when the sun is covered,
and when the stars darken

Holy Qur'an
81:2

ASTRONOMICAL RESEARCH CENTER (A. R. C.)

Issue 12

Jamadi-Alsani 16, 1428
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A. R. C. NEWS

Latest Astronomical News on the Internet

Inside This Issue :

Plans for a Liquid Lunar Telescope

NASA-funded researchers are working on a clever technology that could deploy a gigantic telescope made from rotating liquid… on the Moon! It sounds like science fiction, but they've gotten smaller prototypes to work, and the technology should work even better on the lower lunar gravity.

Here's how it works. Astronauts would deliver the observatory (all folded up) to the Moon during one of their upcoming "return to the Moon" missions. It would unfold into the shape of a telescope mirror made of mesh. The astronauts then pour a reflective liquid onto the mesh. The mesh rotates coating the entire surface in the liquid. Don't worry about the liquid dripping through the mesh, it actually gets held in place by surface tension.

As telescopes go, this would be a whopper. The current plans call for a 20-metre mirror, but it could theoretically get as big as 100-metres across. This would provide 1000 times the observing power as the James Webb Space Telescope, which still won't launch for a few more years. That gives it the power to look right back to the very edge of the observable Universe, and see the first generations of stars forming.

Now there's a reason to send humans back to the Moon.

June 21, 2007
nasa.gov

Golden Mosque in Samerra Attacked Once Again

The minarets before bombing

Insurgents on Wednesday blew up the two minarets of the Golden Dome Shiite shrine in Samarra

New Rocket Could Launch Really Big Telescopes

If you've got a really big rocket, what should you use it for? If you're an astronomer, you'll want it used to launch really big telescopes; observatories that would dwarf the Hubble Space Telescope.

NASA's new Ares V launcher, is being developed as part of the Vision for Space Exploration. Once completed, this mighty launcher will deliver cargo all the way to the Moon. In fact, it'll be capable of launching 8% more weight than the Saturn V rockets that put humans on the Moon during the Apollo missions.

Philip Stahl, an engineer at NASA's Marchall Space Flight Center thinks it should also be used to launch gigantic telescopes. How big? According to Stahl, Ares could loft a telescope with a primary mirror 8+ meters across. This would provide a telescope that could see objects 3 times sharper than Hubble, but more important, it could see objects 11 times fainter.

The main telescope could be launched by Ares V, and follow on missions by smaller rockets could send up new scientific instruments that attach to the end of the mirror. In this way, the observatory could be used for 50 years, just like an Earth-based telescope.

June 26, 2007
science.nasa.gov

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Come on Eta Carinae... Explode Already!

When Eta Carinae does explode, it will be a spectacular fireworks display seen from Earth, perhaps rivaling the moon in brilliance.

Eta Carinae is a mysterious, extremely bright and unstable star located a mere stone's throw - astronomically speaking - from Earth at a distance of only about 7,500 light years. The star is thought to be consuming its nuclear fuel at an incredible rate, while quickly drawing closer to its ultimate explosive demise.

When Eta Carinae does explode, it will be a spectacular fireworks display seen from Earth, perhaps rivaling the moon in brilliance. Its fate has been foreshadowed by the recent discovery of SN2006gy, a supernova in a nearby galaxy that was the brightest stellar explosion ever seen. The erratic behavior of the star that later exploded as SN2006gy suggests that Eta Carinae may explode at any time.

Eta Carinae, a star between 100 and 150 times more massive than the Sun, is near a point of unstable equilibrium where the star's gravity is almost balanced by the outward pressure of the intense radiation generated in the nuclear furnace.

Eta Carinae, a star between 100 and 150 times more massive than the Sun, is near a point of unstable equilibrium where the star's gravity is almost balanced by the outward pressure of the intense radiation generated in the nuclear furnace.

This means that slight perturbations of the star might cause enormous ejections of matter from its surface. In the 1840s, Eta Carinae had a massive eruption by ejecting more than 10 times the mass of the sun, to briefly become the second brightest star in the sky. This explosion would have torn most other stars to pieces but somehow Eta Carinae survived.

The latest composite image shows the remnants of that titanic event with new data from NASA's Chandra X-ray Observatory and the Hubble Space Telescope. The blue regions show the cool optical emission, detected by Hubble, from the dust and gas thrown off the star.

This debris forms a bipolar shell around the star, which lies near the brightest point of the optical emission. This bipolar shell is itself surrounded by a ragged cloud of fainter material.

An unusual jet points from the star to the upper left. Chandra's data, depicted in orange and yellow, shows the X-ray emission produced as material thrown off Eta Carinae rams into nearby gas and dust, heating gas to temperatures in excess of a million degrees.

This hot shroud extends far beyond the cooler, optical nebula and represents the outer edge of the interaction region. The X-ray observations show that the ejected outer material is enriched by complex atoms, especially nitrogen, cooked inside the star's nuclear furnace and dredged up onto the stellar surface. The Chandra observations also show that the inner optical nebula glows faintly due to X-ray reflection.

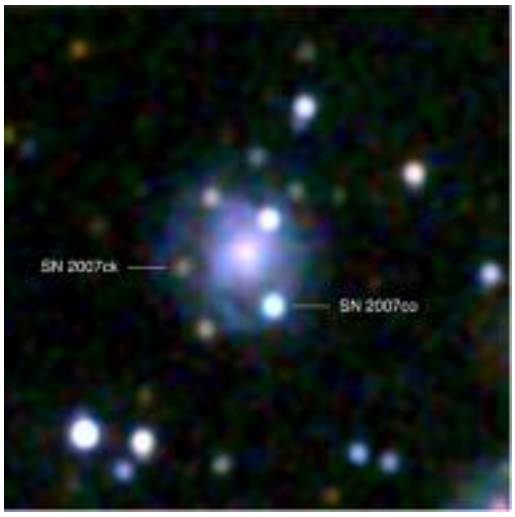
The X-rays reflected by the optical nebula come from very close to the star itself; these X-rays are generated by the high-speed collision of wind flowing from Eta Carinae's surface (moving at about 1 million miles per hour) with the wind of the companion star (which is about five times faster).

The companion is not directly visible in these images, but variability in X-rays in the regions close to the star signals the star's presence. Astronomers don't know exactly what role the companion has played in the evolution of Eta Carinae, or what role it will play in its future.

June 21, 2007
chandra.harvard.edu

NASA's Swift Sees Double Supernova in Galaxy

In just the past six weeks, two supernovae have flared up in an obscure galaxy in the constellation Hercules. Never before have astronomers observed two of these powerful stellar explosions occurring in the same galaxy so close together in time. In just the past six weeks, two supernovae have flared up in an obscure galaxy in the constellation Hercules. Never before have astronomers observed two of these powerful stellar explosions occurring in the same galaxy so close together in time.



The galaxy, known as MCG +05-43-16, is 380 million light-years from Earth. Until this year, astronomers had never sighted a supernova popping off in this stellar congregation. A supernova is an extremely energetic and life-ending explosion of a star. Making the event even more unusual is the fact that the two supernovae belong to different types. Supernova 2007ck is a Type II event – which is triggered when the core of a massive star runs out of nuclear fuel and collapses gravitationally, producing a shock wave that blows the star to smithereens. Supernova 2007ck was first observed on May 19.

In contrast, Supernova 2007co is a Type Ia event, which occurs when a white dwarf star accretes so much material from a binary companion star that it blows up like a giant thermonuclear bomb. It was discovered on June 4, 2007. A white dwarf is the exposed core of a star after it has ejected its atmosphere; it's approximately the size of Earth but with the mass of our Sun. "Most galaxies have a supernova every 25 to 100 years, so it's remarkable to have a galaxy with two supernovae discovered just 16 days apart," says Stefan Immler of NASA's Goddard Space Flight Center. In 2006 Immler used NASA's Swift satellite to image two supernovae in the elliptical galaxy NGC 1316, but both of those explosions were Type Ia events, and they were discovered six months apart. The simultaneous appearance of two supernovae in one galaxy is an extremely rare occurrence, but it's merely a coincidence and does not imply anything unusual about MCG +05-43-16. Because the two supernovae are tens of thousands of light-years from each other, and because light travels at a finite speed, astronomers in the galaxy itself, or in a different galaxy, might record the two supernovae exploding thousands of years apart.

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nasa.gov

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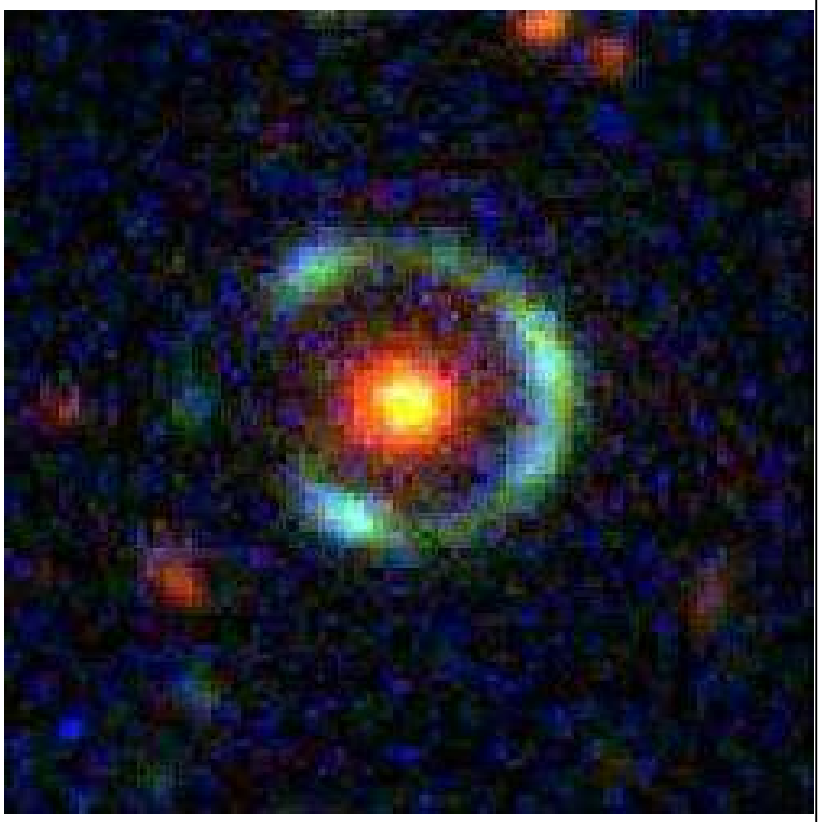
The Cosmic Horseshoe, a Nearly Complete Einstein Ring

If you want to peer into the furthest reaches of space, a regular telescope won't do. You need to harness the power of a massive galaxy to bend light from an even more distant galaxy - a gravitational lens. And a team of European astronomers have found one of the luckiest discoveries of all, an Einstein ring, where the lens and more distant galaxy line almost perfectly. Because of its unique shape, they're calling it "The Cosmic Horseshoe". The discovery was made by more than a dozen astronomers from a handful of European universities, from England to Russia. They published their discovery in a research paper called The Cosmic Horseshoe: Discovery of an Einstein Ring around a Giant Luminous Red Galaxy, which has been submitted to the Astrophysics Journal.

Look at the picture, and you can see a red spherical galaxy surrounded almost completely by a blue ring. In reality, this is a relatively nearby galaxy, located 4.6 billion light-years away (the lens), and then a more distant blue galaxy located 10.9 billion light-years away (the lensed object). The two line up perfectly from our point of view, so that light from the blue galaxy is focused by the gravity of the lens.



They turned up the object after poring through data in the massive Sloan Digital Sky Survey. This survey uses robotic telescopes to capture images of the night sky; eventually it will map out 25% of the sky, seeing 100 million objects. Astronomers regularly look through this vast quantity of data, and pull out all kinds of interesting objects.

Such as the Cosmic Horseshoe.

Then they did follow-up observations using the 2.5 metre Isaac Newton Telescope in La Palma and the 6 metre BTA telescope in Russia. This gave the detailed image attached to this story, as well as the spectral information to determine the chemical constituents of the lens and lensed object. Look at the picture, and you can see a red spherical galaxy surrounded almost completely by a blue ring. In reality, this is a relatively nearby galaxy, located 4.6 billion light-years away (the lens), and then a more distant blue galaxy located 10.9 billion light-years away (the lensed object). The two line up perfectly from our point of view, so that light from the blue galaxy is focused by the gravity of the lens. Light that would head off into space is turned back towards the Earth. All this additional light allows astronomers to see what would normally be an invisible object. In fact, the two are lined up so perfectly, that the lensed galaxy has been turned into a ring that wraps 300-degrees around the lens.

The lens is an extremely massive luminous red galaxy, containing 5 trillion times the mass of the Sun. For comparison, our own Milky Way only contains 580 billion solar masses.

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And this is just the "telescope".

The more distant, lensed object is a starburst galaxy undergoing furious rates of star formation - evidenced by the blue spectrum of its light. If it weren't behind the lens, astronomers wouldn't even know it was there. But because it's directly behind the lens, its light has been focused into a nearly complete ring around the lens. Since it's 10.9 billion light-years away, we see it at a time when the Universe was less than 3 billion years old.

This discovery gives astronomers two useful directions for further research: dark matter distribution around luminous red galaxies, and the formation of stars in the early Universe.

June 14, 2007
Arxiv.org

Sorry Pluto, Eris is Bigger

Die-hard Pluto fans still seeking redemption for their demoted planet have cause for despair this week. New data shows that the dwarf planet Eris is 27 percent more massive than Pluto, thereby strengthening the decree last year that there are eight planets in the solar system and a growing list of dwarf planets.

According to Mike Brown, the discoverer of Eris, and his graduate student Emily Schaller, the data confirms that Eris weighs 16.6 billion trillion kilograms. They know this because of the time it takes Eris's moon, Dysnomia, to complete an orbit.

"This was Pluto's last chance to be the biggest thing found so far in the Kuiper belt," says Brown, a professor of planetary astronomy at the California Institute of Technology. "There was a possibility that Pluto and Eris were roughly the same size, but these new results show that it's second place at best for Pluto."

Eris was discovered in 2005 with Palomar Observatory's 48-inch Samuel Oschin Telescope, an instrument specially adapted to do comprehensive searches for objects in the sky.

When it became apparent that Eris was similar in size if not larger than Pluto, Brown and others called for the International Astronomical Union to rule on its planetary status. The end result was demotion of Pluto and the redesignation of it and other Kuiper-belt objects as dwarf planets.

Schaller says that the new results, obtained with Hubble Space Telescope and Keck Observatory data, indicate that the density of the material making up Eris is about two grams per cubic centimeter. This means that Eris very likely is made up of ice and rock, and thus is very similar in composition to Pluto. Past results from the Hubble Space Telescope had already allowed planetary scientists to determine that its diameter is 2,400 kilometers, also larger than Pluto's.

"Pluto and Eris are essentially twins--except that Eris is slightly the pudgier of the two," says Brown. "And a little colder," adds Schaller.

The reason for Eris's blustery surface conditions is its sheer distance from the sun. Currently 97 astronomical units from the sun (an astronomical unit being the distance between the sun and Earth), Eris hovers at temperatures well below 400 degrees Fahrenheit and is pretty dark.

However, things get a little better on Eris now and then. Orbiting the sun on a highly elliptical 560-year journey, Eris sweeps in as close to the sun as 38 astronomical units. But at present it is nearly as far away as it ever gets.

Pluto's own elliptical orbit takes it as far away as 50 astronomical units from the sun during its 250-year revolution. This means that Eris is sometimes much closer to Earth than Pluto, although never closer than Neptune.

Based on spectral data, the researchers think Eris is covered with a layer of methane that has seeped from the interior and frozen on the surface. As in the case of Pluto, the methane has undergone chemical transformations, probably due to the faint solar radiation, causing the methane layer to redden. But the methane surface on Eris is somewhat more yellowish than the reddish-yellow surface of Pluto, perhaps because Eris is farther from the sun.

As for Dysnomia, the tiny satellite remains the only moon discovered orbiting Eris so far. Dysnomia is about 150 kilometers in diameter, is about 37,000 kilometers from Eris, and has a lunar "month" that lasts 16 days.

"But every year is 560 Earth-years," says Brown. "So on Eris they have a lot more months in their calendar."

Like the Earth-moon system, Eris-Dysnomia probably formed about 4.5 billion years ago following a massive collision.

Brown and Schaller are the authors of a paper, "The Mass of Dwarf Planet Eris," appearing in the June 15 issue of the journal Science.

June 14, 2007
mr.caltech.edu

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No Stars Shine in This Dark Galaxy

An international team of astronomers have conclusive new evidence that a recently discovered "dark galaxy" is, in fact, an object the size of a galaxy, made entirely of dark matter. Although the object, named VIRGOHI21, has been observed since 2000, astronomers have been slowly ruling out every alternative explanation.

In a new research paper, entitled *21-cm synthesis observations of VIRGOHI 21" a possible dark galaxy in the Virgo Cluster*, researchers provide updated evidence about this mysterious galaxy.

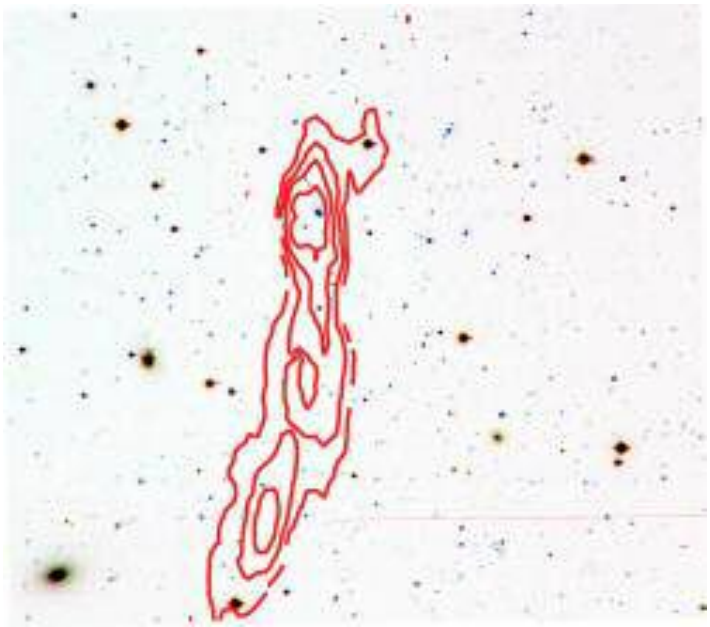
They have now performed a high resolution observations of VIRGOHI21 using the Westerbork Synthesis Radio Telescope (WSRT), to better pin down the quantities of neutral hydrogen gas. They also did follow-up observations with the Hubble Space Telescope, looking for any evidence of stars.

Astronomers first suspected there was an invisible galaxy out there when they spied galaxy NGC 4254. This unusual-looking galaxy appears to be one partner in a cosmic collision. All the normal evidence is there: gas is being siphoned away into a tenuous stream, and one of its spiral arms is being stretched out.

But the other partner in this collision is nowhere to be seen.

The researchers' calculated that an object with 100 billion solar masses must have careened past NGC 4254 within the last 100 million years, creating the gas stream, and tearing at one of its arms. This was the clue that an invisible dark matter galaxy might be lurking nearby.

A detailed search turned up a mysterious object called VIRGOHI21, located about 50 million light-years from Earth. Were it a normal galaxy, you would be able to see it in a powerful amateur telescope. But there's nothing there. Even in the Hubble Space Telescope, not a single star is shining from this massive region of space.



It was only visible in radio telescopes, which could detect the radio emissions from neutral hydrogen gas located in the cloud.

When they first published their research a few years ago, the astronomy community was understandably skeptical, and proposed several alternative theories to explain the mysterious object.

For example, there could be additional mass associated with VIRGOHI21, and not just dark matter. The discovery of red giant stars in the region would give some indication that this was a more normal interaction. But Hubble turned up nothing.

Dr. Robert Minchin, lead researcher from the Arecibo Observatory, said, "not even the power of Hubble has been able to see any stars in it."

It's possible that VIRGOHI21 has always been this way, formed from primordial dark matter and neutral hydrogen after the Big Bang. It's been cruising the Universe ever since, disrupting galaxies as it goes.

However, there do seem to be ways that galaxies and their dark matter can be separated. Only a few months ago, a ring of dark matter was found surrounding a group of colliding galaxy clusters by the Hubble Space Telescope. Perhaps VIRGOHI21 is the wreckage from one of these cluster collisions; a shred of dark matter hurled out into space.

It could be that there are many of these dark galaxies out there. A new sky survey, carried out with the 305-metre (1000-foot) Aricebo radio telescope in Puerto Rico should tease out more of these objects in the future. The survey is called the Arecibo Galaxy Environment Survey (AGES).

This most recent paper has been accepted for publication in the Astrophysical Journal.

June 14, 2007
Arxiv.org

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Most Distant Black Hole Discovered

An international team of astronomers have discovered a super-massive black hole at the very edge of the observable Universe, located 13 billion light-years away. Since the Universe is 13.7 billion years old, we're seeing this object when the Universe was only 700 million years old. Wow.

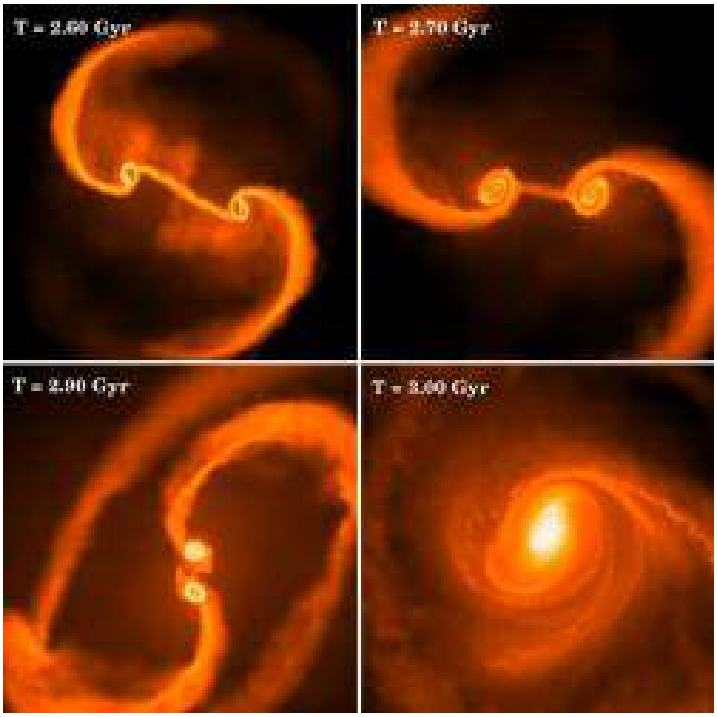
Active galactic nuclei, or quasars, occur when a super-massive black hole is feasting on infalling material. Material piles up faster than the black hole can feed, and it starts to glow so brightly that astronomers can see it clear across the Universe. This object, CFHQS J2329-0301, was discovered as part of a new distant quasar survey performed with the Mega-Cam imager on the Canada-France-Hawaii Telescope (CFHT).

The black hole powering the quasar is thought to have 500 million times the mass of the Sun - that makes it hungry and bright. And because the quasar is so bright, astronomers can use it as a background object to examine the gas in front. And with follow up observations, they can get more details about what kind of galaxy it formed inside.

June 7, 2007
cfht.hawaii.edu

The black hole powering the quasar is thought to have 500 million times the mass of the Sun - that makes it hungry and bright.

How Super-massive Black Holes Come Together



Galaxies get bigger and bigger through galactic mergers. Two small galaxies come together, merge their stars, and you get a bigger galaxy. But astronomers have always wondered, what happens with the two super-massive black holes that seem to always lurk at the heart of galaxies. What happens when two compact objects with millions of times the mass of our sun collide? Good question.

An international team of physicists have developed a computer simulation designed to answer this very question. And in a recent article in *Science Express*, they published the results of the simulation.

It turns out the interaction depends a lot on the amount of hot gas surrounding each black hole. As they start to interact, this gas exerts a frictional force on the black holes, slowing down their spin rate. Once they get within the width of our solar system, they should start emitting gravitational waves, which continues to extract energy from the system. This causes them to continue coming together, and eventually merge.

This simulation is good news for experiments designed to search for gravitational waves. The mergers should be so energetic, they'll generate gravitational waves detectable across space.

June 8, 2007
news-service.stanford.edu

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Issue 12 Jamadi-Alsani 16, 1428 Tir 10, 1386 July 01, 2007

A. R. C. NEWS
Internal, Scientific, Cultural, latest astronomical news on the Internet

Astronomical Research Center Activities

Some of the activities:

- Educational Facilities
- Research Facilities
- Receive and Transmit Atomic-Clock waves
- Institution of a virtual observatory
- Cosmic radio observation project
- Calculation and distribution of timings of religious duties
- Organizing scientific conferences with invitations to scholars and experts
- Publishing new titles on the field of Astronomy
- Building an observatory and a big planetarium

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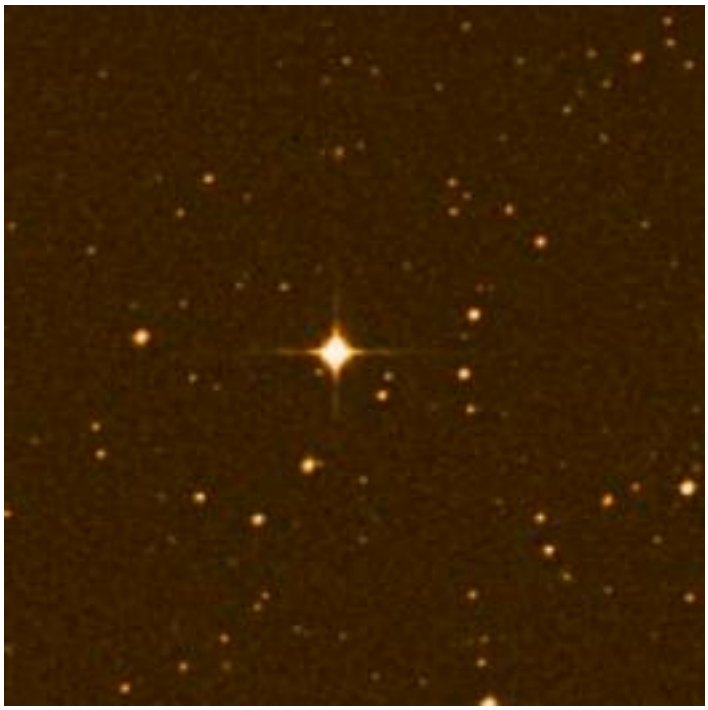
SPECIAL REPORT

Stable Star Gives the Best Chance for Life

"Boring" light from red dwarf star Gliese 581 means better odds for extraterrestrial life in that planetary system, according to University of British Columbia astronomer Jaymie Matthews.

Approximately 20.5 light years from the Earth, Gliese 581 made the headlines in April 2007 when European scientists discovered a planet, named Gliese 581c. Dubbed "superEarth," the planet orbits Gliese 581 and could have water -- and thus able to support life.



"The Gliese 581 system is the first to be found -- beyond our own Earth -- that might have a liveable planet," said Matthews.

Using Canada Space Agency's suitcase-sized space telescope, the Microvariability and Oscillations of STars (MOST), Matthews put Gliese 581 on a six-week scientific stakeout following the April discovery. He will present his findings today at the Canadian Astronomical Society's annual meeting in Kingston, Ontario.

Matthews and his team searched for the subtle dips in the light from the star when the planet's orbit carried it directly between the star and the Earth, resulting in a "mini-eclipse" every 13 days. The depth of the dips would help researchers determine the size of the planet Gliese 581c, while the behaviour of the starlight at other times would help astronomers gauge the suitability of Gliese 581 as a "home star," a star able to sustain life on planets around it.

"Gliese 581 seems remarkably stable over the six weeks it was monitored by MOST," said Matthews. "The brightness of the star changed by only a few tenths of a percent over that time. This level of stability means that it provides a stable source of light -- hence heat -- to the surface of planet Gliese 581c.

"The climate there should not be a wild rollercoaster ride that would make it difficult for life to get a foothold," said Matthews. "It also suggests the star is quite old, and settled in its ways, and that the planets around it have probably been around for billions of years."

It took approximately 3.5 billion years for life on Earth to reach the level of complexity that we call human, said Matthews. "So if Gliese 581 has been around for at least that long, it's more encouraging for the prospects of complex life on any planet around it."

With space missions like MOST, the French satellite COROT, which joined MOST in orbit late last December, and the American Kepler mission due for launch in November 2008, Matthews predicts that other 'Earthy' worlds will come to light in the coming months and years.

"Some of them will have orbits that produce planetary alignments," said Matthews. "Not the kind that excites somebody reading a horoscope but the kind that's exciting for astronomers because they will allow us to test our models of alien worlds -- worlds that might be homes to neighbours in our Galactic city, the Milky Way."

June 8, 2007
publicaffairs.ubc.ca