod or a liquid dye — that can be