

# StarFinders

Astronomy Society



PEGASUS, THE WINGED HORSE

## October 2006

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# Stardust

Summer's officially over, but the sun still refuses to yield to the clouds and showers of fall. Hence, more observing time for us! Unfortunately only a few hand-picked members came out to the September dinner meeting - and they did enjoy great food and company. We hope to see more of you again in December. Here is tonight's agenda, just in case you've missed this event as well.

We need to discuss the format of the next Island Star Party, as the RASCals star party is tentatively blocked in for the month following the ISP. Should there be two star parties, back to back, with the same format? I suspect it will not only be difficult to get lecturers for two consecutive star parties, but also difficult to get support from door prize donors. Robert Deane has a short presentation and there are some short video materials from NASA.

This month, work, volunteering, and family got somewhat in the way of preparing this newsletter ... so you have to contend yourselves with dim punchline highlights a la Kuiper Belt objects. But instead of paying for some HST time you just have to enter [universetoday.com](http://universetoday.com) in your browser and you you'll be able to get the dirt on images, reviews, podcasts, and articles that I pre-viewed for you.

Anybody remember Sunday School and one of typical questions? If you don't, you might still recall that the typical answer was and is either 'God' or 'Jesus'. Well, the other day, I asked a grade eight class a few questions regarding roller coasters, Newton's apple, the planets, and the Moon. This time the standard answer was 'gravity'. But like God, gravity is not readily bottled or canned. While they agreed that the roller coaster, like their treasured HotWheels, required a track, they felt there was no need for heavenly spheres to let planets ride on. My hunch is that they have yet to go outside at night and experience the dome that covers them like a bit of smelly cheese. That's an actual experience, not just a word like 'gravity.' And if the apple is falling due to a gravitational force, why is the Moon not falling down? Even Newton in his happiest moment would have refused to just say 'gravity!' Apparently, the Moon does fall all the time in order to stay on that cloche (sometimes made out of pewter, to cover the cheese) we call the night sky. We can thank him also for the insight that the forces depend only on the masses involved and their respective distances. And good for him to postulate that the Earth instantaneously would perceive the change in the Moon's position - like dad, who keeps his eyes on the little one as they twirl like a merry-go-round. Newton probably figured it would keep the omnipotent Almighty busy over those eons of galactic expansion (but then he didn't know about that either). Anyway, it took until Einstein's happiest thought to modify Newton's theory. The gravitational field has only a relative existence - because for someone freely falling from an airplane there exists no gravitational field. Of course, those were the days without Twin Towers, elevator shafts, and airplanes. This guy sure had an imagination! Last but not least, one student felt the need to contribute the fact that Newton was gay. Goggle gives me over a million hits, so there must be something to it. However, if that's all the dirt someone can dig up on the man and miss the apple and the Moon we're still counseling homophobia instead of teaching science. Remember, we still have to drop Euclid's geometry for that of Riemann and play with a four dimensional space-time continuum. Lucky StarFinders, you can just take off your lens caps and turn on the red light and ponder all night on the questions closest to your heart while distant clusters and galaxies dazzle you as you enter another GoTo destination. Hey, and if there's a kid in your neighbourhood let'm have a look while you tell them about the Giants' dreams! Uli

## How the Really Big Stars Form

Astronomers think they've got a handle on how Sun-sized stars come together. But the formation of the largest stars - more than 10 times the mass of the Sun - still puzzle astronomers. New observations on a 20 solar mass star have revealed that these giant stars maintain a torus of material around themselves. They can continuously feed from this "doughnut" of material, while powerful jets of radiation pour from their poles. The material can continue gathering onto the star while avoiding this radiation, which would normally blast it back into space.

## Two Hot New Planets Discovered

An international team of astronomers have turned up two new Jupiter-sized planets orbiting distant stars. These planets are incredibly close to their parent stars; just a fraction of the distance from Mercury to the Sun. Astronomers believe these planets are being eroded by the intense radiation of their stars. The discovery was made using the new SuperWASP program, which looks for stars that dim and brighten on a regular schedule as a planet passes in front of them.

## New Horizons Sets its Sights on Jupiter

You might have seen better looking pictures of Jupiter before, but that's not the point. What matters is that this photograph was taken by the Pluto-bound New Horizons spacecraft. It took the picture on September 4, 2006 when it was still 291 million km (181 million miles) away from Jupiter. Don't worry, the pictures will get much better. It'll make its closest approach on February 28, 2007, and see the giant planet with 125 times better resolution than this picture.

## Podcast: Hot Jupiters and Pulsar Planets

You have lived on the Earth all your life, so you'd think you know plenty about planets. As usual though, the Universe is stranger than we assume, and the planets orbiting other stars defy our expectations. Gigantic super-Jupiters whirling around their parent stars every couple of days; fluffy planets with the density of cork; and Earth-sized fragments of exploded stars circling pulsars. Join us as we round up the latest batch of bizarre worlds.

## Warmest World in 12,000 Years

Hot enough for you? A new NASA study has found that global temperatures are nearing their hottest level in more than 12,000 years - since the last glaciers covered large portions of the planet. In fact, global temperatures have been going up approximately 0.2° Celsius (.36° Fahrenheit) per decade for the past 30 years. In fact, global temperatures are now within one degree Celsius of the hottest temperatures measured in the last million years.

## New Kind of Supernova Discovered

Astronomers used to believe that all Type Ia supernovae were essentially the same brightness. That's because they explode with the same amount of fuel. But now a supernova has been discovered that's twice as bright as all the other Type Ia supernovae. This is a problem, since this kind of supernovae are used as standard candles, to determine distances across the Universe. Most recently, these supernovae have been used to calculate the mysterious force called dark energy that seems to be accelerating the expansion of the Universe.

## New Ring Discovered at Saturn

Cassini recently passed behind Saturn, so that the Ringed Planet completely obscured the Sun from view. This revealed intricate details in the planet's environment, including a brand new ring.



This newly discovered ring-is-outside Saturn's main rings, but inside the G and E rings - the moons Janus and Epimetheus orbit within it. During its pass behind Saturn, Cassini also captured an image of the Earth, from a vantage of nearly 1.5 billion km (930 million miles) away..

#### Astrophoto: NGC 7048 by Stefan Heutz

The ability for convex and concave transparent objects to enlarge or reduce had been known since Antiquity and by the end of the thirteenth century; quality glass was relatively inexpensive, particularly in Italy. At the same time, techniques for grinding and polishing had reached a high state of relative precision in Venice. So, handheld magnifying glasses became relatively common. During the fourteenth century, the craftsmen of Venice began producing small double-sided convex glass disks that could be mounted and worn in a frame- the first reading glasses. By the middle of the fifteenth century the Italians were also producing spectacles that corrected for nearsightedness. Therefore, around 1450 the ingredients to produce the first telescope were in place but it would be another 150 years before children would trigger its invention and change everything.

#### Angry Astronomy and Centauri Dreaming

I wanted to take a moment and point your browsers at a few websites that I really enjoy, and I think you will too. You've probably heard of the Bad Astronomer, but do you know of the Angry Astronomer? Jon Voisey is an astronomy major at the University of Kansas. Jon has recently been journaling the battle against intelligent design and antiscience movements, but if you dig a little deeper into his archives, you'll see some great articles explaining concepts in astronomy. A second site I really enjoy is called Centauri Dreams, written by Paul Gilster. Paul is the author of the similarly named book, which we reviewed here on Universe Today. Paul's website supports his investigation into concepts for interstellar travel - realistic ways that we could actually get spacecraft from here to neighbouring stars. Roll through the archive, it's absolutely fascinating reading.

#### The Location of the Oldest Recorded Supernova Discovered

Ancient Chinese astronomers recorded the occurrence of a bright star in the sky in 185 AD; probably a supernova explosion. And now modern astronomers think they've found that explosion's corpse: supernova remnant RCW 86. New calculations have found that RCW 86 is about 2000 years old, making it the best candidate for this ancient supernova. This new data was gathered using the XMM-Newton and Chandra X-Ray observatories.

#### Pulsars Confirm Einstein's Theories

Einstein was right. Well, according to new observations of a double pulsar, he was at least 99.95% right. An international team of astronomers have been measuring the pulsar pair for three years, and have detected several effects that match Einstein's theory of general relativity. It's believed the two pulsars are losing energy through the radiation of gravitational waves, and will eventually spiral into each other.

#### Subaru Finds the Most Distant Galaxy

The powerful Subaru telescope in Hawai'i has found the most distant galaxy ever seen, located 12.88 billion light-years away - this is only 780 million years after the Big Bang. Observing objects this distant is extremely difficult, not only because of the great distances involved, but because much of the Universe was obscured behind neutral hydrogen. Stars only then began clearing out this neutral hydrogen, making the Universe transparent.

#### Identifying Planets with Life

Telescope technology is advancing quickly, as larger and larger instruments are getting built. Eventually, an observatory will be built capable of resolving Earth-sized worlds orbiting other stars. If there's life there, will we recognize it? Researchers from Harvard-Smithsonian Center for Astrophysics and NASA have developed a list of epochs in Earth's atmosphere's history that could be visible through this instrument; from the earliest times that life emerged to our current, oxygen/nitrogen-abundant atmosphere.

#### Xena Renamed to Eris

Provisionally designated 2003 UB313, and nicknamed Xena by its discoverers, this newly discovered dwarf planet has been officially named Eris by the International Astronomical Union. The name was proposed by Mike Brown, a member of the team that made its discovery, and the name was accepted by the committee. In Greek lore, Eris is the goddess of discord and strife. Its moon has been named Dysnomia, the Daimon spirit of lawlessness.

#### Book Review: Secrets of the Old One - Einstein, 1905

Imagine that poor, uninformed Neanderthal man who didn't know to rub two sticks together to make fire. Then compare him to today's Homo Sapiens who know this secret. Seems like a great disparity. However, though people today know this secret, few have tried it and fewer still know the best wood, twine and grass. The same awareness can be said for the field of physics. Most know of its secrets, some use this knowledge but fewer are experts on the details. Jeremy Bernstein, in his book 'Secrets of the Old One - Einstein, 1905' gives an excellent recount of secrets learned by experts over a century ago. Reading it will give a great assist to those wanting to be more informed.

#### Astrophoto: The Iris Nebula by Tom Davis

Our home galaxy, the Milky Way, is estimated to have 400 billion stars, give or take 200 billion, but less than 6,000 (also an estimate) are visible from dark locations without telescopic aide- and only part of this number can be seen during any single night. Some are dim but close, others are bright but remote and many are partially hidden behind veils of dust so their splendor only hints at their distance. Therefore, the placement of the stars and their brilliance in the sky creates a completely random distribution of bright pinpoints overhead that people have, nonetheless, grouped into familiar patterns called constellations. This affinity for recognizing or imagining designs also extends to the objects in space that can only be seen through telescopes or in photos with long exposures such as this article's featured picture that, many believe, resembles a flower.

#### Podcast: Pluto's Planetary Identity Crisis

Pluto. It's a planet, then it's not. This week we review Pluto's history, from discovery to demotion by the International Astronomical Union. Learn the 3 characteristics that make up a planet, and why Pluto now fails to make the grade.

#### Hubble Sees the First Bright Galaxies

A new view from the Hubble Space Telescope shows some of the first bright galaxies to emerge in the Universe, appearing around 13 billion years ago, or 900 million years after the Big Bang. Galaxies like these weren't visible 700 million years after the Big Bang, so smaller galaxies must have merged together quite rapidly for them to get large and bright. The discoveries were made in the Hubble Ultra Deep Field and the Great Observatory Origins Deep Survey Fields.



### New Podcast - Astronomy Cast

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### The Link Between Asteroids and Meteorites

In theory, asteroids and meteorites are made of the same basic elements; it's just that asteroids are much much bigger. But scientists had always found troubling chemical differences between the two kinds of objects. New data gathered by the Japanese spacecraft Hayabusa, which recently visited the near-Earth asteroid Itokawa, shows that there's a good reason for the difference. It's the long-term effect of space weathering - solar and cosmic radiation - that changes the surface of asteroids to look different from meteorites.

### Ancient Ocean Released a Torrent of Methane

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diffuse background radiation that covers the sky. ESA's Integral spacecraft recently calibrated the level of this background radiation by watching a point of sky, and let the Earth pass in front of it, to slowly block it out. Using these calculations, astronomers will be better able to distinguish point sources of gamma rays from the wash of background radiation.

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### Spitzer's View of the Large Magellanic Cloud

NASA's Spitzer Space Telescope recently captured this image of the Large Magellanic Cloud, one of a handful of dwarf galaxies



that orbit the Milky Way. This single image, containing about a third of the entire galaxy, is actually made up of 300,000 individual frames captured by Spitzer, and then stitched together on computer to create a gigantic mosaic. Because Spitzer's infrared view allows it to pierce through obscuring dust and gas, this new research has revealed nearly a million never-before-seen objects - mostly stars.

#### Did the Earth Flip Over in the Past?

Scientists have found evidence that the Earth might have flipped over in the past, completely shifting the orientation of its poles. The theory has been around for years; that a large mountain range or supervolcano might unbalance the spinning Earth. Over the course of millions of years, the Earth would change the orientation of its axis until the object was balanced at the equator again. The scientists found evidence of magnetic grains in layers of rock sediment on the ocean floor that maintain a record of the Earth's magnetic field over millions of years.

#### Astrophoto: Star Trails over Namibia by Josch Hamsch

Arc lights had been used in lighthouses for several years when Thomas Edison began seeking a way to improve them. Arc lamps use two rods of carbon arranged so that their tips are almost touching. When sufficient electricity is sent to each, the current jumps between them and causes the carbon to become incandescent. Although carbon burns very slowly, over time the rods erode and have to be replaced. The year was 1881 when Edison embarked on a solution and the result of his success spread around the globe to both light and inadvertently curse the darkness.

#### Birth of Stars Seen by AKARI

The Japanese AKARI spacecraft - formerly known as Astro-F - captured this photograph of the reflection nebula IC 1396. This nebula is a bright star-forming region located about 3,000 light years from Earth in the constellation Cepheus, and it contains several young stars dozens of times more massive than our Sun. AKARI was able to reveal many new stars that were previously invisible because of its ability to see in the far infrared spectrum.

#### Hubble's View of Supernova Remnant Cassiopeia A

NASA's Hubble Space Telescope took this photograph of supernova remnant Cassiopeia A, one of the youngest remnants we know of in the Milky Way. The image was made up of 18 separate photos taken by Hubble using its Advanced Camera for Surveys, and it reveals the faint swirls of expanding debris. Astronomers believe the star that used to live at the centre exploded as a supernova about 340 years ago (as well as the 10,000 years it took for the light to reach us).

#### Fine Tuning the Search for Black Holes

Although black holes can't be seen directly, they're relatively easy to find. Matter spiraling into a black hole becomes superheated, shines brightly, and is visible across the Universe. A new super-computer simulation has fine tuned the energy calculations for atoms in the vicinity of a black hole. This is very important, because astronomers working on black holes will base their assumptions on these atomic data. The new calculations bring the potential error rates down to a few percent, enhancing the accuracy of other research.

#### The Secret to Earth's Shining Auroras

Auroras appear near to the poles when material from the Sun interacts with the Earth's magnetic field. Now ESA's Cluster spacecraft have helped determine exactly how energetic particles are

generated that cause the atmosphere to glow so brightly. Cluster has confirmed that the interactions with the Earth's magnetosphere cause flows of gas traveling more than 300 km/second (186 miles/second) to crash into the atmosphere, generating the light show we see.

#### Did Mariner IV Pass Through a Comet's Tail?

On July 14, 1965, NASA's Mariner 4 made the first successful fly-by of Mars; after six spacecraft had already failed to reach the Red Planet. It passed only 10,000 km (6,200 miles) above the surface of the planet, and sent back 22 pictures. Two years later it passed through an intense shower of meteoroids, more ferocious than anything we've seen here on Earth. Meteor expert Paul Weigert thinks the spacecraft might have passed close to comet D/Swift, and the meteoroids came from the comet's tail.

#### Book Review: Simple Stargazing

Learning the night sky is pretty intimidating. With enough desire and perseverance it's achievable, even though thousands of individual stars glitter away. Trying to install that desire and knowledge into the younger crowd is even tougher. Anton Vamplew with his book *Simple Stargazing* provides a significant aid for just this. With a knack for detail and minimal complications, he cuts the intimidation and adds lots of fun to boot.

#### NASA Invests in SpaceX and Rocketplane Kistler

NASA has announced a \$500 million investment in two aerospace companies: SpaceX and Rocketplane-Kistler to help develop vehicles capable of resupplying the International Space Station after the Space Shuttle is retired. The funding is split between the two companies, and requires them to meet a series of milestones as they develop their vehicles between now and the end of the decade. 20 companies originally submitted proposals to win the Commercial Orbital Transportation Services (COTS) demonstration program contract.

#### Galaxy Collision Separates Out the Dark Matter

There's more dark matter than regular matter in the Universe, and they're normally all mixed up together in galaxies. But astronomers using the Chandra X-Ray Observatory have found a situation where dark matter and normal matter can be wrenched apart. In a collision between giant galaxy clusters, normal matter, like stars and planets, encounters friction as it passes through hot gas and slows down. But the dark matter isn't affected by this friction, so it's able to separate from the regular matter.

#### Linking the Formation of the Earth and Moon

Did the Earth capture the Moon with its gravity, did they form together in the early Solar System, or did the Moon form when a Mars-sized object smashed into the Earth. New data from ESA's SMART-1 spacecraft has turned up deposits of calcium on the lunar surface. By measuring these minerals, as well as aluminium, magnesium and silicon, scientists can better map out the composition of the Moon, and predict what kind of impact might have happened.

#### Hidden Stores of Deuterium Discovered in the Milky Way

A six year study by NASA's Far Ultraviolet Spectroscopic Explorer, or FUSE, satellite has turned up previously hidden quantities of deuterium - a heavier isotope of hydrogen. Astronomers have wondered for years why the levels of deuterium in the Milky Way vary across the galaxy. FUSE has found that deuterium tends to bind to interstellar grains of dust, hiding it from view. Extreme events, like supernovae shockwaves, can vapourize the grains of



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dust, freeing the deuterium, and making it visible.

#### Universe Has Used Up a Fifth of Its Gas Tank

Since the Big Bang, 13.7 billion years ago, the Universe has converted 20% of its original matter into stars. This is according to a new survey by an international team of astronomers. Other than stars, a tiny fraction of non-primordial material is dust expelled from massive stars and supermassive black holes. The survey was made using the Millennium Galaxy Catalogue, which contains more than 10,000 large galaxies. It looks like the Universe will need another 70 billion years to use up all its original fuel.

#### Book Review: Uncentering the Earth

Fighting the good fight. David meeting Goliath. Persevering against the odds. These phrases give images associated with a valiant struggle to succeed. William T. Vollmann in his book *Uncentering the Earth* shares his thoughts on the struggles of Nicholas Copernicus in relocating the Sun to the centre of the solar system. Though Copernicus did not undertake any physical fight, there certainly was conflict while he was promoting and publishing his ideas.

#### Swirling Pinwheels Near the Heart of the Milky Way

Astronomers have gathered new data on a formation of stars called the Quintuplet cluster. These are a group of stars near the supermassive black hole at the centre of the Milky Way. The new data comes from the W.M. Keck telescope, which gathered high resolution images of the stars. They appear to be massive binary stars near the end of their short lives, which are giving off huge amounts of gas and dust. These dust plumes are creating pinwheel-shaped spirals around the stars as they orbit each other.

#### Planck Telescope Tested in Vacuum

ESA's Planck space telescope recently spent two weeks in a chamber that simulates the vacuum and temperature of space. When it finally launches in 2008, the European spacecraft will explore the cosmic background radiation; the afterglow of the Big Bang. Engineers needed to make sure that its instruments will perform well under the harsh conditions of space, and so far, everything checks out. The various components of the mission will continue to be tested separately, and then tested together in the coming months.

#### Hubble Reveals Dimmest Stars in a Nearby Cluster

New photographs from the Hubble Space Telescope show some of the faintest stars ever seen in a globular cluster. The cluster is NGC 6397, which formed almost right at the beginning of the Universe, nearly 12 billion years ago. This means the stars in the formation are made of the primordial material that formed shortly after the Bang Bang. These dim stars are white dwarfs that were once more massive versions of our own Sun. They cool at a very predictable rate, giving astronomers another way to calculate the age of the Universe.

#### STEREO Spacecraft Set for Launch

Get set to see the Sun... in thrilling 3-D! At the end of August, NASA will launch its twin STEREO spacecraft into orbit around the Sun, to provide the first stereoscopic views of coronal mass ejections. The spacecraft will be lofted into space on Thursday, August 31, to begin a 2-year mission; one spacecraft will fly ahead of the Earth in its orbit, and the other will tail back. With this 3-D view, scientists will be able to accurately track the direction and speed of coronal mass ejections, providing much better space weather forecast.

## PHYSICS AND ASTRONOMY

### COLLOQUIUM

Dr. George Lake,  
University of Zurich

## "How Galaxies Got Their Shapes, A Just So Story in the Kipling Tradition"

#### Abstract

Elliptical galaxies are dense and slowly rotating, spiral galaxies are larger and flat owing to their rotation. If one takes the product of the rotation velocity times the half light radius, this is 8x different. I will review the ideas about how these two classes of galaxies are otherwise different and how they formed.

Wednesday, October 4, 2006

3:30 p.m.

Elliott 062



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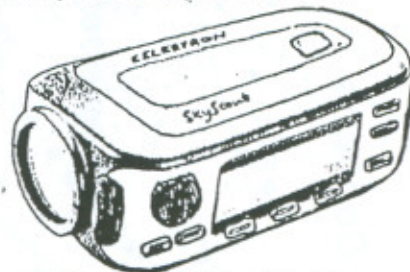
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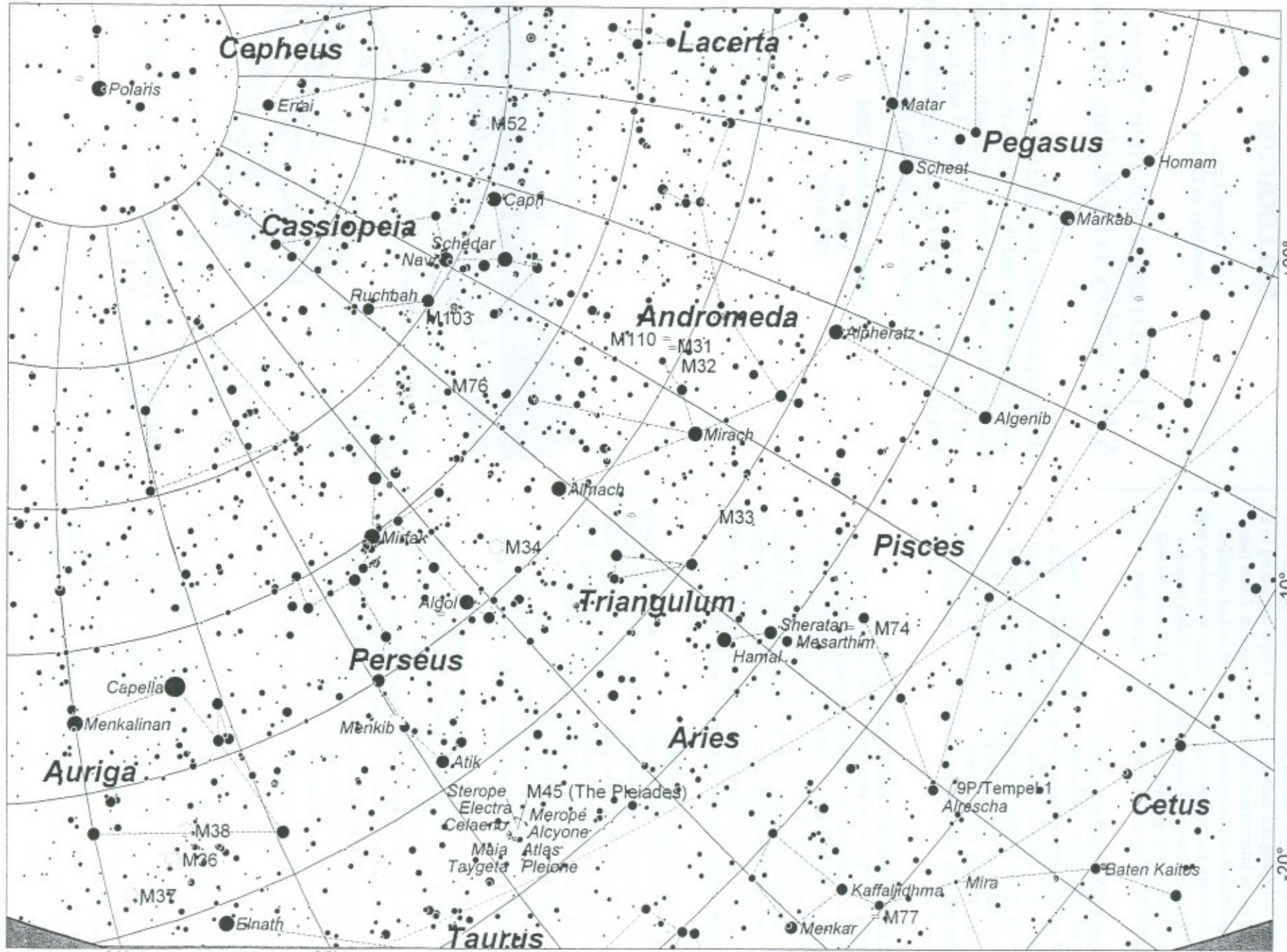
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