SUMMER 2009
VOLUME 32, NO. 2

MIRA NEWSLETTER

MIRA Astronomer Dr. Russell Walker and the WISE Satellite

(See On the Cover, p. 2)

Contents

Los Padres National Forest Re-opens

On 27 April, Los Padres National Forest officials announced that the areas burned in the 2008 fires would re-open on 1 May.

Consequently, MIRA has been able to resume its public activities at the Oliver Observing Station. On 7 June, a record crowd of 64 attended the tour of the observatory, led by Arthur Babcock and Brian Jacobson. See the Calendar for the dates of future tours.

We are also able to schedule the first Friends Night at the telescope in more than a year. This event is limited to members of the Friends of MIRA; see the Calendar for more information.

Membership Renewal

A gentle reminder that the MIRA volunteers, docents, student interns, and astronomers at MIRA depend on your contributions to make all our educational and research activities possible. Please renew your membership in the MIRA adventure.

Calendar of Events

July 12-23 MIRA Eclipse Tour to China (and Tibet!). Call 883-1000 to join the tour.

Sunday, July 19, 2:30-4:00pm Free tour of the Oliver Observing Station on Chews Ridge. **Reservations are required; call 883-1000.**

Saturday, July 25, 8:30-10:30pm "Exploring the Summer Sky" with MIRA docent Dr. Jim Eagle. Garland Ranch Regional Park. This program is offered through the Regional Park District for ages 8 and up and there is a charge of $10. For information, contact the District at 372-3196.

Sunday, August 9, 2:30-4:00pm Free tour of the Oliver Observing Station on Chews Ridge. **Reservations are required; call 883-1000.**

Sunday, September 13, 2:30-4:00pm Free tour of the Oliver Observing Station on Chews Ridge. **Reservations are required; call 883-1000.**

Saturday, October 10 Friends Night at MIRA's Oliver Observing Station on Chews Ridge. Look at the cosmos through the MIRA 36-inch telescope. **Reservations are required; call 883-1000.**

On the Cover

Excitement is mounting at MIRA as the November 2009 launch date of the WISE mission approaches.

The Wide-field Infrared Survey Explorer (WISE) is a NASA-funded Explorer mission that will image the entire sky at mid-infrared wavelengths at much greater sensitivity and resolution than any previous survey. Over a six-month period, the instrument will acquire over 1,000,000 images that will reveal new discoveries in the Solar System, the Milky Way Galaxy, and the Universe.

MIRA astronomers Dr. Martin Cohen and Dr. Russell Walker are members of the WISE science team. The launch aboard a Delta-II launch vehicle will take place this November from Vandenberg Air Force Base in Santa Barbara County.

Q&A

This feature is inspired by the questions we have received over the years from interested readers. If you have a question about an astronomical topic, please send it to us.

On Mon, 20 Apr 2009, Nicholas wrote:

Dear Dr. Weaver:

My name is Nicholas, age 16, grade 11 at Homestead High School. My father has been a supporter of your work for many years, and we met briefly a few years back when my dad took the family to visit your facility in Monterey.

I'm doing a project for my physics class where I elaborate upon a topic covered more vaguely in class, and I've chosen to investigate the search for planets outside of the solar system. I'm supposed to do the research on the actual methods on my own, and if you could answer just two questions about what you think of the field and your work, I'd be very grateful.

1) What do you like best about astronomy (planet searching in particular)? For example, do you like getting out and looking for things or just theorizing based on other people's data, or something else that I've never heard of?

2) Why do you think the field of astronomy, especially the search for other planets, is important?

Thank you for your time.

Nicholas

Dr. Bruce Weaver replies,

Hi Nicholas,

Hard questions. I'd probably have better answers after thinking about them for a few months but that would probably be too late for your purposes.

I don't have a favorite color and I don't like some particular feature of astronomy best. However, there are many reasons that I like astronomy.

I like the feeling of irrational awe I get when I look at a dark night sky. Beyond the personal, it also connects me to every human who has experienced it. At that level, I expect there is little difference between my experience and that of a human of 20,000 years ago.

I like understanding the flow of information from the star, through space, through the telescope and instruments, through the computer, to the page, and me. I mean this is a gestalt feeling grounded on detailed knowledge of the physics of the star and all the steps to me. I've been intimately involved in the design and building of the telescope and instruments, the hardware and software details of the computer, have designed and written programs to take in data from the instruments, reduce and analyze them, and deduce new results previously unknown to anyone. And then I have created computer models or simulations of how the physics works and why I observe what I have. Wow! Can't beat that for a rush!

There are many other reasons but those are the most important ones.

I'm not involved in the search for extra-solar planets but the cool thing for me is to have been a working adult when, after centuries of trying, we discovered them in ways that I completely understood. Until what seems to me a few short years ago, the question of extra-solar planets was metaphysical; now it is everyday science.

Astronomy is important because it attempts to answer questions about our relationship to the Universe that every human has pondered. (I think this is a necessary, if not sufficient, defining characteristic of humans.) It is an ideal science in that it has no practical application (divorcing navigation and, more recently, geology from its domain). It has no social use except to lift our thoughts beyond ourselves.

Beyond the thoughts above, I think that the search for other planets is no more important than many other parts of astronomy. This is for the technical reason that, at the moment, we strongly believe that communication is limited by the speed of light and thus any exchange with other technologically-advanced beings would take longer than would probably be useful to humans.

These may not be the type of answers you were seeking but they're the best I can give in the time frame that would be useful to you.

Good luck with your research.

Students at MIRA

MIRA's Class of 2009

Readers of the MIRA *Newsletter* know that MIRA has an active program for recruiting student summer interns. This program allows students to work one-on-one with professional astronomers in original research and gain an understanding of the scientific process.

This year, we have a total of four interns working with us. From left to right in the accompanying photo, they are: Thomas Bohn of the York School, Victor Zarate of Hartnell College, Cindy Chu of Santa Catalina School, and Jenny Lei of North Salinas High School.

They will be working with Drs. Arthur Babcock, Whitney Shane, and Bruce Weaver on a variety of scientific projects.

MIRA Photo


MIRA Photo

Undergraduate Research at the Oliver Observing Station

Now that the fires of 2008 are behind us, we at MIRA are looking forward to a productive observing season.

Dr. Steve Naftilan (center) of the Joint Science Department of the Claremont Colleges, and Scripps College sophomore Andre Holman recently journeyed from southern California for a three-night observing run on the MIRA 36-inch telescope.

Here they plan their observations of Be stars with Dr. Bruce Weaver.

Imaging Extra-Solar Planets

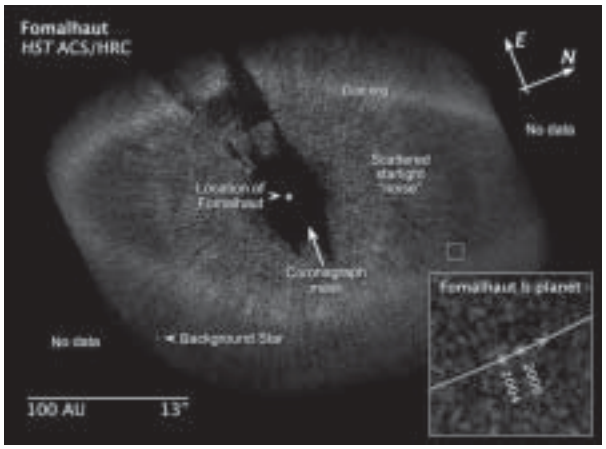
Lecture Review by Rod Norden

On April 18, 2009, MIRA was treated to a fascinating and timely talk by Dr. Ben Zuckerman of UCLA about the current state of imaging of extra-solar planets (exoplanets).

Astronomers have been asking whether and how often other life is present in the Universe. To answer that question, we need to find rocky planets at the proper temperature and distance from their stars to support life.

Dr. Zuckerman presented a review of techniques used in locating the 300+ exoplanets found so far:

- Stars surrounded by disks of dust – since planets appear to form from dust near stars, this is an obvious place to look. The first dust disks around stars were found in 1983 from excess infrared flux.
- Radio timing of pulsars – the pulse occurs faster or slower depending upon Doppler effect caused by orbiting planets. The first planets were found via this method in 1992 orbiting PSR 1257 +12.
- High-precision Radial Velocity – measuring the very small Doppler shift (>=1m/sec) resulting from the planet and star orbiting around their mutual center of gravity. The first planet found via this highly productive method was orbiting 51 Pegasi in 1995. Many more discoveries followed.
- Transits – measuring the minuscule drop in total magnitude as a dark planet blocks a bit of light from the star around which it is orbiting. This method first yielded success in 2002.
- Microlensing – a star aligned between Earth and a second star causes light from the second, more distant, star to brighten visibly in a uniform way. A planet orbiting the closer star will modify the lensing effect, adding a spike of brightness to the otherwise smooth magnification curve. This method first yielded success in 2004.
- Reflected Starlight – actually imaging the planet or planets next to a star and measuring their orbital motions. This worked in 2004 in IR for a planet orbiting a Brown Dwarf. In 2008, direct images were obtained in Visible and IR of planets orbiting dusty young stars (two papers in *Science*).
- Astrometry – using very accurate measurement of the position of a star to tell if the star is orbiting with an unseen planet around their mutual center of gravity.
- Thermal Emission – infrared from very young planets still in the process of cooling or noting a decrease in the total IR emission from a system when the planet is occulted by the star.



Dr. Zuckerman concentrated on several very recent findings.

First, he discussed the details of images of giant planets orbiting unexpected types of stars with dust disks (Fomalhaut and HR 8799). Fomalhaut is a young hot star with one planet that was discovered by the manner in which the dust disk was altered. It was imaged in visible light in 2004 and 2006 using the Hubble Space Telescope to confirm the orbital motion of the planet. HR 8799 is slightly more massive than the Sun, but was imaged with three planets using adaptive optics and a special new imaging technique on the very large telescopes in Hawaii and Chile.

Second, he described the indirect evidence of collisions of rocky planets similar to Earth and Venus (BD +20 307 and HD 23514). BD +20 307 is the dustiest known main sequence star and was found to be a close binary pair near the age of the Sun. HD 23514 is a star with a very large dust disk in the Pleiades. Both stars have very irregular dust disks surrounding them that contain materials that usually exist only in the interiors of rocky planets like the earth as indicated by excess IR emission properties. The most reasonable explanation for these features is a major catastrophic collision of planets

Two new spacecraft have recently been launched that will help us to find more about these and other exoplanets. They are NASA's Kepler Mission launched on 6 March 2009, and the European Herschel Infrared Space Observatory launched on 14 May 2000.

The Summer Sky

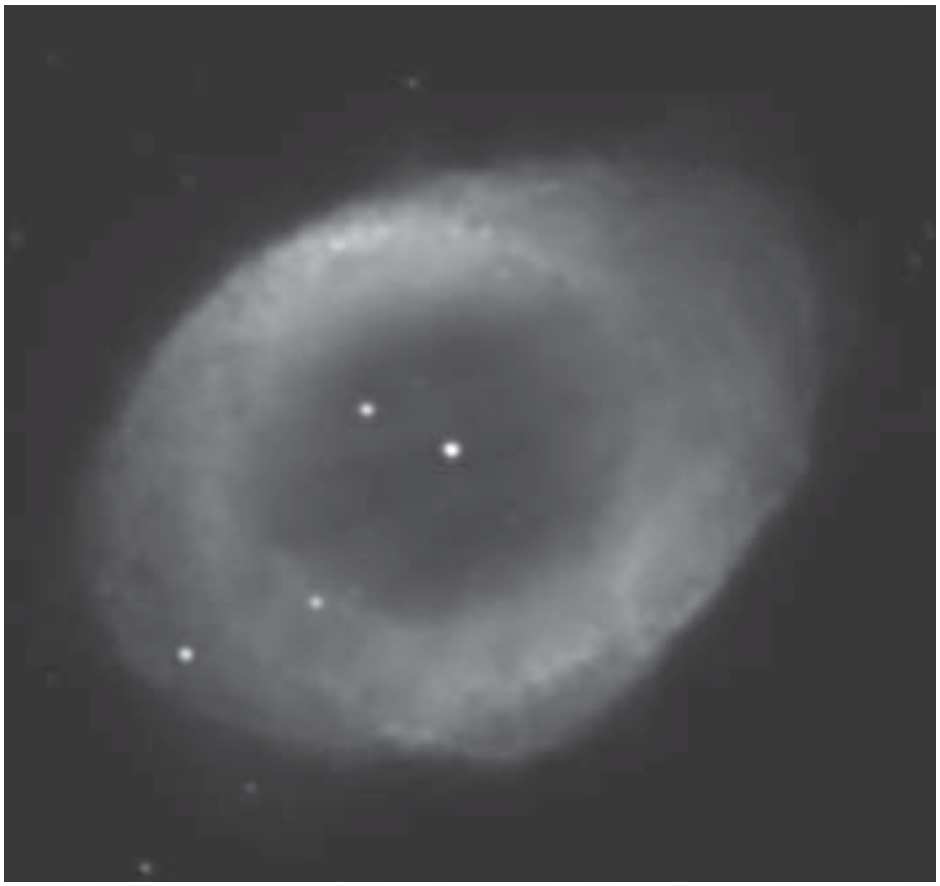
by Rod Norden

The warm summer months are the best time to get out under the stars. The Milky Way extends all the way across the sky and the Summer Triangle stars are high overhead. We need to get out and enjoy the warm evenings!

Fixed Stars

Suitable for observers in a dark sky with binoculars, M24 is a relatively obvious star cloud in Sagittarius, above the southern horizon in the Milky Way. Located just over the top of the "teapot," M24 is a bright cloud of stars. The entire area is full of bright and dark nebulae that are fantastic from a dark sky location with my 15x70 binoculars.

One of my favorite beginner's telescope objects is Messier 57 (Ring Nebula) in Lyra. This "smoke ring" hanging in a field of bright stars is memorable. Increasing magnification and an OIII nebular filter suit it well. The central star is remarkably difficult to see without the filter since the inside of the Ring Nebula is not fully dark. How large a telescope do you have to use to see it? I've seen it in an 18-inch under dark skies, and I always see it in the 36-inch Lick Refractor and the Kitt Peak 36-inch f/5 Newtonian.



M57, the Ring Nebula, imaged with the MIRA 36-inch telescope

Summer provides the opportunity to observe several other interesting planetary nebulae for the more advanced observer. My favorite is NGC 6543 (the Cat's Eye)

The Cat's Eye planetary is located in Draco less than a degree from the North Ecliptic Pole. It is a greenish blue oval with a visible central star. This was the first planetary nebula whose spectrum was examined, in 1864. Instead of a continuous band of colors, it was found that the spectrum consisted of three bright (emission) lines. Astronomers assumed that these lines were due to a new element called "nebulium," but later it was determined that the lines were due to multiply-ionized oxygen. This also proved that the nebula was hot gas and not unresolved stars, which was a common question of the time. The actual nebula is about half a light year across.

Planets

Mercury is visible for evening observation in August, reaching maximum elongation on 24 August. It is much better viewed from the Southern Hemisphere due to our relative orbital positions.

Venus is very bright in the morning sky all during the period, fading slightly in September.

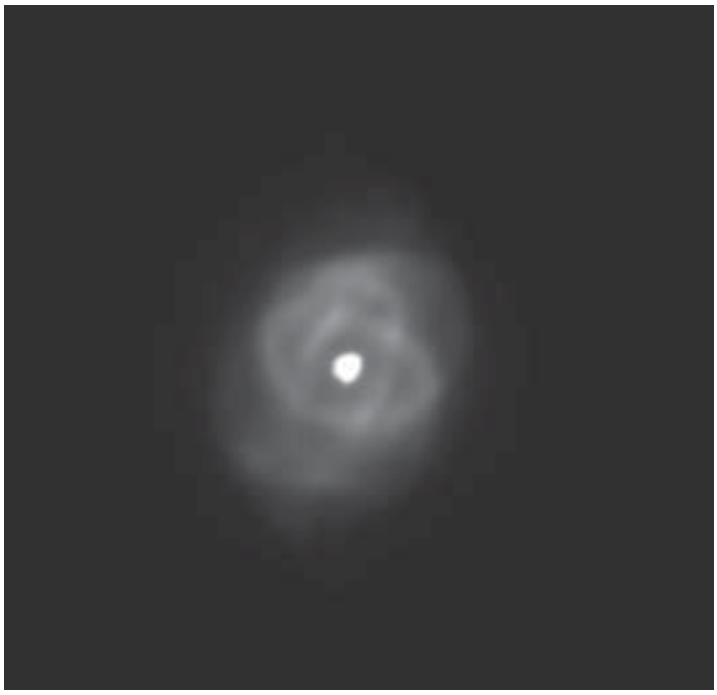
Earth is at aphelion (farthest from the sun) on 4 July. The Autumnal Equinox occurs at 2:19 PM (21:19 UT) on 22 September, as the sun crosses the equator on its way south.

The **moon** will participate in the longest total solar eclipse of the century on 22 July. MIRA has a trip planned to see it (and China—see below). Please also remember that July is the 40th Anniversary of Apollo 11 when Neil Armstrong and Buzz Aldrin first walked on the moon.

Mars, far from the Earth, will remain within 70 degrees of the sun in the morning hours until late fall.

Jupiter reaches opposition on 14 August. In the early evening of 2-3 Sept (9:43pm-11:29pm), none of the Galilean moons will be visible (all will be either in front of or behind Jupiter's disc) and this won't happen again until 2019.

Saturn moves much closer to the sun during July and passes Mercury on 18 August. On 10 August the sun passes through the plane of Saturn's rings, causing our very thin side to appear dark. This may be difficult to see without a very clear and steady sky, and a telescope. We pass through the ring plane on 4 September, but the planet will be so low in the sky after sunset that viewing will be difficult. In addition, we have one of the last chances to see the shadow of Titan on Saturn after sunset on 2 and 18 July. It will appear as a very tiny black dot moving across the planet from before sunset until about 11pm PDT. This only happens when Earth is passing through the plane of Saturn's rings. This last happened in 1995.



NGC 6543, the Cat's Eye Nebula, imaged with the MIRA 36-inch telescope

Uranus comes to opposition on 17 September in Aquarius at magnitude 5.7, allowing it to be seen with the naked eye under very dark sky conditions.

Neptune comes to opposition on 17 August in Capricornus at 8th magnitude. It passes within 0.6 degree from Jupiter on 9 July and is located near Jupiter during early July.

Pluto (our dwarf planet) was in opposition on 23 June (only 3 days later than last year) but is only at 14th magnitude in crowded Sagittarius. You will need a large telescope, a good chart, and patience!

Meteor Showers

The Southern Delta-Aquarids come to maximum 28-30 July with little interference from the first quarter moon. The radiant is up and visible most of the night, although early morning is best. Usually about 15-20 per hour are seen, and about 10% leave persistent trains in their wake.

Although the major Northern Hemisphere Perseids of 12-13 August are badly affected by the last quarter moon near their best this year, there is the possibility they may produce more than one maximum peak again, perhaps with somewhat increased rates around midnight on the evening above. There are always a few Perseids that appear during early to mid-August so be aware when outside observing.

Comets

There are only a few comets visible during the period brighter than 9th magnitude:

Comet C/2008 Q3 (Garradd) fades slightly from 7th magnitude through the period as it moves north through Virgo.

Comet C/2006 W3 (Christensen) remains about 8th magnitude through the period as it moves from Cygnus into Aquila.

Eclipses

The longest total solar eclipse of the 21st century will occur in the Asia on 22 July. MIRA is planning a trip to China to see this eclipse, with optional extension to Tibet. There are still spots available for this dream trip, so please contact Tami at MIRA at 883-1000 for more details.

Friends of MIRA Membership

I would like to become a Friend of MIRA and receive the quarterly MIRA Newsletter.
Enclosed is my membership donation of $_____
In addition, I am making a special contribution of _____

$2500 Associates Circle	$100 Sponsor
$1000 Associate	$50 Family
$500 Patron	$35 Member
$250 Sustaining	$15 Student

MIRA *welcomes corporate and business members. Contributions are tax deductible as allowed by law.*

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Welcome to our new Friends

David and Susan Courrejou

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Thanks!

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