Ancient stellar encounter

A red dwarf passed within 0.8 light years of our Sun 70,000 years ago. **All About Space** caught up with the star's discoverer to find out what kind of havoc this wanderer caused in the Solar System

Interviewed by Gemma Lavender

INTERVIEWBIO

Dr Ralf-Dieter Scholz

Discoverer of Scholz's star, a red dwarf with a brown dwarf companion, Ralf-Dieter Scholz is an astronomer based at the Leibniz Institute for Astrophysics Potsdam (AIP) in Germany where he researches stars (such as hypervelocity and those in clusters) in our galaxy as well as the mysterious gaseous objects known as brown dwarfs.

Could you tell us a bit about how you came to find Scholz's star?

It was a continued search for nearby stars. I have been doing this for around 20 years now. What I should mention, by the way, is that the solar neighbourhood is not very well known. In 1997 it was estimated that around 30 per cent of stars are hiding within around 32 light years of us. There are many nearby stars and also brown dwarfs that are missing or hiding even.

In the case of Scholz's star, I started to search in an area that quickly became problematic because there was a lot of crowding and many stars overlapped in images I had of the galactic plane of the Milky Way. In my search, I got close to the galactic plane, around two degrees, which is very close. The other thing I concentrated on was the movement of stars as observed from the Solar System. In our search for nearby stars, we should be observing their motion. Astronomer Edmond Halley, who discovered Halley's Comet should be much more famous for his discovery of the movement of Sirius, the brightest star in Earth's sky. I think his finding of Sirius' motion is a much more important discovery for astronomy than the comet. This is because it became immediately clear that stars are not actually fixed in the sky, they are at different distances from us and it is only logical to expect that the more they move, the closer they are.

This is the principal I used but I have also applied new observations and new databases in my search for nearby stars, including Scholz's star. My job is that of a more traditional astronomer, taking advantage of lots of available data. Data mining is also a term astronomers use in this respect.

Just like red dwarf Proxima Centauri, Scholz's star is thought to be a flare star. These undergo unpredictable and often dramatic increases in brightness

Scholz used data from the Wide-field Infrared Survey Explorer (WISE) satellite - seen here with an engineer loading hydrogen gas into the spacecraft at the Vandenberg Air Force Base, California

Scholz's star's discoverer Ralf-Dieter Scholz believes that if the star has disturbed any comets from the Oort Cloud, then we won't know for at least 100,000 years

"Scholz's star could have also touched the outer Oort Cloud and directed the comets to different orbits"

My search for Scholz's star was a combined search for star motion and colour. I didn't really want to find sun-like stars, which are yellow dwarfs, so to speak. My main aim was to discover red or brown dwarfs. With this in mind, I used a sample of very bright sources and selected a particular colour spectrum of stars, which were observed by NASA's Wide-Field Infrared Survey Explorer (WISE) satellite. I only really expected to find dwarf stars of spectral type M5, a very cool, main-sequence red dwarf. I had to use the motion of the stars to exclude the presence of any background stars, which may have been nearby red M-dwarfs that do not move in the sky.

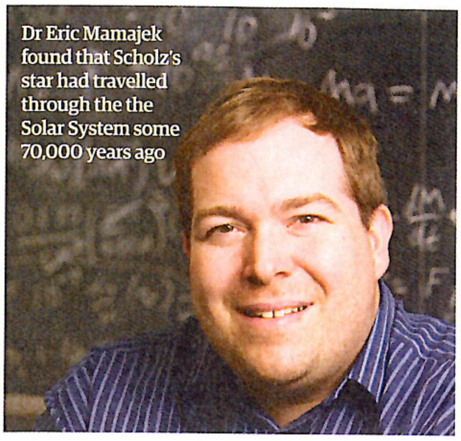
But what I found instead was a late red dwarf of spectral class M9, which rests on the boundary of the brown dwarf region and this was just based on my measurements of the high intensity radiation that it was throwing out. This spectral type is known to be quite rare and there is only one other nearby object, known as LP 944-20, located 21 light years from the Solar System in the constellation of Fornax. I also worked out that Scholz's star could quite possibly be part of a binary. I originally thought that the binary was comprised of two red dwarfs that were equal in mass but I soon discovered I was wrong.

How do we know that Scholz's star has a brown dwarf companion?

Another team of scientists confirmed the spectral type of Scholz's companion. They believed that it should be an M9 dwarf and a mid T-class brown dwarf companion, which have temperature ranges of 430 to 1,030 degrees Celsius (806 to 1,886 degrees Fahrenheit). As well as the indication of spectra, they also confirmed the pairing through adaptive optics imaging and because it is a very close binary, it could now be seen. The two independent conclusions prove that Scholz's star is in a binary. There are also two other binaries comprised of a late M-dwarf and a T5 brown dwarf.

Roughly where in the Solar System did Scholz's star pass through?

There is a 98 per cent probability that the star crossed the Solar System. It was in the Solar System for around 10,000 years, from 65,000 to 75,000 years ago. The closest point was about 70,000 years ago at a distance of 0.8 light years away from Earth. Scholz's star passed through the outer Oort Cloud, not the inner one which would have been much more dangerous for us or a more important one for comets, with respect to them being



Dr Eric Mamajek found that Scholz's star had travelled through the the Solar System some 70,000 years ago

Scholz's star has a brown dwarf companion called a T-dwarf (centre). A T-dwarf is cooler than an L-type (left) and Y-type brown dwarf (right)

sent through our Solar System. Scholz's star could have also touched the outer Oort Cloud and directed the comets to different orbits, but they will take hundreds of thousands or millions of years to even come close to us in any case.

Would any Earth-based observers have been able to see Scholz's star?

Personally, I think not. The star is much fainter than you would expect to see with the naked eye. I mean, even if Proxima Centauri, our closest red dwarf, which is a bit hotter than Scholz's star, came as close to us as Scholz's star did, you still wouldn't be able to see it with the naked eye. I mean, by the naked eye, it is harder to see because it would be at a magnitude of 11. And we can see stars only up to a magnitude of six with the naked eye. Nonetheless, Scholz's star is a strong flare star and outbursts from its surface can be very strong.

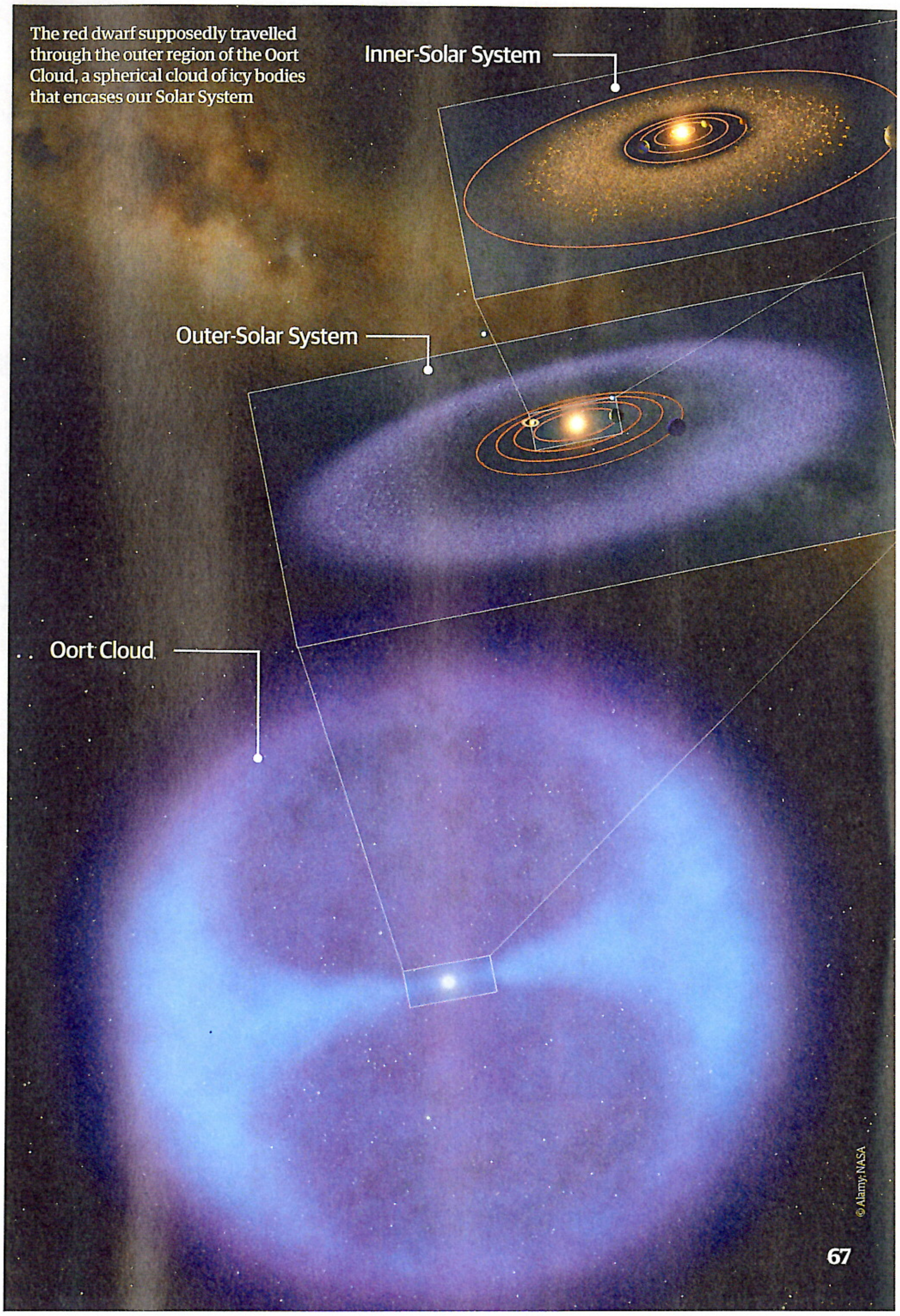
Flare stars can reach up to seven or eight magnitudes. So in that case, of course, it could be visible, but who would notice? [laughs]. If Scholz's star was still on the boundary of sixth magnitude, at normal times it would be easier to observe by the naked eye. There was also no pollution 70,000 years ago and Earth had very clear skies where you could see more stars in the Milky Way during the night and they would appear very clearly if you were to observe them.

Will the star be back?

I don't think so because it is on a rather eccentric orbit. The stars move more or less in the spiral arm on a circular orbit around the galactic centre, whereas this star crosses close to the Sun at a speed of 80 kilometres per second (50 miles per second) and is also moving on a very different orbit to other stars. It changes its distance and comes close to the galaxy's central region as it crosses the solar neighbourhood region but I would not expect it to return. It will not come anywhere near the Sun again.

Where is Scholz's star at the moment?

It is about 20 light years from us. Astronomers have been observing the star recently and they were able to see it with their own telescopes. There are a few videos on YouTube where some guys have observed it. You don't really need a large telescope to see Scholz's star, as long as you are not looking to observe it in any real visual detail, but with the help of a CCD camera and at least an eight inch telescope it is really easy, as this is usually the limit that amateurs have.



The red dwarf supposedly travelled through the outer region of the Oort Cloud, a spherical cloud of icy bodies that encases our Solar System