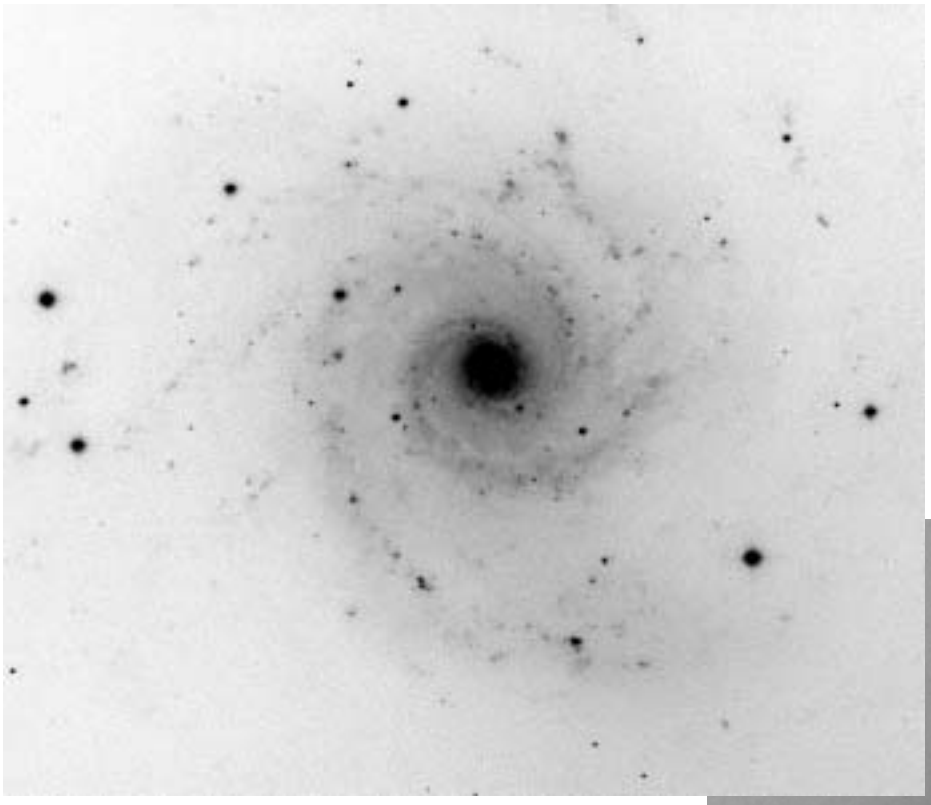
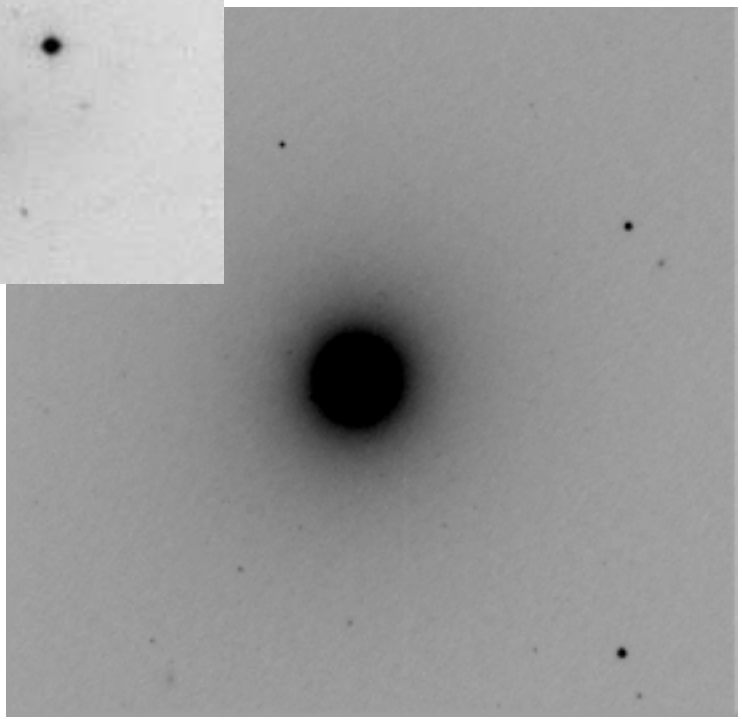
FALL 2007
VOLUME 30, NO. 3

MIRA NEWSLETTER





M74 in Pisces, upper left, is a spiral galaxy like our own Milky Way. M87, lower right, is a large elliptical galaxy in Virgo. In his regular column, Dr. Whitney Shane discusses the differences between the two types. Both images were made with the MIRA 36-inch telescope.

Living in an Elliptical Galaxy?

(See "The Fall Sky," p.6)

Contents

Calendar of Events

Saturday, 27 October, 7:30pm Free public lecture by Dr. Chung-Pei Ma of UC Berkeley on "Dark Matter: The Other Universe." Monterey Peninsula College, Lecture Forum 102.

AT&T Pebble Beach Charities Contributions Total $100,000

Last summer the AT&T Pebble Beach Charities kicked off the MIRA fundraising for the badly needed buildout of the proposed second and third floors of the Richard W. Hamming Astronomy Center with the first of two $50,000 grants. The second grant was contingent on good progress being made in the funding effort.

Good progress has been made and their second year grant was received this month.

The anticipation of reasonable working spaces for our students, volunteers, and staff as well as a consolidated library is now palpable. We thank Laurel Lee-Alexander, Director of Grant Programs, and the Board of AT&T Pebble Beach Charities.

TABASGO Challenge Grant Nearly Complete

Excitement is mounting in the Hamming Astronomy Center (pictured below) as MIRA closes in on the goal set by the TABASGO Foundation $50,000 challenge grant (*MIRA Newsletter*, Summer, 2007, page 5). Only $5,000 in contributions remains to be found.

Put another way, for MIRA donors seeking the greatest impact for their contribution, the moment is at hand: every dollar you can give will be matched by TABASGO, and soon MIRA will be $100,000 closer to its goal of building out the high bay in the Astronomy Center with classrooms, workspaces for astronomers, docents, interns, and students, and an expanded and more usable library.

When the TABASGO grant is completed, MIRA will have on hand 80% of the $500,000 needed for this construction project.

MIRA's Hamming Astronomy Center

Q&A

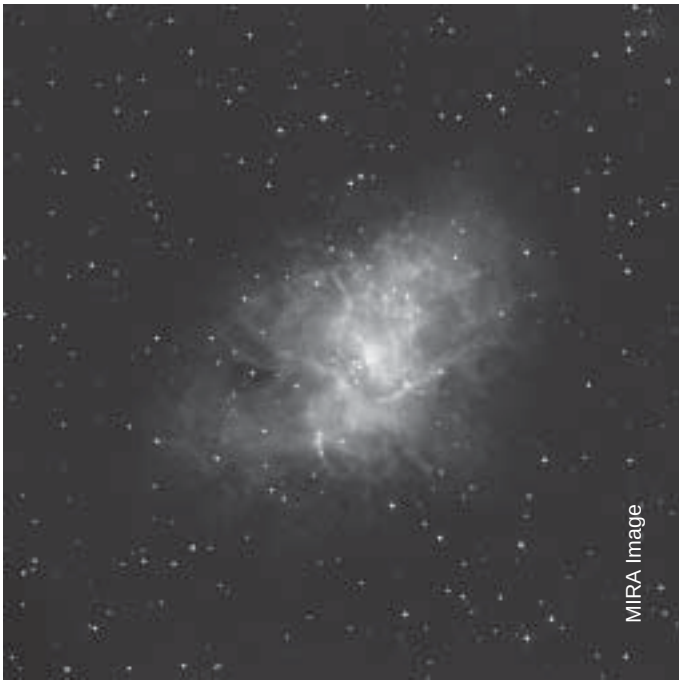
This feature is inspired by the questions we have received over the years from interested readers. If you have a question about an astronomical topic, please send it to us.

In this issue, we are pleased to present two questions:

Question asked at the MIRA Perseids Event: If all the visible stars in the sky were combined into one star, how bright would it be?

Dr. Bruce Weaver replies,

Interesting question and a bit of a challenge to do off the top of one's head. The Bright Star Catalog is the standard listing of the stars bright enough to be seen with the unaided eye and it lists about 9,100 stars. Most of those stars will be pretty faint, so we guess that about 100 are among the brightest. If we had 100 stars of 0 magnitude, they would add up to -5th (there are five magnitudes of difference in a linear difference of 100). There are only about ten stars, like Vega, that are as bright as 0 magnitude but there are about 100 that are at least 20% as bright as Vega and a couple, like Sirius, that are brighter. All the rest have to add some more, so let's guess a couple more magnitudes so the final guess was -7th magnitude.



The Crab Nebula (M1)

Now there is the issue that there are more bright stars in the southern hemisphere than in the north but the shadowy questioner beneath the quietly tracking 36-inch telescope had not specified where the observer was (all the stars can be seen if you're standing on the equator). Besides, the question was hard enough while one is keeping one's eyes peeled for streaking meteors.

Last week I ran across the answer while looking something else up in *Astrophysical Quantities* by C.W. Allen. The visible starlight from the whole sky is equivalent to 460 zero magnitude stars. That is equivalent to one star of -6.6 magnitudes. I was pretty happy that my estimate was that close!

So, just how bright would a star of -6.6 magnitude be? Venus, at its brightest, gets to about -4.6 magnitude, which means that our super star, would be 2 magnitudes brighter or about 6.6 times brighter than Venus at its brightest. With care, Venus at its brightest can be seen in the daylight sky and, at night, will cast faint shadows. So our super star would be easily visible in daylight and would cast definite shadows at night.

The supernova of 1054, the remnants of which now make up the Crab Nebula, was observed by the Chinese in daylight so it was probably about 2 to 3 magnitudes brighter than Venus or pretty much the brightness of our hypothetical super star. Now that would have been a sight to see!

Matt asked, via the internet,

I'm getting married in Monterey on 15 September, 2007.

What time is sunset? What phase is the moon on that date?

I did some research, and cannot find a reliable source of info. It's kinda important for a couple of champagne toasts we are planning.

Thank you in advance for your time and consideration.

Dr. Bruce Weaver replies,

Sounds romantic. You'll find the information you're looking for at www.mira.org under 'The night sky' - 'the sun and moon'. Note that the times are PST so you'll have to add an hour for PDT. Hint: the moon should be perfect if you have a good view of the west (but I can't vouch for the weather!).

Readers whose matrimonial plans involve the sun and the moon are invited to follow Dr. Weaver's instructions. Please note, however, that we are not in a position to give advice on one's choice of spouse or other life decisions! --Ed.

Perseid Meteor Shower Star Party at the Oliver Observing Station

by Arthur Babcock

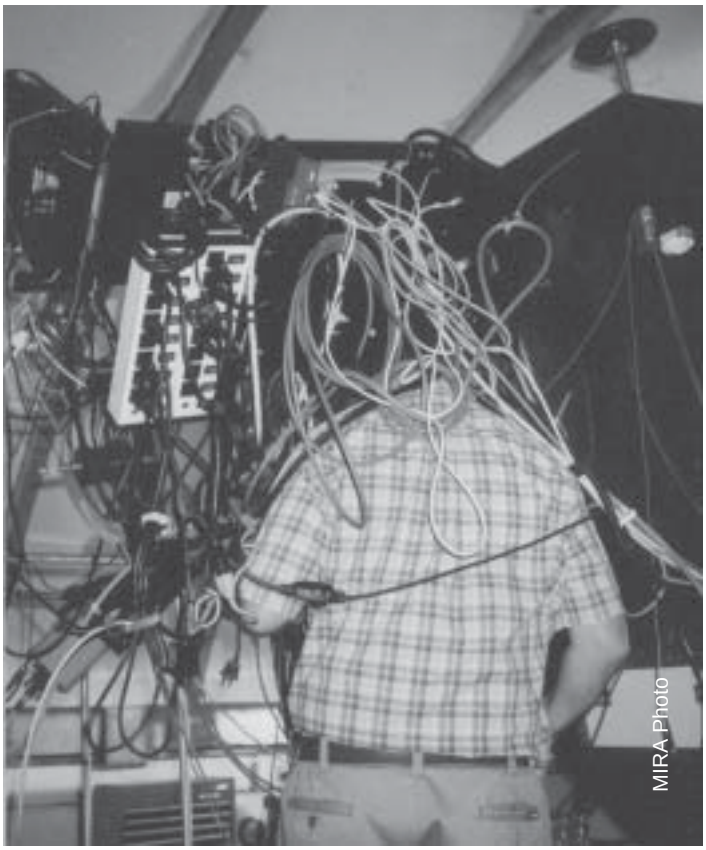
Over 70 Friends of MIRA journeyed to Chews Ridge on 12 August to take advantage of a rare confluence of near-perfect conditions for observing the Perseid meteor shower: the peak was predicted to occur in the evening of a new-moon night, and this night fell on a weekend (albeit a Sunday), convenient for folks who work Monday-Friday. Add to those factors the exceptional dark skies of Chews Ridge, a warm August night, and the reputation of the Perseids as one of the best annual showers, and it just doesn't get much better than that.

Rob Hawley, President of the San Jose Astronomical Association and Mrs. Hawley set up their 10-inch Dobsonian telescope on Chews Ridge.

Attendees made themselves comfortable on the east side of the observatory (facing the radiant), shared food, and took in the show. One meteor watcher who was keeping score saw 55 Perseids.

The meteor shower was backed up by telescope viewing through the MIRA 36-inch telescope, which was aimed at Jupiter, the Ring Nebula (M57), the globular cluster M5, and the Cat's Eye Nebula (NGC 6543), and through a collection of smaller instruments brought by guests. The impressive array of instrumentation (see photo below) acquired by MIRA in recent years makes access to the eyepiece difficult in parts of the sky; MIRA astronomers plan to reposition some equipment to improve matters.

Your correspondent, charged as he was during much of the evening with running the 36-inch telescope, failed to see very many meteors, but spotted a couple of nice fireballs through the windshield of his car on the way home.



In this picture, it seems that Dr. Arthur Babcock has become trapped in the cabling of the MIRA telescope. In fact, he is only checking the position of the GAP slide. No wonder he didn't see very many meteors.

MIRA volunteer Jim Neeland and friends look forward to a night of observing meteors.

Dr. Bruce Weaver addresses the crowd on safety and other issues before it was dark enough to look for meteors. "Did you see THAT one?", he advised, is not the most helpful remark when one is gathered with others for a meteor shower.

Improving Your *Newsletter*

We're always glad to hear from our readers with suggestions for the *MIRA Newsletter*. We try to present diverse topics at a variety of technical and popular levels in each *Newsletter*. Unfortunately, we don't receive many comments and we always fret a bit as to whether this is because most are happy with our efforts or that folks have not gotten around to letting us know about their great ideas or, even, criticisms.

As a result of this small volume of comments, a couple of e-mails can have a big impact on our thinking about what would be good addition or deletion. So, here are some ideas and suggestions that have come up recently. What do you think? Let us know at mira@mira.org.

Fewer technical articles.

More technical articles.

A feature on What's New in Astronomy. Perhaps with commentary from MIRA astronomers?

Let us know what you'd like to see more of or less of in *your Newsletter*.

--Ed.

Friends Close Gap in TABASGO Challenge Grant

MIRA has received several notable donations toward meeting the $50,000 TABASGO challenge grant recently.

The Kenneth L. Hess Family Charitable Foundation has contributed $10,000.

The Kenneth and Gabrielle Adelman Fund has contributed $2,000.

Yellow Brick Road has contributed $1,000.

All three are long term supporters of MIRA, and we thank them for their generosity.. MIRA depends heavily on its Friends, and is most appreciative of their long-term support..We are now within $5,000 of meeting the challenge goal. We hope you can help as well.

The Fall Sky

by Dr. Whitney Shane, MIRA's Charles Hitchcock Adams Fellow

Fixed Stars

With the Milky Way in full view, we might ask ourselves what the sky would look like if we were living in an elliptical rather than a spiral galaxy. It takes little imagination to realize that, in most respects, the view would be less spectacular. Some of the familiar kinds of objects such as globular clusters and planetary nebulae would still be plentiful, but the great gaseous nebulae and open star clusters would be scarce or altogether absent, as would be almost all dark nebulae and the regions of star formation which still seem to attract the attention of some astronomers. In fact, the whole Milky Way would be gone and we would see a smooth haze of stars with a concentration in the direction of the center. Except for the very occasional supernova, the excitement, if any, would be limited to this center, and it would depend upon the presence of an accreting black hole of the kind that seems to inhabit the center of many an elliptical galaxy. Such a black hole, or rather its immediate surroundings, will often be the source of one or two very well defined beams of high energy particles which pass right through the galaxy without producing much visible light. As these beams encounter the surrounding intergalactic material they are slowed down and dispersed, producing large amounts of radio radiation but again not much in the optical domain. We would, however, be well advised to keep out of these beams, because life in such a region of high energy particles would be short and unpleasant.

The diffuse matter, gas and dust, which seldom account for more than a few percent of the mass of any galaxy, make all the difference in determining if a galaxy is a spiral or an elliptical. In a galaxy without diffuse matter there will be no star formation as there is nothing from which to make stars. The brightest stars will then be the red giants, which are old. If there is enough diffuse matter, new stars will form, and the most massive of these will quickly become short-lived bright blue stars, and these will be the brightest stars in the galaxy. This difference was the key to Walter Baade's discovery of the distinction between populations I and II. If there were no diffuse matter then there would, of course, be no diffuse nebulae, and even if there were they would not be very spectacular because there would be no hot young stars to ionize them. (Completeness dictates that we note here that some elliptical galaxies do show patches of absorption. This may be due to the recent accretion of small dusty companion galaxies). Similarly, without star formation there will be no open clusters. These are necessarily young objects because, with a very few exceptions, they do not contain enough mass to bind their members by gravity, so that they will eventually evaporate and be lost in the general field of stars.

But the diffuse matter has another very important function in determining the form of a galaxy. We still have no very clear picture of how galaxies form, but it seems quite likely that accretion of surrounding small galaxies onto a growing nucleus is part of the process. The stars accreted in this way will have high velocities in all different directions, so that the galaxy will be puffed up and look like an elliptical. If there is little diffuse matter present, what there is will be expelled from the growing galaxy by radiation pressure or swept out by passage through the hot intergalactic medium. The diffuse matter expelled from the stars during their ageing process will suffer the same fate, so that the galaxy will retain more or less its original form. If, however, there is a substantial amount of diffuse matter initially present, it will collapse, through cloud collisions, into a rotating disk which can resist the above processes. Bright new stars will form in this disk. The old stars, in what we now call the halo, will gradually lose material in the form of gas, and most of this will eventually also be absorbed in the disk. Thus the disk, with its orderly rotational motion, will eventually become the dominant feature of the galaxy. This is an ideal environment for the formation of gaseous nebulae, regions of star formation and finally open star clusters. It is also the environment required for the formation of spiral arms, which do not survive easily where the random velocities are large. The presence of spiral arms, in turn, causes the diffuse matter to be compressed, and this leads to enhanced formation of diffuse nebulae and stars. Thus the presence, or absence, of even a relatively small amount of matter in the form of gas and dust during the period of formation can be decisive in determining what kind of galaxy will result. It is probably not an accident that a habitable planet like the Earth is located in a spiral rather than and elliptical galaxy, but we may still consider ourselves fortunate that as a result we have an abundance of exciting objects to study in our immediate neighborhood.

Planets

Mercury will be visible, with great difficulty for northern observers, in the southwestern evening twilight during

early October. It will reappear in early November as a morning object and be well placed for northern observers.

Venus will be prominent in the morning sky until the end of the year. On November 5 it will be three degrees north of the moon, making it easy to find during daylight.

Mars spends practically the whole fall quarter in Gemini, where it is stationary on November 15. It reaches opposition on December 24 but is closest to the Earth on December 19. This is a favorable opposition because of the far northern declination. Mars will be occulted by the full moon on the evening of December 23, but this occultation will be visible only from the northwest corner of the U.S., from western Canada and from some arctic regions.

Jupiter, which is still in Ophiuchus, will remain visible in the southwestern evening sky until early December. It is in conjunction with the sun on December 22.

Saturn remains a morning object, but before the end of the year it will rise well before midnight. It will be stationary in Leo on December 20. The last of the current series of lunar occultations occurs on October 7, but it is visible only from the south Pacific Ocean.

The monthly occultations of Neptune continue, but they are observable only from the southern hemisphere.

Meteor Showers

Meteor showers seem to favor the last three months of the year, so there are several worth mentioning. October begins with the rather unpredictable Draconids. The most recent outburst occurred in 2005, coinciding with the perihelion of the parent comet, 21P/Giacobini-Zinner. Other more intense outbursts have been observed, but more often nothing is seen. This year the predicted maximum is on the evening of October 8. The radiant is far north so that observations are possible during the whole night, and the moon is close to new.

The Orionids, which are almost indistinguishable from the much weaker epsilon Geminids, are expected to peak on October 21 with the possibility of secondary peaks at other times. The moon is past first quarter, but it will not be much bother as the best time for observation is after midnight.

The northern and southern Taurids, which might be observed at any time during the first two weeks of November, are not expected to be numerous this year, but spectacular fireballs are relatively frequent in this stream. It is part of a complex associated with comet 2P/Encke. The moon will be favorable except near the beginning of the month.

The Leonids, which were so spectacular a few years ago, are not expected to produce much excitement this year. They should peak on November 17 when the moon is approaching full. The morning hours are best suited for observation.

By far the most promising shower of this fall season will be the Geminids, which peak on December 14. Unfortunately for us, the maximum will fall during daylight hours in our region, the best views being expected from Asia. Observations are possible during the whole night, and the moon, which is less than a week old, should be no problem.

The Ursids, which peak on December 21 or 22 (depending upon who you like to believe) fall very close to full moon and are thus not suitable for observing this year.

Comets

Three fairly bright comets are expected during the fall. The first of these, C/2007 F1 (LONEOS), can be seen with great difficulty during the first few days of October as it moves into Coma. It is visible in the evening sky, but the morning is a little more favorable. The magnitude may be about 7. After the middle of October it will no longer be visible from the northern hemisphere.

The periodic comet 8P/Tuttle will spend the whole fall describing a small loop in Cepheus, and thus be well placed for observation. It is expected to brighten from magnitude 12 to 6 during that period, reaching its maximum brightness at the end of the year.

Another periodic comet, 46P/Wirtanen, will also be describing a small loop, this one in Aquarius where it will be well observable in the evening hours. Initially it will be very faint, about magnitude 16, but it is expected to brighten rapidly and reach magnitude 10 by the end of the year, continuing to brighten for a couple of months thereafter.

There are also several fainter comets, all around magnitude 13, which will be visible during the fall. Comet C/2006 Q1 (McNaught) will be describing a small loop (this is currently quite the fashion) in Vela and, being so far south, is very low in the southern evening sky. Comet C/2006 S5 (Hill) is currently very faint, but toward the end of the year it will brighten to magnitude 14 and be well placed for observation in Cancer. Periodic comet 93P/Lovas 1 is almost stationary in Andromeda and thus very well placed for observation. At magnitude 14 it is close to its maximum expected brightness. Periodic comet 29P/Schwassmann-Wachmann 1, also about magnitude 14, will be moving into Auriga and be well observable during most of the night.

Eclipses

There will be no more eclipses in 2007.

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.*

Name_____

Address_____

City, State, Zip_____

Phone/e-mail_____

Welcome to our new Friends

Christine Bava
Anne & Bruce Bloxom
Margaret Butterfield
Charlie Craddock
Ashley Dusenbury
Dennis Dyrud
Stephen Hayes
Christine P. Jacobson
Muriel Miller
Briar O'Bryant
Jeannie Petrinovich
Mary Ellen Scharffenburger
Reinhard Vehring
Katherine Wells

Thanks!

Staff

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The Monterey Institute for Research in Astronomy owns and operates the Oliver Observing Station under permit from the U.S. Dept. of Agriculture-Forest Service.

* * *

The Monterey Institute for Research in Astronomy owns and operates the Richard W. Hamming Astronomy Center and the Ralph Knox Shops through an arrangement with the U.S. Dept. of Education.

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Monterey Institute for Research in Astronomy
200 Eighth Street
Marina, CA 93933

(831) 883-1000
(fax) (831) 883-1031
www.mira.org

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