Mount Diablo Astronomical Society

Diablo MoonWatch

January 2012

General Meeting

Tuesday January 24, 2012

Einstein and the Far Future of Interstellar Travel

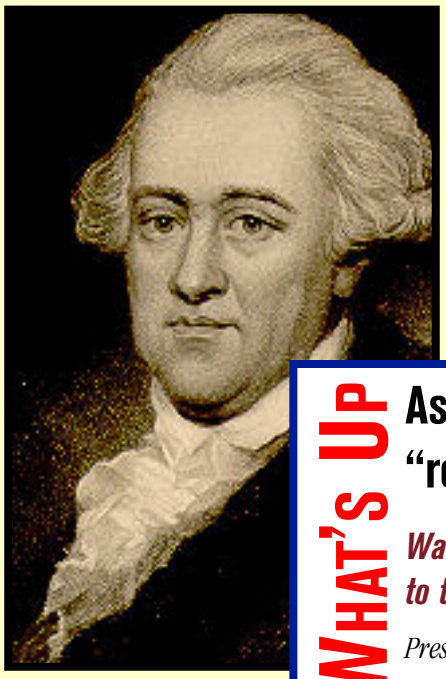
Dr. Andisheh Mahdavi, SFSU

Doors open at 6:45 p.m.
Concord Police Association Facility
5060 Avila Road, Concord

Einstein's two theories of relativity have dramatic consequences for the far future of human spaceflight.

The most famous predictions come from his special theory of relativity: that it is difficult even to approach the speed of light, impossible to exceed it, and the closer we are to the speed of light, the less we age. But the story goes deeper: Einstein's general theory of relativity allows for "warp drive" spacetimes that resemble the stuff of science fiction.

Unfortunately, Einsteinian warp drives require an exotic form ofmatter which most physicists believe cannot exist, and this keeps them firmly in the realm of science fiction for now. However, using Einstein's equations, we are able to calculate the structure of such warp drives and get a physically correct idea of what they might look like if exotic matter states were to exist. The construction of such devices would require the capability to engineer several Suns' worth of material.



William Herschell, Astronomer to the King

Please come Tuesday January 24 to listen Dr. Mahdavi's explaining his research involving dark matter, clusters of galaxies, X-ray astronomy and dynamics.

He is an assistant Professor of Physics and Astronomy at San Francisco State University with a Ph.D. in Astronomy and Astrophysics from Harvard University and a B.A. Magna cum laude in Astronomy and Astrophysics also from Harvard University.

What's Up

Astronomy and Music "real music that is."

Was astronomy a source of inspiration to the greatest musicians?

Presented by Vianney

President's Corner

Astronomy With a Laser Gun

by Chris Ford

Happy New Year to all MDAS members!

I am going to kick off my first Presidents corner of 2012 with a review of the single most useful astronomical accessory that I purchased last year. The device in question is not even intended for astronomy but I was amazed at how useful it has been. I would particularly like to acknowledge Jim Head for pointing out this little gem that cost all of (wait for it) $12. So what is this astronomical wonder?

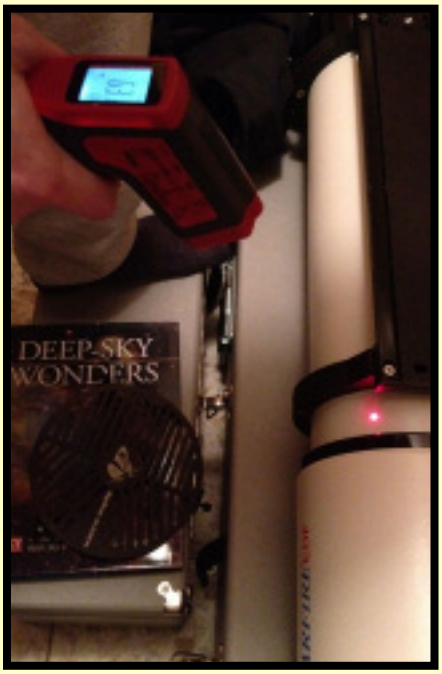
It is nothing less than a simple laser guided infrared thermometer.

Of course amateur astronomy and lasers are old friends when it comes to pointing at objects in the sky, but the use of laser thermometers to record the temperature of your telescope, camera, associated instruments, your surroundings, even yourself, is much under-appreciated in my point of view. These devices make it extremely easy to measure the dynamically changing temperature environment around your telescope.

Laser thermometers come in various price ranges from the hundreds of dollars to cheap imported models costing $20 or less.

The ridiculously cheap model I purchased from Amazon did not lack anything in terms of its basic temperature functions and has proved more than adequate for astronomical purposes. The readout display is large and can be configured for either C or F and it all runs off a 9V battery. Depending on the distance from the object you are pointing at, the temperature gun projects a cone field that averages the temperatures of either small or large areas. This ability provides you with a more comprehensive thermal picture than the limited spot measurements obtained from fixed thermometers and temperature probes.

The accuracy of infrared temperature sensors is dependent on the "emissivity" of the materials being measured. In general they prove least effective on surfaces that have very low emissivity or that reflect light such as a mirrors and some types of glass. For these materials there is some scope for error because you risk reading the temperature of objects that are being reflected, but on everything else laser thermometers provide instant spot readings ranging from -26F to 716 F! You just select your distance, point, and read off the temperature.



Measuring my telescope temperature indoors at 63F.

So why is this useful or important?

If you are an astrophotographer understanding the temperature of your telescope is critical to achieving a constant focus. Recently we have been experiencing sunny winter days but fairly cold nights, so I decided to experiment by tracking the temperature variations on different parts of my

Astronomy With a Laser Gun *(Continued from the previous page)*

Maksutov-Cassegrain that has been outdoors for the entire holiday period and in principle in equilibrium with the ambient temperature. As the temperature dropped in the late afternoon from around 60F it was fascinating to record instant temperature readings from different parts of the telescope and note the rate of change. The tube dropped very quickly, the mirror section took longer, and the focuser longest of all. While doing this I imaged some stars using a Bahtinov mask to correlate slight changes in focus with the temperatures that I was recording and was able to derive a relationship of temperature to focus that applied to that specific telescope. Eventually the temperature stabilized 8.00 pm at a chilly 33 F and focus from then on remained constant throughout the night. Assessing the impact of telescope temperature on focus is something I have always assessed by gut instinct, but to be able to measure it empirically and accurately made a big difference.

Anyone with a larger mirror, (typically in a a Dobsonian) knows that it needs significant time to reach thermal equilibrium with its surroundings. Aiming a laser thermometer at different parts of the mirror edge and back (not the reflective surface) enables you to track your mirrors temperature stabilization across different parts of its mass. You can also measure the temperature of other parts of the telescopes structure, and you can build up a picture of the thermal environment inside the shroud by pointing at the truss poles. There are many options.

There is more!

You can use a laser thermometer to measure the average temperature of the ground on which you have located your telescope. For example, if it is too hot you may want to remove the telescopes cover so that you do not trap heat with a detrimental effect on seeing later. You can also measure the temperature of nearby objects that might be radiating in your direction, and it is often quite surprising how hot or cold they are. You can even measure the heat that you yourself are emitting.

Ultimately, it is the "point and read" nature of a laser thermometer makes it easy to quickly assemble a comprehensive picture of the thermal environment in and around your telescope and to track its changes over time. And lets face it, pointing lasers at anything delivers a certain amount of instant gratification. Go no further than Amazon to acquire one of these extremely useful devices.

http://amzn.to/xpARzd

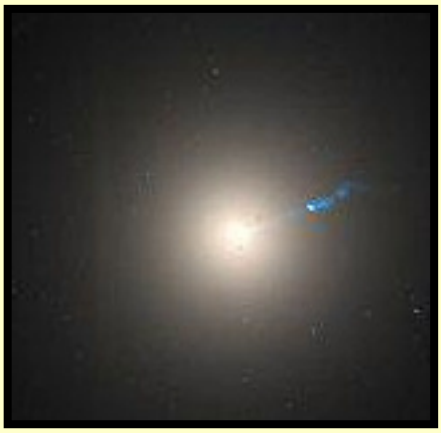
Alternatively you can Google "temperature gun infrared thermometer laser sight" and you will find many choices. Though the price has gone up a small amount since I acquired mine for a ridiculously cheap $12, at the price of a takeout pizza acquiring one of these devices is almost a no-brainer and I recommend it!

Clear skies for 2012!

Chris Ford

M87

by Nathaniel Bates



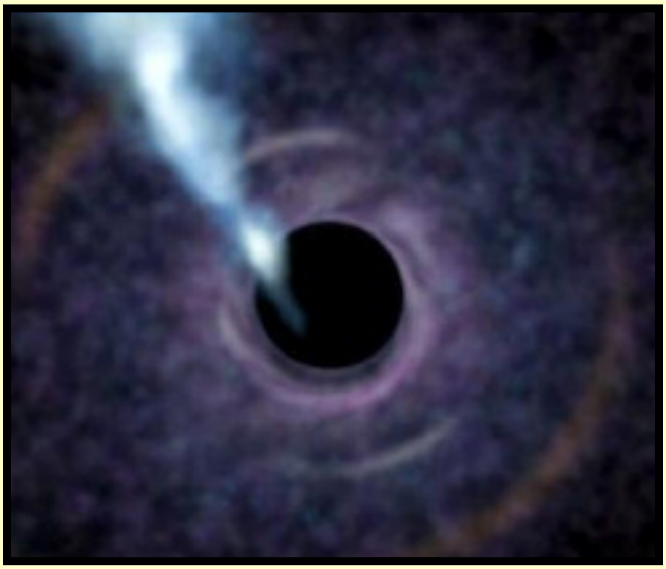
The giant elliptical galaxy Messier 87

I remember it well, across a chasm of time both long and familiar.

I was a teenager reading my Astronomy Magazine when I saw the funnel that extended whole star systems. There was a picture of a white funnel extending five thousand light years out in to intergalactic space, a cone of light that contrasted heavily against the blackness of space. I could not take my eyes off of it. The very existence of this galaxy with a funnel coming out of it suggested that the universe was a mysterious place, one that defied the limits of normality while at the same time a place honoring the austere laws of science and reason. There had to be an explanation, we all knew. The faith of the scientist is that the universe can be explained by knowable laws. That faith may be borne out, or it may remain ever unprovable, but it is the faith of a scientist. To a teenage boy, a dim memory of myself today, it was a hope that took me through the darkest hours as well as times of triumph. The brilliant funnel extending light years out could only affirm and not deny that the universe was a place both knowable and beautiful.

M87 was still a mystery at that time.

It was first discovered by Charles Messier, although he did not notice the funnel. In fact, he did not even notice it as a "galaxy" since such a concept did not as yet exist. Galaxies were classified as nebulosities at that point, as were all fuzzy objects. It was not much later that galaxies became classified as "island universes" while stellar nurseries and the remnants of supernovae were still titled as "nebulae." In the twentieth century, Edwin Hubble re-classified M87 as a Globular Cluster, which was easy to do given its lack of spiral arms. It was not until 1956 that M87 was classified as a supergiant elliptical galaxy, an easy fit once it was realized that some galaxies might resemble globular clusters. Yet, this was no ordinary galaxy. In 1918, Astronomer Heber Curtis noticed a light jet extending from M87. By the fifties, a powerful radio source had been discovered with its origins in the same region. Soon, the radio source was confirmed to be connected with the optical jet. The newly discovered funnel hurdles material out of the galaxy in a phenomenon known as a "relativistic jet." (More on that later) The jet can be seen from our galaxy, light years away, so it must certainly be huge. In fact, it extends five thousand light years out, an awesome sight to any civilization closer to it than we are. The question of what formed this jet was soon on the minds of Astronomers throughout the world.



Artust rendition of a Black Hole

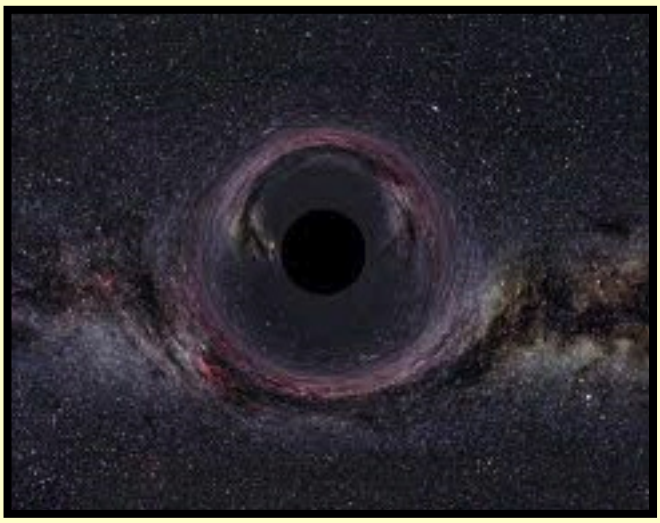
We learned a great deal about M87 on the quest to solve its mystery.

Scientists were able to determine its distance of 53,500,000 light years away near the center of the Virgo Cluster through a variety of methods, including the standard use of Cepheid variables. This places M87 near the core of the much larger Virgo Supercluster in which our own galaxy is relegated to the periph-

M 87 *(Continued from the previous page)*

ery, a fact that enhances to mysterious nature of M87 all that much more if you ponder it. Knowing the distance, scientists can calculate the length of the funnel and see that only a tremendous energy source could create it. As an interesting aside, the galaxy has also been determined to be relatively free of heavy elements. Its stellar population is primarily comprised of Population II stars that did not have a chance to produce heavy elements. This might mean that the galaxy is relatively free of life, perhaps completely free of intelligent life. If so, then the mystery of M87 would not be known by anyone in M87 itself. There would be no planet filled with intelligent life to try to interpret this funnel as a great cosmic mystery to be interpreted through their myths or legends as a portal for heavenly beings to reach them or guide them. Given this probability, it is even more incumbent upon us that we solve this mystery. Something this beautiful might well have a meaning to itself that intends some form of rational understanding, even if by beings in a distant spiral galaxy 53.5 million light years away on the third planet around a humble star, admiring from afar a phenomenon that would over-awe us if we were closer.

For those of you who love mystery, I must disappoint you. For those who love rational order, I will tell you the rational order, but first I hope that you have at least appreciated the mystery for a while. The explanation for the funnel of M87 has apparently been found, at least to the satisfaction of most scientists. From what the experts surmise, the funnel of M87 is formed by a rotating black hole. It is termed a "relativistic jet," a funnel of plasma being emitted as material attracted to a black hole is flung out in to space before it can reach the event horizon of the black hole. Let me explain it with an analysis of types of black holes. There are static, rotating and charged black holes. We will be discussing the second type for now. Suffice to say, rotating black holes gravitationally attract matter and cause it to spin around very fast. As this happens, a funneling process begins that shoots out ionized plasma into deep space. The disk around a spinning black hole has magnetic properties that, when they interact with plasma, will create a funnel effect. Among known phenomena, only a black hole could have powered a funnel like the jet of M87.



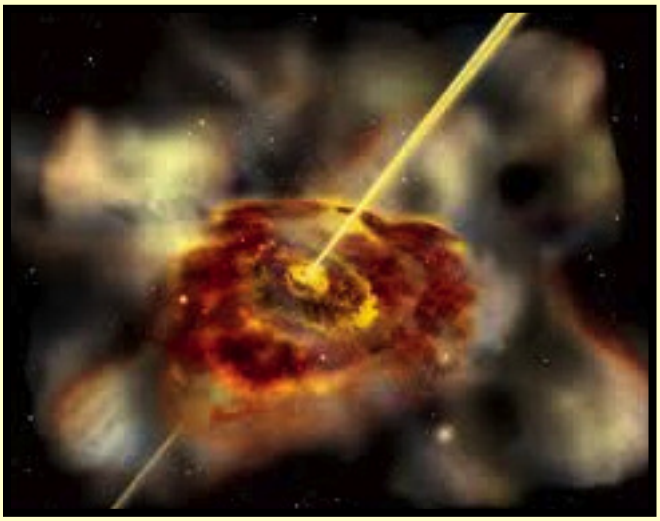
Artust rendition of a Black Hole

As of the time I read the Astronomy magazine, it was believed that the overwhelming majority of galaxies have black holes in their centers.

The mystery of black holes at the center of galaxies is one that has excited the scientific imagination. In the case of M87, there is a confluence of properties of the galaxy that allows for a massive super jet. But, this may not be so unusual. It is now believed that quasars can be explained in a manner similar to M87. If a similar black hole existed in the early universe, one that rotated and had magnetic properties, then it would funnel light in a way similar to M87. Those pointing to us would appear as super-luminous quasars. Quasars are about one hundred times the luminosity of our own galaxy, and can rightfully be called "cosmic candles."

Please indulge me a little more, now that the mystery is solved. I referred to the jet as a "relativistic jet" and promised more information. Those of you who remember that various talks on the theory of relativity know that acceleration to near the speed of light will bend space-time itself. A rotating black hole will create what is known as "frame dragging," distorting the fabric of space-time itself. Any jet coming from the material near the event horizon of that black hole will also experience relativis-

M 87 *(Continued from the previous page)*



Artust rendition of a Quasar

tic effects, particularly if the material is accelerated to high speeds. This means that the jet will have all measure of unusual properties. For one thing, it appears from our standpoint that the jet's motion is faster than light. Now, this is not possible according to Einstein's Relativity. However, such an apparent effect would be the result of Relativity itself, the bending of space and time. Such is called "superluminal motion" in relativistic physics, an optical illusion caused by the fact that the material fromthe jet is traveling near the speed of light at a slight angle from the observer. This effect has been noticed among quasars as well. For those of you who still love the mystery of M87, and who are upset with me for revealing it, there is still a mystery in the fact that M87 experiences superluminal motion while it is at an angle wider than it theoretically should be to experience that motion. Indeed, M87 is not at fairly wide angle to us, and yet we apparently notice superluminal motion. Scientists still debate how superluminal motion entirely fits the picture.

Years ago, I cut the picture of M87 out of my Magazine and put it on the wall.

I have lost that picture since. It was not actually a real picture of M87. Rather, it was an artist's doing. Perhaps it is not a big loss. I think that the mystery solved is more gain than loss. Yet, the mystery led to other mysteries, so we have gained yet more mysteries. I do not know if the universe is ultimately knowable or not. That is the faith of a scientist. It is one that might be forever unprovable. I do know that the universe is beautiful. On a cold night starring at the Virgo Cluster and imagining a great funnel, that is enough for me.

It's Membership Renewal Time!

Renew your MDAS membership and your magazines online!

ANNUAL MEMBERSHIP DUES OF $25 ARE DUE BY APRIL 1, 2012 for members on the April membership cycle. That's almost everyone. Some of our members renew in October, but they will be notified separately.

To renew your club membership, you may either:

• Renew online using Paypal or your credit card at: http://mdas.net/mdas_store.html, select Membership Renewal. On the same web page, please consider making an additional MDAS Donation of $10 or $15 to further support our club. Even $5 helps.

• Or if you do not have internet access or prefer not to make online payments, you may mail a check for $25 (or more!) made payable to the M.D.A.S. to this address:

Mount Diablo Astronomical Society
P.O. Box 4889
Walnut Creek, CA 94596
MAGAZINE SUBSCRIPTION RENEWALS

All Sky & Telescope and Astronomy magazine subscriptions renewals are handled online – AT THE CLUB DISCOUNT RATE!

The Astronomical Society of the Pacific has made arrangements with these magazines to allow members of the NASA Night Sky Network to renew at the club discount rate. All you need is a login for the Night Sky Network (NSN) through our club.

You can log into Night Sky Network and go to the Links page to find the "New and Renewal Subscriptions" link. Here's the direct link: http://www.astrosociety.org/magazine/

If you don't have access to a computer, please renew by mail directly with the magazine using your renewal notification.

Any questions, please email memberinfo@mdas.net or call Marni Berendsen at 925-930-7431.

Time to Order Your MDAS Jacket!

Time to place your order for the new royal blue, embroidered and personalized MDAS jacket. We are planning to place the order by February 6th, so reserve yours now: http://www.mdas.net/mdas_store.html#MDAS_Jacket

If we place our order in early February, the jackets will be ready by our February 28th meeting. You may also reserve your personalized jacket by sending an email to memberinfo@mdas.net or call Marni Berendsen at 925-930-7431.

Be sure to tell us the size you want (M, L, XL, XXL) and the first name you want embroidered on the jacket.

You can bring a check for $55 made payable M.D.A.S. to the January meeting or send the check to this address:

Mount Diablo Astronomical Society
P.O. Box 4889
Walnut Creek, CA 94596

Mount Diablo Astronomical Society Event Calendar–January 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
New Year's Day 1	2	3	4	5	6	7 Sunset: 5:05 PM
8	Board Meeting (Private) 9	MDAS Imaging SIG (Private) 10	11	12	Project Astro JNH (Private) 13	Observatory Maintenance (Private) 14 10:00 AM Docent Training Session Sunset: 5:12 PM
15	Martin Luther King, Jr. Day 16	17	18	Telecon: Venus Transit (Private) 19	20	Society Observing (Private) 21 Sunset: 5:19 PM
22	23	7:15 PM Gen Mtg: Warp Drives 24	Golden View Astronomy Nig (Private) 25	Pleasant Hill Science (Private) 26	27	Society Observing (Private) 28 Sunset: 5:27 PM
29	30	Riverside Elementary Star (Private) 31	1	2	3	4

For Sale: Meade LX200 (8") Astrophotography setup.

I have just purchased a new imaging telescope and mount, and will be selling my current Telescope, mount, and some accessories. Includes:

- *Meade LX 200 – 8" F10 Telescope and mount;*
- *Meade 1207 Electric Focuser;*
- *Meade balancing weight set;*
- *JMI hard carrying case for the LX200;*
- *Heavy-duty Milburn Wedge;*
- *LX90 OTA and Guide Star Mount; Meade*
- *Dew shield for the LX200; LX90 Dew Shield.*
- *Mount has blinking red-lights on the legs*
- *25mm Meade Series 4000 Super Plossel eyepiece and 90-degree Diagonal eyepiece holder*
- *LX90 OTA has Meade Flip-Mirror for ease in finding guide stars*

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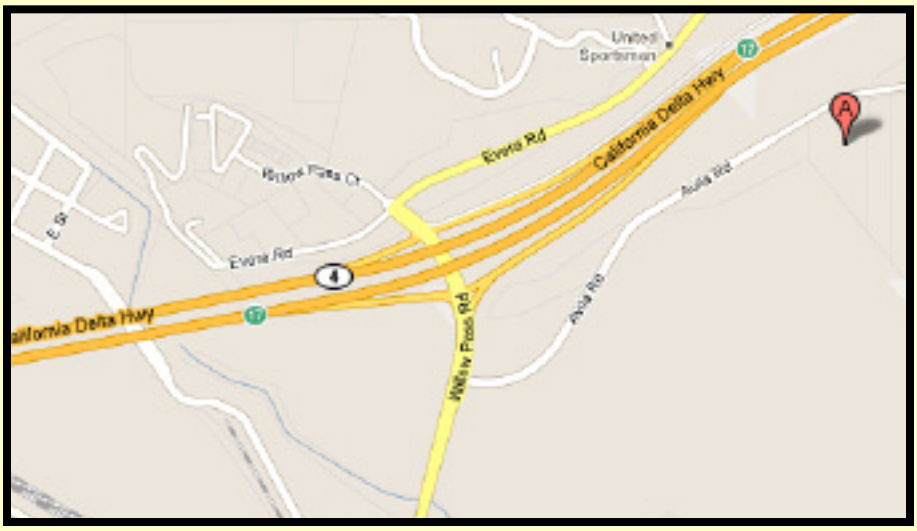
Mailing address:
MDAS
P.O. Box 4889
Walnut Creek, CA 94596-
General Meetings:
Fourth Tuesday every month,
except on the third Tuesday
Refreshments and conversations
Meetings begin at 7:15pm.
Where:
Concord Police Association
5060 Avila Road, top of the
Take Avila Road from Willow
Directions to facility:



Your Help Would Be Greatly Appreciated

Our association needs a few members to come at 6:30 p.m. before our monthly meeting which starts at 7:15 p.m. to help in seting up the chairs and other elements needed to conduct the general meeting.

Similarly at the end of each meeting the chairs and tables have to be removed, the room has to be cleaned and the garbage emptied.

Thank you for your help.