Monday, June 20, 2005

Taking up all that space

By GARY ROBBINS
The Orange County Register

On a night when the skies are clear, tilt your head back and gaze at the darkest region you can find amid the magnificence of the stars and planets.

You'll feel as though you are staring into a void. Chances are, you're not.

The seeming emptiness is filled with invisible matter and energy that makes up more than 90 percent of the mass in the universe. Or so the reasoning goes among scientists who are searching for evidence to tie it all together.

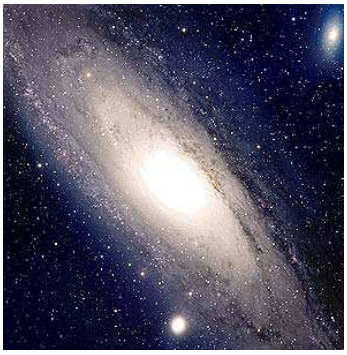
Some of the sleuths are at UC Irvine, which recently created the Center for Cosmology to expand its study of the origin, structure and evolution of the universe.

The center has more than 20 scholars, giving it broad expertise on cosmology's grand questions. Its nucleus is a group of young cosmologists and particle physicists hired during the past four years. The recruits include Manoj Kaplinghat, 31, a theoretical cosmologist trying to decipher the nature of dark matter. He discussed his work in a recent interview.

Q. Most people have heard the term "dark matter." But many of us don't know what it means. What is it?

A.Cosmologists often use the term to refer to all the matter in the universe that isn't luminous but makes its presence felt through the effects of gravity. We're talking about matter that is different from the stuff that makes up things like stars, planets and humans. We haven't detected dark matter yet, so we don't really know what it is.

We care about dark matter because we have overwhelming evidence that it represents about 30 percent of the observable universe. It takes a while to wrap one's head around that. The result is even more amazing when you realize that the observable universe is unimaginably vast; it takes light 14 billion years to traverse it. We also care about dark matter because



Scientists believe that dark matter can exert a gravitational effect on the sort of stars shown here in the Andromeda galaxy.

MORE PHOTOS

RELATED STORIES

- The new stargazers

MORE INFO

"It's a really great puzzle whose answer involves the composition of 30 percent of the universe."

Manoj Kaplinghat

Article tools

E-MAIL THIS ARTICLE

PRINTABLE VERSION

Site tools

EVENTS SEARCH

DISCUSSION BOARDS

MOVIE TIMES

LIVE TRAFFIC

GET A MAP

FINANCIAL TOOLS

without it galaxies like our own Milky Way would never have formed.

Q. Can you say what dark matter might be?

A. The answer won't involve protons, neutrons and electrons – the basic ingredients of atoms and molecules. matter is something else. It might have to do with super-symmetry, which was proposed decades ago, (when wasn't overwhelming evidence for dark matter). Super-symmetry predicts the existence of new particles, som which are collectively called WIMPS (weakly interacting massive particles). WIMPS are heavier than protons, neutrons and electrons, but they don't weigh much. There could be roughly as many WIMPS in one ounce of matter as there are cells in all the humans on Earth. Many scientists think that WIMPS are the dark matter bec they could naturally be abundant enough to make up 30 percent of the universe and have a strong gravitation effect on stars in a galaxy.

Q. Why is that important?

A.We can calculate the expected speed of stars in a galaxy based on the amount of light coming from that gal the stars move faster than expected - and they do - the most likely explanation is that they are being influence the gravitational pull of dark matter. We now have four other completely independent lines of observational ev for the presence of dark matter.

Q. Are there are other candidates?

A. Yes, there a few. Another candidate particle is known as superWIMP. They interact more weakly with norm things like protons, neutrons and electrons. The possibility that superWIMPS constitute dark matter was recer proposed by UCI professors Jonathan Feng and Arvind Rajamaran and researcher Fumihiro Takayama. This candidate is starting to get a lot of attention among cosmologists.

Q. How long do you think it will be before scientists discover the nature of dark matter?

A.This is a tough question. The answer depends on what dark matter really is. If dark matter is something like WIMP, chances are that we will see it (or some hint of it) in laboratory experiments. If the dark matter particle superWIMP, cosmological observations will play a central role. Finding it could happen tomorrow or in 10 yea is playing an active role in this search on both the terrestrial and cosmological front.

Q. Why are you so captivated by this?

A.It's a really great puzzle whose answer involves the composition of 30 percent of the universe. It almost doe matter what the explanation is; this is a window into a new area of physics.

CONTACT US: (714) 796-7970 or grobbins@ocregister.com