



Courtesy NASA

Sam Logan

The Universe: Nothing to Report

by Stephen Whitt

Scientists are a clever bunch. That's why it is a little unnerving to find out how little they actually know.

Take the universe, for example. Once, scientists thought they had it figured out. Everything is made of matter, and matter is made of atoms. Atoms themselves are made of three smaller bits. Different combinations of bits give you different atoms. Atoms come together to make galaxies, stars, planets, and people.

Then a scientist named Vera Rubin found something — or rather, she found nothing. Rubin found that the galaxies she was studying weren't behaving properly. Some *thing*, some invis-

ible mass no one had ever detected, was tugging on the stars in the galaxies. Scientists called it "dark matter", which meant two things. First, they couldn't see it. Second, they had no idea what it could be.

Sure, there are a few leads. Some of the dark matter is gas between the stars. Some of it is in black holes (more on those later). But most of the dark matter, the vast majority of it, in fact, has to be something completely different.

Dark matter doesn't react with ordinary matter. It passes right through as if ordinary matter wasn't there. The only way we know about dark matter is that it has mass, a mass we can measure. Remember, this is most of the matter in the universe.

What is dark matter? We just don't know.



Space is full of dark matter, see? Well...no, you can't see it. But it's there, and there's a lot of it!

Courtesy NASA

This is an artist's concept of a super massive black hole at the centre of a galaxy.

Dueling Theories

If we don't know what the universe is made of, at least we know how it works, right? Um, not really.

Two great theories explain the universe. One is called quantum mechanics. The other is general relativity. Quantum mechanics describes how atoms behave with amazing accuracy. General relativity tells us how gravity holds the universe together. Here's the thing, though. They can't both be right.

Usually, the two theories get along fine because quantum mechanics talks about tiny things like atoms and general relativity deals with big things like stars. But what if a star gets as tiny as an atom? That very thing happens in the universe, in a place called a black hole.

A black hole's gravity is so strong that nothing, not even light, can get away from it. That's why it's black. Any unfortunate astronaut who wanders too near a black hole would disappear forever because the black hole would gobble up the astronaut and any radio signals he might be sending, like "Help!"

One kind of black hole is born when a gigantic star dies. As the star collapses, the force of gravity is so strong that it squashes the star smaller, smaller, smaller until...well, until something happens. Nobody knows exactly what that something is, because this is where general relativity and quantum mechanics come together. And one of them has to be wrong. What's in the centre of a black hole? We just don't know.

Runaway Universe

OK, so we don't get black holes just yet, and dark matter is still dark. At least we know where the universe is going, right? Not quite.

For a long time, scientists have known that the universe is expanding. They assumed this expansion must be slowing down, like a ball tossed in the air slows down near the top of its arc. Then in 1998, two teams of scientists discovered that the universe isn't slowing down at all. It's speeding up! Who ordered that?

Scientists say the speeding up is caused by something called "dark energy". Dark energy is even more mysterious than dark matter, though recent ideas say the two might be related. What is dark energy? You guessed it — we know nothing.

Are scientists depressed by all these unknowns? No way! If there's one thing scientists love, it's a good mystery, and the universe itself is the greatest mystery of all. So while there's nothing to report right now, stay tuned. ✈

Sam Logan



A Hole in the Sky

Professor Lawrence Rudnick of the University of Michigan has found nothing — literally. An area a billion light-years across, and billions of light-years away, seems to be almost completely empty — no stars, galaxies, black holes, or even mysterious dark matter. It's the largest void ever discovered. Why is it there? You guessed it — so far, nobody knows.