COMING EVENTS
March Meeting
The Pluto Files
Friday March 11, 2011
7:30 PM
2001 Malott Hall
PUBLIC OBSERVING
Sunday April 3
8:30 - 9:30
Prairie Park Nature Center

President:
Rick Heschmeyer
rcjbm@sbcglobal.net
University Advisor:
Dr. Bruce Twarog
btwarog@ku.edu
Webmaster:
Gary Webber
gwebber@ku.edu
Observing Clubs
Doug Fay
dfay@ku.edu

INSIDE THIS ISSUE

Cosmic Challenge (cont.) 2
Less DM, More Stars 3
NASA Space Place 4
Discovering Pluto POSTER 5
Extended Stellar Family 6
The Pluto Files POSTER 7
HST Spiral Galaxy 8
Less DM (continued) 8
Most Distant Galaxy 9
Distant Galaxy (continued) 10

Report from the Officers:
Astronomers are used to the weather interfering with their interests, but this is getting a little excessive, even by Kansas standards. As you know, the visit by Michael Byers was cancelled due to the snowstorm that hit Lawrence and the Midwest, up to and including the Chicago region, the day before his visit. As the poster inside emphasizes, it has been rescheduled for a less risky time period weather-wise, i.e. April 19. That should give everyone plenty of time to obtain a T-shirt and, again, help spread the word regarding the talk. Please note the new date on your calendar. As part of our ongoing semester dedicated to Pluto and Clyde, our next meeting on FRIDAY, MARCH 11 will feature a DVD presentation of and by the individual who partially initiated the

Cosmic Challenge

What kind of observer are you? Many of us are the kind of observers who challenge ourselves to make difficult observations – the ones that we were told were not possible. We wait for new moon, exquisitely clear skies, and we travel long distances to get away from city lights and often use with large telescopes and we push ourselves to see objects that are at the limit of visibility. We wait for a planet to be in exactly the right place on the sky to make our observations possible. The moon phase must be the one that properly illuminates the surface feature we want to see, Saturn must show us its ring system in the best orientation, the moons of Jupiter must be in the right place. Others of us, while equally serious about our observing program, are not primarily working on observing at the limit of visibility or resolvability. Variable star observers work on making brightness estimates of the stars on their observing lists. Supernova hunters are specifically looking for bright (relative term) objects in distant galaxies. Those who measure the position of objects in the sky (astrometry), are doing great work but are not necessarily observing at the limit.

Perhaps you’re a combination of both observers – a person who goes after the difficult objects when the conditions are right, but who also enjoys other kinds of observing at other times. If you are an observer who relishes observing at the limit you’ll want to get your hands on the book Cosmic Challenge – The Ultimate Observing List for Amateurs (Cambridge Press, 2011) by Philip S. Harrington.

Whether you’ve met Phil in person or not you probably know him. He writes the “Binocular Universe” column (Cloudynights.com), is a contributing editor for Astronomy magazine, and has authored several books, including Touring the Universe Through Binoculars, and Star Ware, a regularly updated review of astronomical equipment. What’s in the Cosmic Challenge book? The book contains 188 challenges (plus 100 double star challenges) and they are organized by observing instrument. (The back cover of the book says that there are 187 challenges, but there really are 188.) They are organized into groups for naked-eye observers, binocular...
The club is open to all people interested in sharing their love for astronomy. Monthly meetings are typically on the second Friday of each month and often feature guest speakers, presentations by club members, and a chance to exchange amateur astronomy tips. Approximately the last Sunday of each month we have an open house at the Prairie Park Nature Center. Periodic star parties are scheduled as well. For more information, please contact the club officers: our president, Rick Heschmeyer at rcjbm@sbcglobal.net, our webmaster, Gary Webber, at gwebber@ku.edu, or our faculty advisor, Prof. Bruce Twarog at btwarog@ku.edu. Because of the flexibility of the schedule due to holidays and alternate events, it is always best to check the Web site for the exact Fridays and Sundays when events are scheduled. The information about AAL can be found at http://www.ku.edu/~aal.

Copies of the *Celestial Mechanic* can also be found on the web at http://www.ku.edu/~aal/celestialmechanic
Herschel finds less dark matter but more stars
Herschel Press Release

ESA’s Herschel space observatory has discovered a population of dust-enshrouded galaxies that do not need as much dark matter as previously thought to collect gas and burst into star formation.

The galaxies are far away and each boasts some 300 billion times the mass of the Sun. The size challenges current theory that predicts a galaxy has to be more than ten times larger, 5000 billion solar masses, to be able form large numbers of stars. The new result is published today in a paper by Alexandre Amblard, University of California, Irvine, and colleagues.

Most of the mass of any galaxy is expected to be dark matter, a hypothetical substance that has yet to be detected but which astronomers believe must exist to provide sufficient gravity to prevent galaxies ripping themselves apart as they rotate. Current models of the birth of galaxies start with the accumulation of large amounts of dark matter. Its gravitational attraction drags in ordinary atoms. If enough atoms accumulate, a ‘starburst’ is ignited, in which stars form at rates 100–1000 times faster than in our own galaxy does today.

“Herschel is showing us that we don’t need quite so much dark matter as we thought to trigger a starburst,” says Asantha Cooray, University of California, Irvine, a co-author on today’s paper.

This discovery was made by analyzing infra-red images taken by Herschel’s SPIRE (Spectral and Photometric Imaging Receiver) instrument at wavelengths of 250, 350, and 500 microns. These are roughly 1000 times longer than the wavelengths visible to the human eye and reveal galaxies that are deeply enshrouded in dust.

“With its very high sensitivity to the far-infrared light emitted by these young, enshrouded starburst galaxies, Herschel allows us to peer deep into the Universe and to understand how galaxies form and evolve,” says Göran Pilbratt, the ESA Herschel project scientist.

There are so many galaxies in Herschel’s images that they overlap, creating a fog of infrared radiation known as the cosmic infrared background. The galaxies are not distributed randomly but follow the underlying pattern of dark matter in the Universe, and so the fog has a distinctive pattern of light and dark patches. Analysis of the brightness of the patches in the SPIRE images has shown that the star-formation rate in the distant infrared galaxies is 3–5 times higher than previously inferred from visible-wavelength observations of similar, very young galaxies by the Hubble Space Telescope and other telescopes.

Further analysis and simulations have shown (Continued on page 8)
Thank Goodness the Sun is Single

By Trudy E. Bell

It’s a good thing the Sun is single. According to new research, Sun-like stars in close double-star systems “can be okay for a few billion years—but then they go bad,” says Jeremy Drake of the Harvard-Smithsonian Astrophysical Observatory in Cambridge, Mass. How bad? According to data from NASA's Spitzer Space Telescope, close binary stars can destroy their planets along with any life. Drake and four colleagues reported the results in the September 10, 2010, issue of The Astrophysical Journal Letters.

Our Sun, about 864,000 miles across, rotates on its axis once in 24.5 days. “Three billion years ago, roughly when bacteria evolved on Earth, the Sun rotated in only 5 days,” explains Drake. Its rotation rate has been gradually slowing because the solar wind gets tangled up in the solar magnetic field, and acts as a brake. But some sun-like stars occur in close pairs only a few million miles apart. That’s only about five times the diameter of each star—so close the stars are gravitationally distorted. They are actually elongated toward each other. They also interact tidally, keeping just one face toward the other, as the Moon does toward Earth.

Such a close binary is “a built-in time bomb,” Drake declares. The continuous loss of mass from the two stars via solar wind carries away some of the double-star system’s angular momentum, causing the two stars to spiral inward toward each other, orbiting faster and faster as the distance shrinks. When each star’s rotation period on its axis is the same as its orbital period around the other, the pair effectively rotates as a single body in just 3 or 4 days.

Then, watch out! Such fast spinning intensifies the magnetic dynamo inside each star. The stars “generate bigger, stronger ‘star spots’ 5 to 10 percent the size of the star—so big they can be detected from Earth,” Drake says. “The stars also interact magnetically very violently, shooting out monster flares.”

Worst of all, the decreasing distance between the two stars “changes the gravitational resonances of the planetary system,” Drake continued, destabilizing the orbits of any planets circling the pair. Planets may so strongly perturbed they are sent into collision paths. As they repeatedly slam into each other, they shatter into red-hot asteroid-sized bodies, killing any life. In as short as a century, the repeated collisions pulverize the planets into a ring of warm dust. The infrared glow from this pulverized debris is what Spitzer has seen in some self-destructing star systems. Drake and his colleagues now want to examine a much bigger sample of binaries to see just how bad double star systems really are.

They’re already sure of one thing: “We’re glad the Sun is single!”

Read more about these findings at the NASA Spitzer site at www.spitzer.caltech.edu/news/1182-ssc2010-07-Pulverized-Planet-Dust-May-Lie-Around-Double-Stars. For kids, the Spitzer Concentration game shows a big collection of memorable (if you’re good at the game) images from the Spitzer Space Telescope. Visit spaceplace.nasa.gov/en/kids/spitzer/concentration/. This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.
Discovering Pluto

An Evening with Michael Byers
Author of Percival’s Planet - A Novel

TUESDAY, APRIL 19, 2011

6:30 - 9:30 pm
Kansas Union Ballroom

Guided Display by the KU Astronomy Department

Introductory Remarks by Michael Byers

Michael Byers Presentation

Telescope Observing Session:
Union 6th floor deck

Byers Book Signing
Birthday Cake for Clyde Tombaugh, Discoverer of Pluto

Co-sponsored by KU Bookstore, KU Memorial Unions, KU Department of Physics & Astronomy, KU Hall Center for the Humanities, and The Commons
An Extended Stellar Family

This swirling landscape of stars is known as the North America nebula. In visible light, the region resembles North America, but in this new infrared view from NASA's Spitzer Space Telescope, the continent disappears. Where did the continent go? The reason you don’t see it in Spitzer’s view has to do, in part, with the fact that infrared light can penetrate dust whereas visible light cannot. Dusty, dark clouds in the visible image become transparent in Spitzer’s view. In addition, Spitzer’s infrared detectors pick up the glow of dusty cocoons enveloping baby stars.

Clusters of young stars (about one million years old) can be found throughout the image. Slightly older but still very young stars (about 3 to 5 million years) are also liberally scattered across the complex, with concentrations near the "head" region of the Pelican nebula, which is located to the right of the North America nebula (upper right portion of this picture). Some areas of this nebula are still very thick with dust and appear dark even in Spitzer’s view. For example, the dark “river” in the lower left-center of the image -- in the Gulf of Mexico region -- are likely to be the youngest stars in the complex (less than a million years old). The Spitzer image contains data from both its infrared array camera and multi-band imaging photometer. Light with a wavelength of 3.6 microns has been color-coded blue; 4.5-micron light is blue-green; 5.8-micron and 8.0-micron light are green; and 24-micron light is red.
A DVD PRESENTATION

FRIDAY MARCH 11, 2011
7:30 PM
2001 Malott Hall
University of Kansas

FREE AND OPEN TO THE PUBLIC
that this smaller mass for the galaxies is a sweet spot for star formation. Less massive galaxies find it hard to form more than a first generation of stars before fizzling out. At the other end of the scale, more massive galaxies struggle because their gas cools rather slowly, preventing it from collapsing down to the high densities needed to ignite star formation. But at this newly identified ‘just-right’ mass of a few hundred billion solar masses, galaxies can make stars at prodigious rates and thus grow rapidly.

“This is the first direct observation of the preferred mass scale for igniting a starburst,” says Dr Cooray. Models of galaxy formation can now be adjusted to reflect these new results, and astronomers can take a step closer to understanding how galaxies – including our own – came into being.
NASA’S HUBBLE FINDS MOST DISTANT GALAXY CANDIDATE EVER SEEN IN UNIVERSE
HST Press Release

Astronomers have pushed NASA’s Hubble Space Telescope to its limits by finding what is likely to be the most distant object ever seen in the universe. The object’s light traveled 13.2 billion years to reach Hubble, roughly 150 million years longer than the previous record holder. The age of the universe is approximately 13.7 billion years.

The tiny, dim object is a compact galaxy of blue stars that existed 480 million years after the big bang. More than 100 such mini-galaxies would be needed to make up our Milky Way. The new research offers surprising evidence that the rate of star birth in the early universe grew dramatically, increasing by about a factor of 10 from 480 million years to 650 million years after the big bang.

"NASA continues to reach for new heights, and this latest Hubble discovery will deepen our understanding of the universe and benefit generations to come," said NASA Administrator Charles Bolden, who was the pilot of the space shuttle mission that carried Hubble to orbit. "We could only dream when we launched Hubble more than 20 years ago that it would have the ability to make these types of groundbreaking discoveries and rewrite textbooks."

Astronomers don’t know exactly when the first stars appeared in the universe, but every step farther from Earth takes them deeper into the early formative years when stars and galaxies began to emerge in the aftermath of the big bang.

"These observations provide us with our best insights yet into the earlier primeval objects that have yet to be found," said Rychard Bouwens of the University of Leiden in the Netherlands. Bouwens and Illingworth report the discovery in the Jan. 27 issue of the British science journal Nature.

This observation was made with the Wide Field Camera 3 starting just a few months after it was installed in the observatory in May 2009, during the last NASA space shuttle servicing mission to Hubble. After more than a year of detailed observations and analysis, the object was positively identified in the camera’s Hubble Ultra Deep Field-Infrared data taken in the late summers of 2009 and 2010.

(Continued on page 10)
The object appears as a faint dot of starlight in the Hubble exposures. It is too young and too small to have the familiar spiral shape that is characteristic of galaxies in the local universe. Although its individual stars can’t be resolved by Hubble, the evidence suggests this is a compact galaxy of hot stars formed more than 100-to-200 million years earlier from gas trapped in a pocket of dark matter.

“We’re peering into an era where big changes are afoot,” said Garth Illingworth of the University of California at Santa Cruz. "The rapid rate at which the star birth is changing tells us if we go a little further back in time we’re going to see even more dramatic changes, closer to when the first galaxies were just starting to form."

The proto-galaxy is only visible at the farthest infrared wavelengths observable by Hubble. Observations of earlier times, when the first stars and galaxies were forming, will require Hubble’s successor, the James Webb Space Telescope (JWST).

The hypothesized hierarchical growth of galaxies — from stellar clumps to majestic spirals and ellipticals — didn’t become evident until the Hubble deep field exposures. The first 500 million years of the universe’s existence, from a z of 1000 to 10, is the missing chapter in the hierarchical growth of galaxies. It’s not clear how the universe assembled structure out of a darkening, cooling fireball of the big bang. As with a developing embryo, astronomers know there must have been an early period of rapid changes that would set the initial conditions to make the universe of galaxies what it is today.

"After 20 years of opening our eyes to the universe around us, Hubble continues to awe and surprise astronomers," said Jon Morse, NASA’s Astrophysics Division director at the agency’s headquarters in Washington. "It now offers a tantalizing look at the very edge of the known universe — a frontier NASA strives to explore."