and in the night, give him glory too, and at the setting of the stars

Holy Qur'an 52:49

ASTRONOMICAL RESEARCH CENTER (A. R. C.)

Issue 10

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A. R. C. NEWS

Latest Astronomical News on the Internet

Inside This Issue :

In the most comprehensive survey of its kind, the team looked for disks in 69 binary systems between about 50 and 200 light-years away from Earth.

Astronomers find first habitable Earth-like planet

Astronomers have discovered the most Earth-like planet outside our Solar System to date, an exoplanet with a radius only 50% larger than the Earth and capable of having liquid water.

Using the ESO 3.6-m telescope, a team of Swiss, French and Portuguese scientists discovered a super-Earth about 5 times the mass of the Earth that orbits a red dwarf, already known to harbour a Neptune-mass planet.

The astronomers have also strong evidence for the presence of a third planet with a mass about 8 Earth masses.

This exoplanet - as astronomers call planets around a star other than the Sun - is the smallest ever found up to now and it completes a full orbit in 13 days. It is 14 times closer to its star than the Earth is from the Sun. However, given that its host star, the red dwarf Gliese 581, is smaller and colder than the Sun - and thus less luminous - the planet nevertheless lies in the habitable zone, the region around a star where water could be liquid!

"We have estimated that the mean temperature of this super-Earth lies between 0 and 40 degrees Celsius, and water would thus be liquid," explains Stéphane Udry, from the Geneva Observatory (Switzerland) and lead-author of the paper reporting the result. "Moreover, its radius should be only 1.5 times the Earth's radius, and models predict that the planet should be either rocky - like our Earth - or covered with oceans," he adds.

"Because of its temperature and relative proximity, this planet

will most probably be a very important target of the future space missions dedicated to the search for extra-terrestrial life.

On the treasure map of the Universe, one would be tempted to mark this planet with an X."

The host star, Gliese 581, is among the 100 closest stars to us, located only 20.5 light-years away in the constellation Libra ("the Scales"). It has a mass of only one third the mass of the Sun. Such red dwarfs are intrinsically at least 50 times fainter than the Sun and are the most common stars in our Galaxy: among the 100 closest stars to the Sun, 80 belong to this class.

"Red dwarfs are ideal targets for the search for low-mass planets where water could be liquid.

Because such dwarfs emit less light, the habitable zone is much closer to them than it is around the Sun," emphasizes Xavier Bonfils, a co-worker from Lisbon University. Planets lying in this zone are then more easily detected with the radial-velocity method, the most successful in detecting exoplanets.

Two years ago, the same team of astronomers already found a planet around Gliese 581. With a mass of 15 Earth-masses, i.e. similar to that of Neptune, it orbits its host star in 5.4 days. At the time, the astronomers had already seen hints of another planet. They therefore obtained a new set of measurements and found the new super-Earth, but also clear indications for another one, an 8 Earth-mass planet completing an orbit in 84 days.

The planetary system surrounding Gliese 581 contains thus no fewer than 3 planets of 15 Earth masses or less, and as such is a quite remarkable system.

Neptunes.'

April 25, 2007
www.eso.org

Hubble sees extreme star birth in the Carina Nebula

One of the largest panoramic images ever taken with Hubble's cameras has been released to celebrate the 17th anniversary of the launch and deployment of the NASA/ ESA Hubble Space Telescope. The image shows a 50 light-year-wide view of the tumultuous central region of the Carina Nebula where a maelstrom of star birth - and death - is taking place.

The fireworks in the Carina region started three million years ago when the nebula's first generation of newborn stars condensed and ignited in the middle of a huge cloud of cold molecular hydrogen.

Hubble's new view of the Carina Nebula shows the process of star birth at a new level of detail.

The bizarre landscape of the nebula is sculpted by the action of out flowing winds and scorching ultraviolet radiation from the monster stars that inhabit this inferno. These stars are shredding the surrounding material that is the last vestige of the giant cloud from which the stars were born.

This immense nebula contains a dozen or more brilliant stars that are estimated to be at least 50 to 100 times the mass of our Sun.

The most opulent is the star eta Carinae, seen at far left. Eta Carinae is in the final stages of its brief eruptive lifespan, as shown by two billowing lobes of gas and dust that presage its upcoming explosion as a titanic supernova.

The fireworks in the Carina region started three million years ago when the nebula's first generation of newborn stars condensed and ignited in the middle of a huge cloud of cold molecular hydrogen. Radiation from these stars carved out an expanding bubble of hot gas. The island-like clumps of dark clouds scattered across the nebula are nodules of dust and gas that have so far resisted being eaten away by photo Ionization.

The hurricane-strength blast of stellar winds and blistering ultraviolet radiation within the cavity is now compressing the surrounding walls of cold hydrogen. This is triggering a second stage of new star formation.

Our Sun and Solar System may have been born inside such a cosmic crucible 4.6 billion years ago. In looking at the Carina Nebula we are seeing star formation as it commonly occurs along the dense spiral arms of a galaxy.

This immense nebula is an estimated 7,500 light-years away in the southern constellation Carina, the Keel of the old southern constellation Argo Navis, the ship of Jason and the Argonauts from Greek mythology.

This image is an immense (29,566 x 14,321 pixels) mosaic of the Carina Nebula assembled from 48 frames taken with Hubble's Advanced Camera for Surveys. The Hubble images were taken in the light of ionized hydrogen. Colour information was added with data taken at the Cerro Tololo Inter-American Observatory in Chile. Red corresponds to sulphur, green to hydrogen, and blue to oxygen emission.

In its 17 years of exploring the heavens, NASA's Hubble Space Telescope has made nearly 800,000 observations and snapped nearly 500,000 images of more than 25,000 celestial objects. Hubble does not travel to stars, planets and galaxies. It takes pictures of them as it whirls around Earth at 17,500 miles an hour. In its 17-year lifetime, the telescope has made nearly 100,000 trips around our planet.

Those trips have racked up plenty of frequent-flier-miles, about 2.4 billion, which is the equivalent of a round trip to Saturn.

The 17 years' worth of observations has produced more than 30 terabytes of data, equal to about 25 percent of the information stored in the Library of Congress.

Each day the orbiting observatory generates about 10 gigabytes of data, enough information to fill the hard drive of a typical home computer in two weeks.

The Hubble archive sends about 66 gigabytes of data each day to astronomers throughout the world.

Astronomers using Hubble data have published nearly 7,000 scientific papers, making it one of the most productive scientific instruments ever built.

April 24, 2007
www.hubblesite.org

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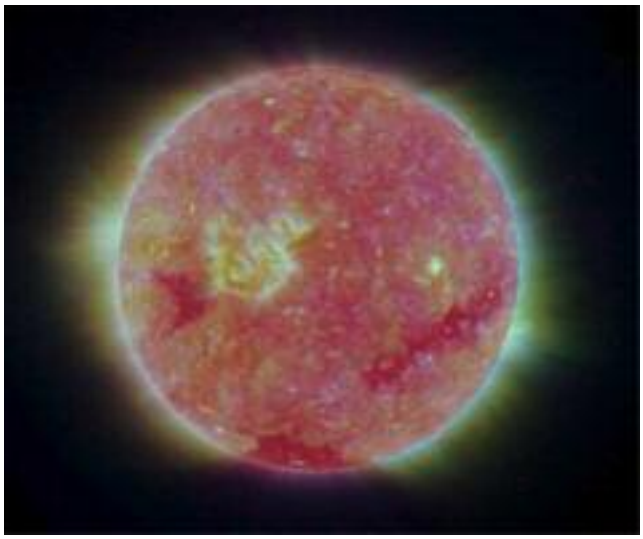
NASA spacecraft make first 3-D images of Sun

NASA's twin Solar Terrestrial Relations Observatory (STEREO) spacecraft have made the first three-dimensional images of the Sun. The new view will greatly aid scientists' ability to understand solar physics and thereby improve space weather forecasting.



"The improvement with STEREO's 3-D view is like going from a regular X-ray to a 3-D CAT scan in the medical field," said Michael Kaiser, the mission's project scientist at NASA's Goddard Space Flight Center, Greenbelt, Md.

The spacecraft were launched October 25, 2006. On January 21 they completed a series of complex maneuvers, including flying by the moon, to position the spacecraft in their mission orbits.

The two observatories are now orbiting the Sun, one slightly ahead of Earth and one slightly behind, separating from each other by approximately 45 degrees per year. Just as the slight offset between a person's eyes provides depth perception, the separation of spacecraft allows 3-D images of the Sun. The new 3-D images are generated by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Violent solar weather originates in the Sun's atmosphere, or corona, and can disrupt satellites, radio communication, and power grids on Earth. The corona resembles wispy smoke plumes, which flow outward along the Sun's tangled magnetic fields. It is difficult for scientists to tell which structures are in front and which are behind.

"In the solar atmosphere, there are no clues to help us judge distance. Everything appears flat in the 2-D plane of the sky. Having a stereo perspective just makes it so much easier," said Russell Howard of the Naval Research Laboratory, Washington, the principal investigator for the Sun Earth Connection Coronal and Heliospheric Investigation suite of telescopes on the spacecraft.

"With STEREO's 3-D imagery, we'll be able to discern where matter and energy flows in the solar atmosphere much more precisely than with the 2-D views available before. This will really help us understand the complex physics going on," said Howard.

The mission's depth perception also will help improve space weather forecasts. Of particular concern is a destructive type of solar eruption called a coronal mass ejection. These are eruptions of electrically charged gas, called plasma, from the Sun's atmosphere. A coronal mass ejection cloud can contain billions of tons of plasma and move at a million miles per hour.

Such a cloud is laced with magnetic fields, and coronal mass ejections directed toward Earth smash into our planet's magnetic field. If the coronal mass ejection magnetic fields have the proper orientation, they dump energy and particles into Earth's magnetic field. This causes magnetic storms that can overload power line equipment and radiation storms that disrupt satellites.

Satellite and utility operators can take precautions to minimize coronal mass ejection damage, but they need an accurate forecast of when one will arrive. To do this, forecasters need to know the location of the front of the coronal mass ejection cloud. STEREO will allow scientists to accurately locate the cloud front.

"Knowing where the front of the CME [coronal mass ejection] cloud is will improve estimates of the arrival time from within a day or so to just a few hours," said Howard. "STEREO also will help forecasters estimate how severe the resulting magnetic storm will be."

"In addition to the STEREO perspective of solar features, STEREO for the first time will allow imaging of the solar disturbances the entire way from the Sun to the Earth. Presently, scientists are only able to model this region in the dark, from only one picture of solar disturbances leaving the Sun and reaching only a fraction of the Sun-Earth distance," said Madhulika Guhathakurta, the mission's program scientist at NASA Headquarters, Washington.

April 23, 2007
jpl.nasa.gov

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Mystery of galaxy's spiral arms possibly explained

In visible-light images, two prominent arms emanate from the bright nucleus and spiral outward. These arms are dominated by young, bright stars, which light up the gas within the arms.

"One of the predictions of this scenario is that the anomalous arms will gradually be pushed out of the galactic disk plane by jet-heated gas"

Using a quartet of space observatories, University of Maryland astronomers may have cracked a 45-year mystery surrounding two ghostly spiral arms in the galaxy M106.

The Maryland team, led by Yuxuan Yang, took advantage of the unique capabilities of NASA's Chandra X-ray Observatory, NASA's Spitzer Space Telescope, the European Space Agency's XMM-Newton X-ray observatory, and data obtained almost a decade ago with NASA's Hubble Space Telescope.

M106 (also known as NGC 4258) is a stately spiral galaxy 23.5 million light-years away in the constellation Canes Venatici.

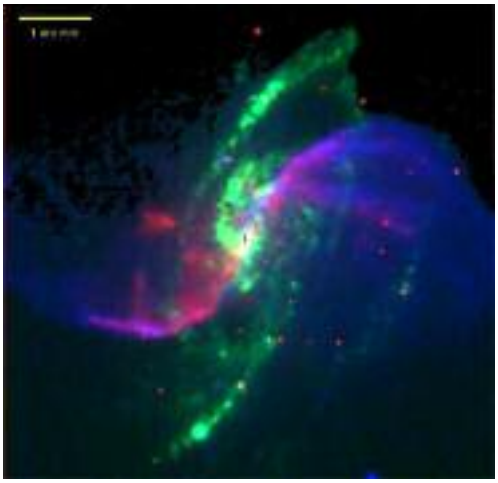
In visible-light images, two prominent arms emanate from the bright nucleus and spiral outward. These arms are dominated by young, bright stars, which light up the gas within the arms.

"But in radio and X-ray images, two additional spiral arms dominate the picture, appearing as ghostly apparitions between the main arms," says team member Andrew Wilson of the University of Maryland. These so-called "anomalous arms" consist mostly of gas.

"The nature of these anomalous arms is a long-standing puzzle in astronomy," says Yang. "They have been a mystery since they were first discovered in the early 1960s."

By analyzing data from XMM-Newton, Spitzer, and Chandra, Yang, Bo Li, Wilson, and Christopher Reynolds, all at the University of Maryland at College Park, have confirmed earlier suspicions that the ghostly arms represent regions of gas that are being violently heated by shock waves.

Previously, some astronomers had suggested that the anomalous arms are jets of particles being ejected by a super massive black hole in M106's nucleus. But radio observations by the National Radio Astronomy Observatory's Very Long Baseline Array, and the Very Large Array in New Mexico, later identified another pair of jets originating in the core. "It is highly unlikely that an active galactic nucleus could have more than one pair of jets," says Yang.



In 2001, Wilson, Yang, and Gerald Cecil, of the University of North Carolina, Chapel Hill, noted that the two jets are tipped 30 degrees with respect to the galaxy disk. But if one could vertically project the jets onto the disk, they would line up almost perfectly with the anomalous arms. Figuring that this alignment was not strictly a matter of chance, Wilson, Yang, and Cecil proposed that the jets heat the gas in their line of travel, forming an expanding cocoon. Because the jets lie close to M106's disk, the cocoon heats gas in the disk and generates shock waves, heating the gas to millions of degrees and causing it to radiate brightly in X-rays and other wavelengths.

To test this idea, Yang and his colleagues looked at archival spectral observations from XMM-Newton. With XMM-Newton's superb sensitivity, the team could measure the gas temperature in the anomalous arms and also see how strongly X-rays from the gas are absorbed en route by intervening material.

"One of the predictions of this scenario is that the anomalous arms will gradually be pushed out of the galactic disk plane by jet-heated gas," says Yang. The XMM-Newton spectra show that X-rays are more strongly absorbed in the direction of the northwest arm than in the southeast arm. The results strongly suggest that the southeast arm is partly on the near side of M106's disk, and the northwest arm is partly on the far side.

The scientists noted that these observations show clear consistency with their scenario. Confirmation of this interpretation has recently come from archival observations from NASA's Spitzer Space Telescope, whose infrared view shows clear signs that X-ray emission from the northwest arm is being absorbed by warm gas and dust in the galaxy's disk.

Moreover, Chandra's superior imaging resolution gives clear indications of gas shocked by interactions with the two jets.

Besides addressing the mystery of the anomalous arms, these observations allowed the team to estimate the energy in the jets and gauge their relationship to M106's central black hole. The team's paper will appear in the May 10 issue of the Astrophysical Journal.

April 12, 2007
www.gsfc.nasa.gov

Are there purple palm trees on alien worlds?

A team of NASA scientists led by a member of the Spitzer Science Center believe they have found a way to predict the color of plants on planets in other solar systems.

Green, yellow or even red-dominant plants may live on extra-solar planets, according to scientists whose two scientific papers appear in the March issue of the journal, Astrobiology. The scientists studied light absorbed and reflected by organisms on Earth, and determined that if astronomers were to look at the light given off by planets circling distant stars, they might predict that some planets have mostly non-green plants.

"We can identify the strongest candidate wavelengths of light for the dominant color of photosynthesis on another planet," said Nancy Kiang, lead author of the study and a biometeorologist at NASA's Goddard Institute for Space Studies, New York. Kiang worked with a team of scientists from the Virtual Planetary Laboratory (VPL) at the California Institute of Technology, Pasadena, Calif.

VPL was formed as part of the NASA Astrobiology Institute (NAI), based at the NASA Ames Research Center in California's Silicon Valley.

"This work broadens our understanding of how life may be detected on Earth-like planets around other stars, while simultaneously improving our understanding of life on Earth," said Carl Pilcher, director of the NAI at NASA Ames. "This approach -- studying Earth life to guide our search for life on other worlds -- is the essence of astrobiology."

Kiang and her colleagues calculated what the stellar light would look like at the surface of Earth-like planets whose atmospheric chemistry is consistent with the different types of stars they orbit. By looking at the changes in that light through different atmospheres, researchers identified colors that would be most favorable for photosynthesis on other planets. This new research narrows the range of colors that scientists would expect to see when photosynthesis is occurring on extrasolar planets. Each planet will have different dominant colors for photosynthesis, based on the planet's atmosphere where the most light reaches the

planet's surface. The dominant photosynthesis might even be in the infrared.

"This work will help guide designs for future space telescopes that will study extrasolar planets, to see if they are habitable, and could have alien plants," said Victoria Meadows, an astronomer who heads the VPL. The VPL team is using a suite of computer models to simulate Earth-size planets and their light spectra as space telescopes would see them. The scientists' goal is to discover the likely range of habitable planets around other stars and to find out how these planets might appear to future planet-finding missions.

On Earth, Kiang and colleagues surveyed light absorbed and reflected by plants and some bacteria during photosynthesis, a process by which plants use energy from sunlight to produce sugar.

Organisms that live in different light environments absorb the light colors that are most available. For example, there is a type of bacteria that inhabit murky waters where there is little visible light, and so they use infrared radiation during photosynthesis.

Scientists have long known that the chlorophyll in most plants on Earth absorbs blue and red light and less green light. Therefore, chlorophyll appears green. Although some green color is absorbed, it is less than the other colors. Previously, scientists thought plants are not efficient as they could be, because they do not use more green light.

According to scientists, the Sun has a specific distribution of colors of light, emitting more of some colors than others.

Gases in Earth's air also filter sunlight, absorbing different colors. As a result, more red light particles reach Earth's surface than blue or green light particles, so plants use red light for photosynthesis. There is plenty of light for land plants, so they do not need to use extra green light. But not all stars have the same distribution of light colors as our Sun. Study scientists say they now realize that photosynthesis on extrasolar planets will not necessarily look the same as on Earth.

"It makes one appreciate how life on Earth is so intimately adapted to the special qualities of our home planet and Sun," said Kiang.

April 05, 2007
www.nasa.gov

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Beauty of barred spiral galaxy shown by Hubble

The NASA/ESA Hubble Space Telescope has delivered an unrivalled snapshot of the nearby barred spiral galaxy NGC 1672.

This remarkable image provides a high definition view of the galaxy's large bar, its fields of star-forming clouds and dark bands of interstellar dust.

NGC 1672, visible from the Southern Hemisphere, is seen almost face on and shows regions of intense star formation.

The greatest concentrations of star formation are found in the so-called starburst regions near the ends of the galaxy's strong galactic bar. NGC 1672 is a prototypical barred spiral galaxy and differs from normal spiral galaxies in that the spiral arms do not twist all the way into the centre. Instead, they are attached to the two ends of a straight bar of stars enclosing the nucleus.

Astronomers believe that barred spirals have a unique mechanism that channels gas from the disk inwards towards the nucleus.

This allows the bar portion of the galaxy to serve as an area of new star generation. It appears that the bars are short-lived, begging the question: will non-barred galaxies develop a bar in the future, or have they already hosted one that has disappeared?

In the new image from the NASA/ESA Hubble Space Telescope, clusters of hot young blue stars form along the spiral arms, and ionize surrounding clouds of hydrogen gas that glow red. Delicate curtains of dust partially obscure and redden the light of the stars behind them. NGC 1672's symmetric look is emphasised by the four principal arms, edged by eye-catching dust lanes that extend out from the centre.

Galaxies lying behind NGC 1672 give the illusion they are embedded in the foreground galaxy, even though they are really much farther away. They also appear reddened as they shine through NGC 1672's dust. A few bright foreground stars inside our own Milky Way Galaxy appear in the image as bright, diamond-like objects.

NGC 1672 is a member of the family of Seyfert galaxies, named after the astronomer, Carl Keenan Seyfert, who studied a family of galaxies with active nuclei extensively in the 1940s.

The energy output of these nuclei can sometimes outshine their host galaxies. The active galaxy family include the exotically named quasars and blazars. Although each type has distinctive characteristics, they are thought to be all driven by the same engine - supermassive black holes - but are viewed from different angles.

The new Hubble observations, performed with the Advanced Camera for Surveys aboard the observatory, have shed light on the process of starburst activity and on why some galaxies are ablaze with extremely active star formation.

NGC 1672 is more than 60 million light-years away in the direction of the Southern constellation of Dorado. These observations of NGC 1672 were taken with Hubble's Advanced Camera for Surveys in August of 2005.

This composite image contains filters that isolate light from the blue, green, and infrared portions of the spectrum, as well as emission from ionized hydrogen.

April 05, 2007
www.hubblesite.org

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Star burps, then explodes

Signs of the first shock reached Earth on Oct. 20, 2004, when the star was observed letting loose an outburst so enormous and bright that Japanese amateur astronomer Koichi Itagaki initially mistook it for a supernova. The star survived for nearly two years, however, until on Oct. 11, 2006, professional and amateur astronomers witnessed it blowing itself to smithereens as Supernova (SN) 2006jc.

"We have never observed a stellar outburst and then later seen the star explode," said University of California, Berkeley, astronomer Ryan Foley. His group studied the 2006 event with ground-based telescopes, including the 10-meter (32.8-foot) W. M. Keck telescopes in Hawaii. Narrow helium spectral lines showed that the supernova's blast wave ran into a slow-moving shell of material, presumably the progenitor's outer layers that were ejected just two years earlier. If the spectral lines had been caused by the supernova's fast-moving blast wave, the lines would have been much broader.

Another group, led by Stefan Immler of NASA's Goddard Space Flight Center in Greenbelt, Md., monitored SN 2006jc with NASA's Swift satellite and the Chandra X-ray Observatory. By observing how the supernova brightened in X-rays, a result of the blast wave slamming into the outburst ejecta, they could measure the amount of gas blown off in the 2004 outburst: about 0.01 solar mass, the equivalent of about 10 Jupiters.

"The beautiful aspect of our SN 2006jc observations is that although they were obtained in different parts of the electromagnetic spectrum, in the optical and in X-rays, they lead to the same conclusions," said Immler.

"This event was a complete surprise," added Alex Filippenko, leader of the UC Berkeley/Keck supernova group and a member of NASA's Swift satellite team. "It opens up a fascinating new window on how some kinds of stars die."

All the observations suggest that the supernova's blast wave took only a few weeks to reach the shell of material ejected two years earlier, which did not have time to drift very far from the star. As the wave smashed into the ejecta, it heated the gas to millions of degrees, hot enough to emit copious X-rays. The Swift satellite saw the supernova continue to brighten in X-rays for 100 days, something that has never been seen before in a supernova. All supernovae previously observed in X-rays have started off bright and then quickly faded to invisibility.

"You don't need a lot of mass in the ejecta to produce a lot of X-rays," noted Immler. Swift's ability to monitor the supernova's X-ray rise and decline over six months was crucial to the mass determination by Immler's team. But he added that Chandra's sharp resolution enabled his group to resolve the supernova from a bright X-ray source that appears in the field of view of Swift's X-ray telescope.

"We could not have made this measurement without Chandra," said Immler, who will submit his team's paper next week to the Astrophysical Journal. "The synergy between Swift's fast response and its ability to observe a supernova every day for a long period, and Chandra's high spatial resolution, is leading to a lot of interesting results."

Foley and his colleagues, whose paper appears in the March 10 Astrophysical Journal Letters, propose that the star recently transitioned from a Luminous Blue Variable (LBV) star to a Wolf-Rayet star. An LBV is a massive star in a brief but unstable phase of stellar evolution. Similar to the 2004 eruption, LBVs are prone to blow off large amounts of mass in outbursts so extreme that they are frequently mistaken for supernovae, events dubbed "supernova impostors." Wolf-Rayet stars are hot, highly evolved stars that have shed their outer envelopes.

Most astronomers did not expect that a massive star would explode so soon after a major outburst, or that a Wolf-Rayet star would produce such a luminous eruption, so SN 2006jc represents a puzzle for theorists.

"It challenges some aspects of our current model of stellar evolution," said Foley. "We really don't know what caused this star to have such a large eruption so soon before it went supernova."

"SN 2006jc provides us with an important clue that LBV-style eruptions may be related to the deaths of massive stars, perhaps more closely than we used to think," added coauthor and UC Berkeley astronomer Nathan Smith. "The fact that we have no well-established theory for what actually causes these outbursts is the elephant in the living room that nobody is talking about."

SN 2006jc occurred in galaxy UGC 4904, located 77 million light years from Earth in the constellation Lynx. The supernova explosion, a peculiar variant of a Type Ib, was first sighted by Itagaki, American amateur astronomer Tim Puckett and Italian amateur astronomer Roberto Gorelli.

April 04, 2007
www.berkeley.edu

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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

Astronomers map out planetary danger zone

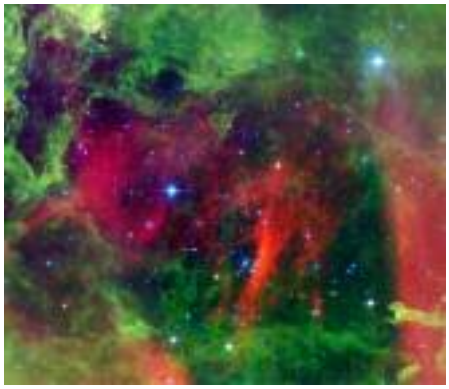
Astronomers have laid down the cosmic equivalent of yellow "caution" tape around super hot stars, marking the zones where cooler stars are in danger of having their developing planets blasted away.

In a new study from NASA's Spitzer Space Telescope, scientists report the first maps of so-called planetary "danger zones." These are areas where winds and radiation from super hot stars can strip other young, cooler stars like our sun of their planet-forming materials. The results show that cooler stars are safe as long as they lie beyond about 1.6 light-years, or nearly 10 trillion miles, of any hot stars. But cooler stars inside the zone are likely to see their potential planets boiled off into space.

"Stars move around all the time, so if one wanders into the danger zone and stays for too long, it will probably never be able to form planets," said Zoltan Balog of the University of Arizona, Tucson, lead author of the new report, appearing May 20 in the Astrophysical Journal.

Planets are born out of a flat disk of gas and dust, called a protoplanetary disk, that swirls around a young star. They are believed to clump together out of the disk over millions of years, growing in size like dust bunnies as they sweep through the dust.

Previous studies revealed that these protoplanetary disks can be destroyed by the most massive, hottest type of star in the universe, called an O-star, over a period of about a million years. Ultraviolet radiation from an O-star heats and evaporates the dust and gas in the disk, then winds from the star



blow the material away. Last year, Balog and his team used Spitzer to capture a stunning picture of this "photoevaporation" process at work.

They used Spitzer's heat-seeking infrared eyes to look for disks around 1,000 stars in the Rosette Nebula, a turbulent star-forming region 5,200 light-years away in the constellation Monoceros. The stars range between one-tenth and five times the mass of the sun and are between 2 and 3 million years old. They are all near at least one of the region's massive O-stars.

The observations revealed that, beyond 10 trillion miles of an O-star, about 45 percent of the stars had disks - about the same amount as there were in safer neighborhoods free of O-stars. Within this distance, only 27 percent of the stars had disks, with fewer and fewer disks spotted around stars closest to the O-star. In other words, an O-star's danger zone is a sphere whose damaging effects are worst at the core. For reference, our sun's closest star, a small star called Proxima Centauri, is nearly 30 trillion miles away.

In addition, the new study indicates that a protoplanetary disk will boil off faster in the zone's perilous core. For example, a disk two times closer to an O-star than another disk will evaporate twice as fast. "The edges of the danger zone are sharply defined," said Balog. "It is relatively safe for protoplanetary disks outside it, whereas a disk that gets dragged along by its star to be really close to an O-star could disappear in as fast as a hundred thousand years."

Despite this doomsday scenario, there is a chance some planets could survive a close encounter with an O-star. According to one alternative theory of planet formation, some gas giants like Jupiter might form in less than one million years. If such a planet already existed around a young star whose disk is blown away, the gas giant would stay put while any burgeoning rocky planets like Earth would be forever swept away.

Some astronomers think our sun was born in a similarly violent neighborhood studded with O-stars before migrating to its present, more spacious home. If so, it was lucky enough to escape a harrowing ride into any danger zones, or our planets, and life as we know it, wouldn't be here today.

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