

Triton Fun Company

Science Newsletter March 2010

# Science Newsletter

## March 2010

### Infrared Astronomy With WISE

T. Dockweiler

#### Special points of interest:

A Very WISE spacecraft

Triton Fun stuff

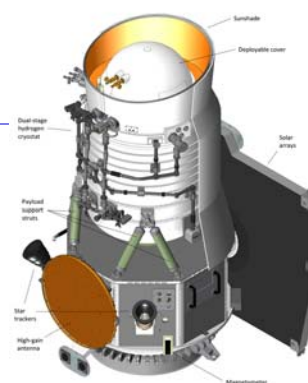
Superfluous questions

Celestial astronomical surveys have improved immensely in the last four decades with the use of space satellites and space telescopes. The most recent, the Wide-Field Infrared Survey Explorer (WISE) 16-Inch reflector space telescope, was launched successfully during predawn on 2009 December 14 at Vandenberg Air Force Base near Lompoc, California. WISE is one of 11 launched infrared-imaging space telescopes. Six of these telescopes are operating - - the most notable presently being the Spitzer Space Telescope. Four have completed their programs and have been terminated. One failed after launch. WISE is in a Sun-precensing synchronous low Earth polar orbit above the Earth's terminator. This satellite-telescope is managed by the Jet Propulsion Laboratory (JPL). The scientific investigations are primarily coordinated through the University of California, at both Los Angeles (UCLA) and Berkeley (UCB). Scientists from many institutions are represented. The infrared-band images are significantly better in resolution (6-12 arcseconds) than anything previously done.

After launch, there are three operational phases. The first month involved orbital placement, satellite operation, instrument checking, and instrument calibration. The main survey mission that will last

six months is currently underway and serves as the second phase. Depending on the cryogenic gas supply of hydrogen remaining, the final three months of the ten-month mission will involve a supplemental re-survey of half of the celestial sky which will allow for review of orbital motion and positional changes of astronomical objects.

On 2010 February 25, over 1/4 of the entire celestial sky had been imaged in four different wavelength bands within the near-infrared and mid-infrared parts of the spectrum. Altogether, an impressive 1.5 million 1-megapixel images are expected to be taken - - one about every 11 seconds. The imaging will be momentarily stopped four times a day for image data transmission to Earth. First light for the instrument occurred on 2009 February 29 when the telescope cover was released (cap-ejection). A first light image was publicly made available on 2010 January 06. Eight days after the first image release the main survey of the science mission began. Eight days after that, WISE discovered its first Near Earth Object (NEO), an asteroid (on 2010 January 25) which is designated 2010AB78. On 2010 February 11, WISE discovered its first comet, a periodic comet designated P/2010 (WISE).



Wide-field Infrared Survey Explorer (WISE) spacecraft

The WISE infrared sky survey will allow for major discoveries in many areas. Improvements to celestial cartography will occur. Intergalactic astronomy, intragalactic Milky Way astronomy, Solar Neighborhood astronomy, and Solar System astronomy will all benefit.

WISE will permit the study of objects known as LIRGs (Luminous Infrared Galaxies), ULIRGs (Ultra-Luminous Infrared Galaxies) such as the closest known Arp 220 in the constellation Serpens, and HLIRGs (Hyper-Luminous Infrared Galaxies). Milky Way phenomena such as stellar Strömrgren spheres will be investigated, along with star clusters (both open and globular), nebulae, planetary nebulae, and the recently discovered *Cygnus Bubble*.

continued, pg 2 —>

We are always looking for **contributors** to the Science Newsletter. If you would like to write an article about a science subject you are excited about, or contribute a superfluous question, or if you would like to be on our **mailing list** for future newsletters, please e-mail us at:

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**Infrared Astronomy with WISE: *continued***  
 Photos/Info: NASA

The Cygnus Bubble was found on 2009 July 06 by David M. Jurasevich within the Crescent Nebula (NGC 6888) in the northern celestial constellation Cygnus and is the most perfectly symmetrical gas sphere bubble seen in the sky to date.

Stellar wind/gas interactions of Wolf-Rayet stars will be observed, along with looking into stellar nurseries like the Orion Nebula (M42) near the celestial equator, and Berkeley 59 (a star cluster within NGC 7822) in the northern celestial constellation Cepheus, the starfields of the southern constellations of Scorpius and Sagittarius, stellar dust disks, protoplanetary disks around stars, variable stars, brown dwarfs, and new unknown faint stars within our own Solar Neighborhood. 500 new brown dwarfs are anticipated along with potential confirmation of the Oort Cloud (although probably not the Kuiper belt). Our own Solar System will be analyzed with expected new discoveries of a very large quantity of new asteroids and objects/comets of visual magnitude 22, some being potentially hazardous asteroids (PHA) to Earth. Diameter measurements of 250,000 asteroids are sought, 100,000 potentially from newly discovered Main Belt asteroids. 300 new NEO's are expected. Much of this work may initially overwhelm the asteroid recording groups by sheer quantity causing momentary backlogs or data release delays. The current registry has just short of 70 million observations, which include mostly just under a half million asteroids. The first scientific papers from the beginning of the survey mission have yet to be submitted. We should all look forward to the discovery of many new objects and unknown astronomical phenomena uncovered by the WISE spacecraft.



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References:

1. Lonsdale, C. J.; et al. (2009), "Ulirgs with WISE: Tracing the most luminous starbursts over the history of the universe", *Bull. Amer. Astron. Soc.* 41, 365
2. Mainzer, A. K.; et al. (2010), "NEOWISE - The WISE Near Earth Object Survey", 41<sup>st</sup> Lunar and Planetary Science Conference (2010 March 01-05), *Lunar and Planetary Institute Science Conference Abstracts*, 2010 March.
3. Majaess, D. J.; et al. (2008), "The exciting star of the Berkeley 59/Cepheus OB4 complex and other chance variable star discoveries", *J. Amer. Assoc. of Var. Star Observers*, (AAVSO) 36, No. 1, 2008 June.

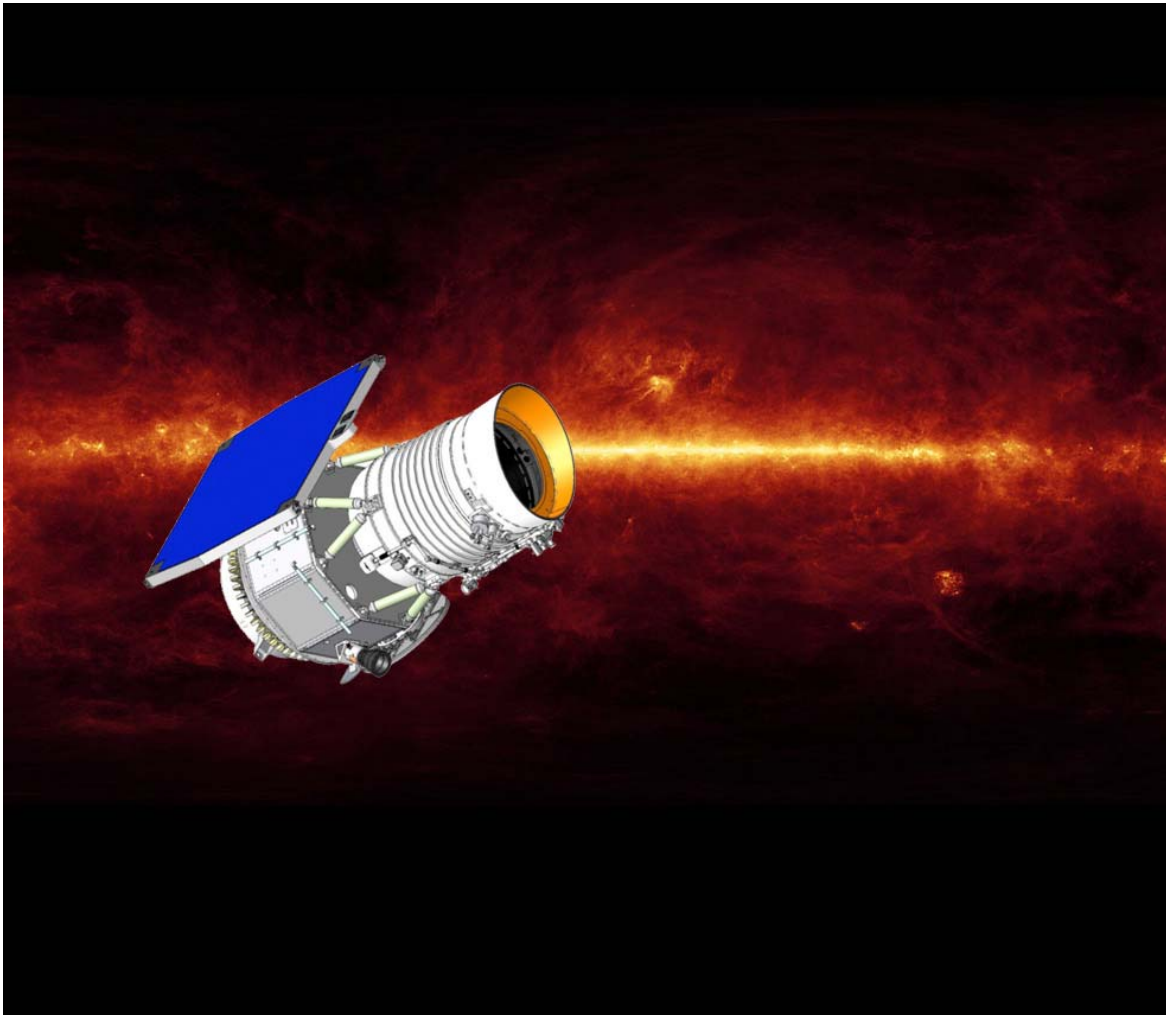
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**A familiar sight ?**

(Above) A WISE image of the Andromeda Galaxy (M31). WISE used all four of its infrared detectors to capture this picture and see structure in the interior. Colors are added to show the different infrared wavelengths (3.4- and 4.6-micron light is colored blue; 12-micron light is green; and 22-micron light is red). Blue indicates mature older stars; yellow and red show dust heated by newborn, massive stars.

**Websites:**

- <http://www.jpl.nasa.gov/wise/>
- <http://www.jpl.nasa.gov/wise/missions.cfm>
- <http://www.jpl.nasa.gov/wise/images.cfm>



**WISE spacecraft observing the galactic center**

(Above) The instruments onboard operate in the near- and mid-infrared allowing WISE to see through dust lanes and obscured areas of the galaxy to study the structure within. (Below) The Cygnus Bubble, a remarkably spherical, bizarre structure that will be observed by WISE; these observations should shed light on the bubble's origins.



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\*\* Send us your superfluous questions for a future issue ! They can be on any subject. The funnier, the better. M.D., our editor, appreciates the help and will send you a free Triton Fun coffee mug as compensation for your question. Or write an article for us and be read by professional and amateur astronomers and scientists in the U.S. and Canada ! \*\*

## Superfluous Questions:

- 1) How many windows are there on the Empire State Building in New York City ?  
a) 10,000    b) 6000    c) 8000    d) 15,000
- 2) The Chevrolet automobile was named after Louis Chevrolet. What was his profession ?  
a) doctor    b) politician    c) race car driver    d) auto mechanic
- 3) What plant's leaves did American colonists use to brew a tea substitute after the Boston Tea Party ?  
a) dandelion    b) peppermint    c) goldenrod    d) chamomile
- 4) A pharmacy called Wall Drug has billboards all over America. What state is their store in ?  
a) Montana    b) Colorado    c) South Dakota    d) Wyoming

→ ANSWERS in next months issue of the Science Newsletter ! ←---

\*\* ANSWERS to February's Superfluous Questions: 1. c) DeForest Kelley    2. d) Douglas    3. d) McGill    4. c) fish