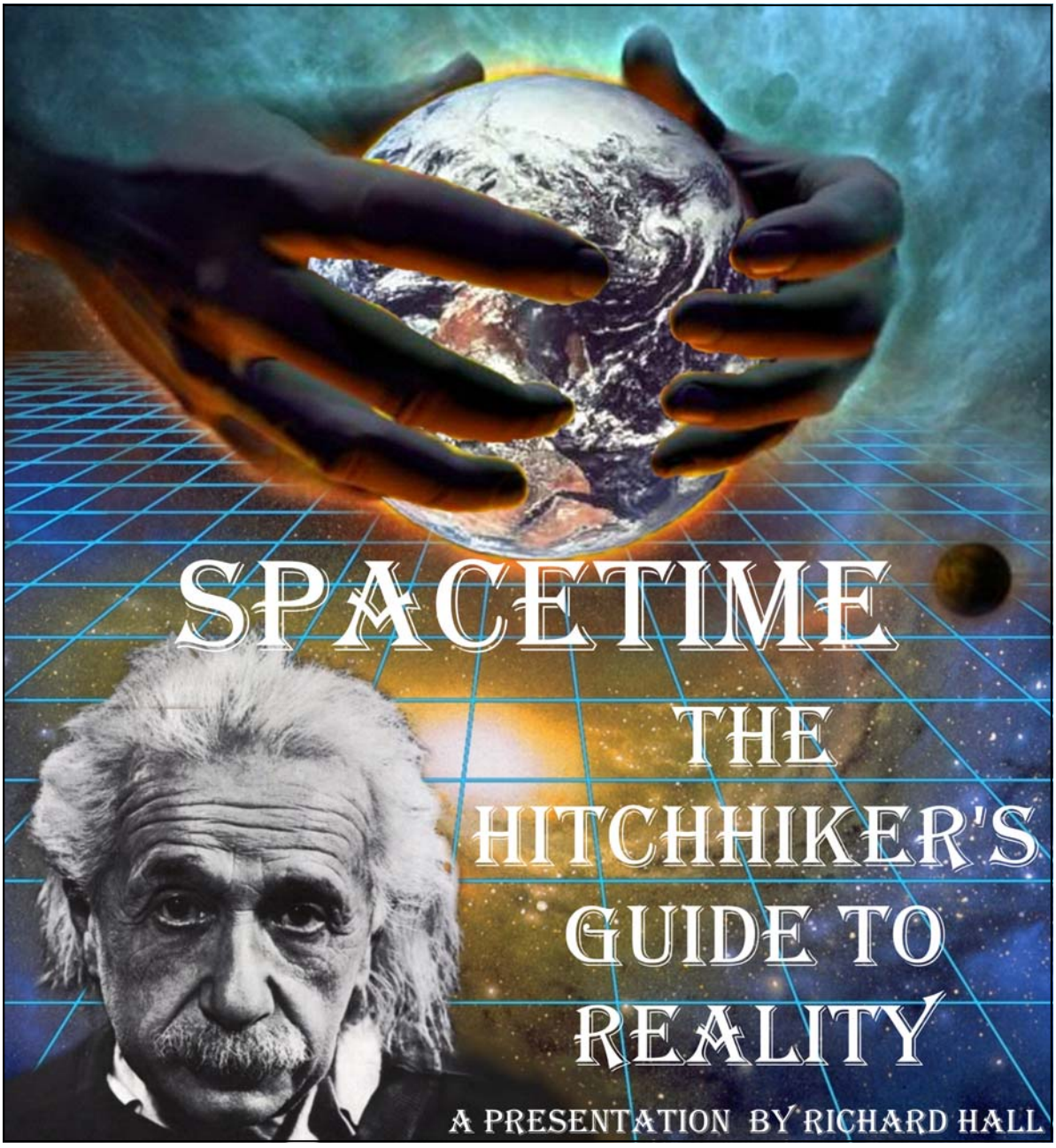
AUCKLAND ASTRONOMICAL SOCIETY

May 2010

SOCIETY JOURNAL

Society Meeting Monday 10th May at 8:00pm



Einstein's theories of Special and General Relativity revolutionised the way in which scientists perceive the universe around us. In this presentation we will explore, in laypersons terms, the basics of relativity and the fascinating predictions it makes to the nature of the universe and our concepts of reality.

Topics include the nature of space-time, time-travel and, we take a journey into a black hole. If we still have space or time we will also discuss wormholes and the Multiverse.

AGM Report

A Very Successful Year for the Society

By Gavin Logan

Catherine Harland, Chair of the Auckland Observatory and Planetarium Trust addresses the AGM.

New Council members, Bernie Brenner (Left) who takes the Introduction to Astronomy evenings and Tony Reynolds (right) the new Librarian. The society also has a new Secretary, Michelle Knowler

The 84th Annual General Meeting of the Society was held in April with the President Grant Christie reporting a very successful year with a growing membership and many new activities.

Among the highlights were four successful star parties at the Stardome, a successful Burbidge Dinner, Practical Astronomy nights, a new monthly film night and a more structured curriculum for the Introduction to Astronomy evenings. As well as excellent presentations from our own members, during the year there were many excellent talks from visiting speakers such as Dr John Storey (University of New South Wales), Dr Melanie Johnston-Hollitt (Victoria University) and Richard Hall (Phoenix Astronomical Society). Filmmaker Jeffrey Fox presented his documentary on John Dobson called "A Sidewalk Astronomer" and Dr Miller Goss spoke on his research into early radio astronomy in New Zealand

Saturn is on the screen during the Sky at Night film screened after the AGM. It covered the latest on exploration of Saturn, last year's impact on Jupiter and the Total Solar Eclipse in China

Two dark sky weekends were held at Waharau Outdoor Centre and the Society made submissions to Auckland local government on light pollution. The society was also active in research projects throughout the year.

The treasurer Andrew Buckingham reported that the Society is in a strong financial position. The evening concluded with the screening of a recent BBC Sky at Night film with Patrick Moore.

Footnote

A full copy of the President's Report and the Treasurer's report are available in the member's area of the Society website.

Double Feature Film Night

By Gavin Logan

Two Astronomical Documentaries were shown at the April monthly meeting. The first one was a BBC Horizon Documentary entitled "Is Everything We know About The Universe Wrong"? The film covered the subjects of the Theory of Inflation, Dark Matter, Dark Energy and Dark Flows and the problems they posed for the Standard Model of Cosmology.

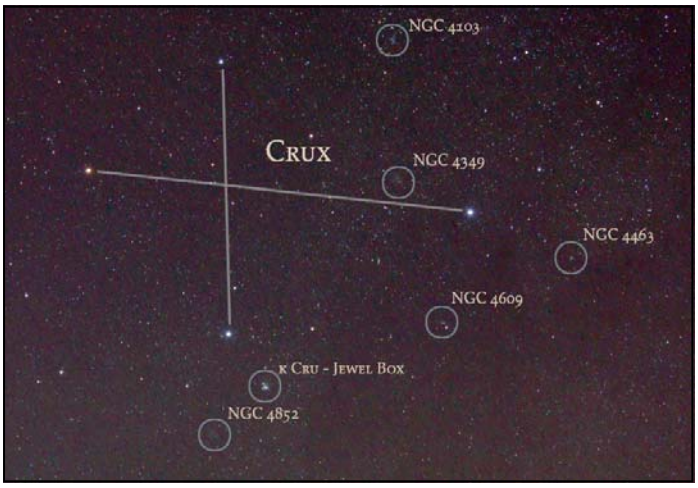
The second film entitled "Who's Afraid of the Big Black Hole?" gave an interesting account of the theory of Black Holes, and how Einstein's "Theory of Relativity" predicted them. It also covered the latest attempts to image the shadow of a Black Hole using a large number of radio telescopes linked to a computer to create a virtual telescope.

On Monday 17th May the society will be screening a film called "Isaac Newton - The Dark Heretic". This is a dramatised documentary that tells about many little known facets of Newton's life including his religious ideas and how they influenced his science and life. Also covered is his secret experimentation with alchemy.

Practical Astronomy, Southern Clusters

Report by Shaun Fletcher

For the society's April practical astronomy session, Andrew Buckingham gave a talk on the star clusters of the southern sky. The meeting was well attended in spite of inclement weather and the holiday weekend, and several new members were present.



Beginning with our iconic Jewel Box cluster (NGC 4755) Andrew gave a brief explanation of what a star cluster is, why different stars have different colours and some information on distances. We then proceeded to tour the brighter and more interesting open clusters visible in the southern sky at this time of year.

Giving useful tips on star-hopping navigation to find each cluster along with suggestions for viewing targets for binoculars and different telescope sizes, he covered the main objects in the Centaurus, Crux and Carina regions.

Finally, the globular clusters of 47 Tucanae (NGC 104) and Omega Centauri (NGC 5139) were discussed, including an explanation of the difference between open and globular clusters and navigation tips.

Andrew's enthusiastic presentation was assisted by the popular Starry Night software and a number of annotated images of the southern sky supplied by Shaun Fletcher. These images and a useful list of the objects mentioned in the presentation are available on the society website.

Calendar of Events

May Programme

Mon	3	8:00pm	Practical Astronomy Celestial Navigation with Colin James.
Fri	7	7:30pm	Night Eyes Young Astronomers with Margaret Arthur.
Mon	10	8:00pm	Society Meeting. SPACETIME by Richard Hall, Phoenix Society
Mon	17	8:00pm	Film. Night with Gavin Logan Isaac Newton, The Dark Heretic
Wed	19	7:30pm	Council Meeting
Mon	24	8:00pm	Introduction to Astronomy Michigan Tech course on Astronomy continues with Bernie Brenner. .

June Programme

Fri	4	7:30pm	Young Astronomers with Margaret Arthur
Mon	7	8:00pm	Practical Astronomy Winter Star party with Andrew Buckingham.
Mon	14	8:00pm	Society Meeting TBA
Mon	21	8:00pm	Film Night with Gavin Logan Alien Planet based on WD Barlowe's book "Expedition"
Wed	23	7:30pm	Council Meeting
Mon	28	8:00pm	Introduction to Astronomy The Michigan Technical University course continues with Bernie Brenner

Welcome to New Members

Henry Killian (family)

Ismail Salman (family)

Georgy Hadwen (student)

Nancy Groh (ordinary)

Waharau Dates for 2010

The next date for the Waharau Dark Sky weekend in 2010 is Friday 10th September to Sunday the 12th.

Mark this date in your diary.

The 2010 Council

President	Grant Christie	(021) 024-04992
Vice President	David Britten	(09) 846-3657
Treasurer & Membership	Andrew Buckingham	(09) 473-5877
Secretary	Michelle Knowler	(021) 148-6764
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Librarian	Tony Reynolds	(09) 480 8607
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Observing Notes

May 2010

by Alan Gilmore

Venus is the 'evening star', appearing near the northwest skyline soon after sunset. It sets around 7 pm. As the sky darkens **Sirius** appears in the west with **Orion** below it. **Canopus** is southwest of the zenith. **Crux**, the Southern Cross, and the Pointers are southeast of overhead. **Mars** is an orange-red star well down the northwest sky. Near it is **Regulus**, the brightest star in Leo. Higher in the north sky, and brighter, is **Saturn**, Low in the northeast is **Arcturus**, a bright orange star whose colour is often separated into flashes of red and green.

Below Sirius are **Rigel** and **Betelgeuse**, the brightest stars in **Orion**. Between them is a line of three stars: Orion's belt. To southern hemisphere star watchers, the line of three makes the bottom of 'The Pot', now tipped on its side. **Sirius,** 'the Dog Star', marks the head of **Canis Major** the big dog. Sirius is the brightest star in the sky though planets Venus, Mars and Jupiter can be brighter.

Crux, the Southern Cross, is southeast of the zenith. Left of it are Beta and **Alpha Centauri,** often called 'The Pointers'. Alpha Centauri is the closest naked-eye star, 4.3 light years away. It is a binary star: two sun-sized stars orbiting each other in 80 years. Beta Centauri, like most of the stars in Crux, is a blue-giant star hundreds of light years away. **Canopus** is also very luminous and distant: 13 000 times brighter than the Sun and 300 light years away.

Low in the east is the orange star **Antares**, marking the heart of the Scorpion. Antares means 'rival to Mars' in Greek. Just now you can see why. It is a red giant like Betelgeuse; 600 light years away and 19 000 times brighter than the sun. Red giants are dying stars; wringing the last of the thermo-nuclear energy out of their cores. Big ones like Antares and Betelgeuse will end in massive supernova explosions in a few million years.

Arcturus, in the northeast, is the brightest red star in the sky but, at 37 light years, is much closer than the red-giants previously mentioned. It is about 120 times brighter than the sun.

The **Milky Way** is brightest in the southeast toward **Scorpius** and **Sagittarius**. In a dark sky it can be traced up the sky past the Pointers and Crux, fading toward Sirius. The Milky Way is our edgewise view of the galaxy, the pancake of billions of stars of which the sun is just one. The thick hub of the galaxy, 30 000 light years away, is in Sagittarius. The nearby outer edge is by Orion. A scan along the Milky Way with binoculars shows many clusters of stars and some glowing gas clouds, particularly in the **Carina** region, to the right of Crux, and in Scorpius.

The Clouds of Magellan, **LMC** and **SMC**, are midway down the southern sky, easily seen by eye on a dark moonless night. They are small galaxies. The Large Magellanic Cloud is about 160 000 light years away and is about 5% the mass of our Milky Way galaxy. The Small Cloud is around 200 000 light years away and 3% the mass of our galaxy. That's still many billions of stars.

Saturn's rings are still nearly edge on to us and look like a thick line through the planet. Some of Saturn's moons cross in front of the planet and disappear behind it. Titan, Saturn's biggest moon, disappears behind the planet for four hours on the evenings May 9 and 25. Titan crosses Saturn's disk on May 17. Saturn is 1340 million km from us mid month. **Mars** continues to fade as we leave it behind. At mid month it is 210 million km away and shows just a tiny disk in a telescope.

Jupiter, not shown, rises due east around 3 a.m. It looks like a very bright golden star shining with a steady light. Binoculars show the disk of Jupiter. A small telescope shows its four bright moons lined up on each side. Jupiter is 820 million km away mid month. Mercury makes a morning sky appearance in May and June. In mid May it rises a little north of due east around 6 a.m., the brightest 'star' in that area. It passed us in late April and is now swinging around to the far side of the sun. It sinks into the dawn twilight in late June.

*A **light year** (**l.y**.)is the distance that light travels in one year: nearly 10 million million km or 10^{13} km. Sunlight takes eight minutes to get here; moonlight about one second. Sunlight reaches Neptune, the outermost major planet, in four hours. It takes four years to reach the nearest star, Alpha Centauri.

Notes by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand.

Planet Notes for May 2010

By Brian Loader RASNZ

May 1	94% lit Moon 2.5° from Antares, magnitude 1.1, brightest star in Scorpius, closest at dawn.
May 2	Moon furthest south, so highest southern hemisphere transit for the month.
May 6	Moon at last quarter 4:15pm NZST (04:15 UT).
May 7	Moon at apogee, its greatest distance from the Earth for the Lunar month, 404235 km.
May 10	18% lit crescent Moon, 7.5° to lower left of **Jupiter**, and 6° from **Uranus** closest at dawn.
May 11	**Mercury** stationary.
May 14	New Moon at 1:04pm NZST (1:04 UT).
May 16	Moon furthest north, so lowest southern hemisphere transit for the month.
May 16	6% lit crescent Moon, 3° to lower left of **Venus**, low to northwest following sunset.
May 20	42% lit Moon 4° to upper left of **Mars**, early evening sky.
May 20	Moon at perigee, its closest to the Earth for the lunar month, 369 734km.
May 21	Moon at first quarter 11.43am NZST (May 20, 23:43 UT).
May 21	53% lit Moon 5° to upper right of Regulus, magnitude 1.4, brightest star in Leo, closest at sunset.
May 23	75% lit Moon 8° from **Saturn**, closest at sunset.
May 24	86% lit Moon 6° from Spica, magnitude 1.1, late evening, closer after midnight.
May 26	**Mercury** at greatest elongation, 25° west of sun.
May 28	Full Moon at 11.07am NZST (May 27, 23:07 UT).
May 28	Full Moon less than 3° from Antares, magnitude 1.1, brightest star in Scorpius, closest but low to SE, at sunset.
May 29	Moon furthest south, so highest southern hemisphere transit for the month.

J.E. Bode "Uranographia"

By Ivan Vazey

If you happened to read the Myth on the Constellation Corvus in the March Journal, you will have seen the 19th century drawing of Corvus, Crater and Hydra, taken from Bode's "Uranographia".

I was fortunate in being able to examine a first edition of Uranographia at the Cambridge University Observatory library. I was in the company of Fred Watson from A.A.T. Siding Springs, Australia so the librarian took this as a good enough reason to bring out of storage, some very rare editions for us to examine.

"Uranographia" was one of these .

If the Golden age of the Celestial atlas began with Bayer's "Uranometria" 200 years earlier, then Bode's magnificent "Uranographia" published in 1801 brought the Golden Age to an end.

The Uranographia as it was seen at the Cambridge University Observatory

This is the largest Star Atlas ever published. It contains over 2500 nebula discovered and catalogued by William Herschel.

Bode actually printed two totally different star atlas's. Bode's Edition of Flamsteed's atlas was small in size whereas his Uranographia was around 20 times the size and contains 20 double page plates. In this Atlas he has 5 entirely new constellations.

The enlarged section of the Southern Sky plate shows some of these.

Johann Bode published Uranographia in 1801. It was the last of the great celestial star atlases and is of the highest quality. The 17,240 stars were plotted with the greatest precision ever seen, and the constellation illustrations are superb

A section of the Southern Sky Plate

Own a Piece of Another World!

These beautifully cut meteorite specimens were once part of an asteroid orbiting between Mars and Jupiter.

It crashed with another asteroid and some of the fragments eventually landed on Earth in the northwest Sahara Desert. They have been retrieved by nomads and authenticated by an expert.

Your only opportunity to own and touch a piece of another world!

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Asteroid 243 Ida with its little moon Dactyl

Amateur Rocketry in New Zealand

By Joel L. Schiff – NZRA & AAS

If you think that you have seen so many rocket launches already that you no longer get excited about them, have a look on YouTube

The sheer raw power of this launch is truly something that can stir even the most launch-jaded soul. While most of us will come no closer to such an event than this video, there is still a way to experience the same thrill but on a smaller scale. And that is through amateur rocketry.

We are not talking here of the fireworks you light a fuse to on Guy Fawkes night and send into an enemy neighbour's yard. Amateur rockets have fins for guidance and a parachute for recovery at their most basic level. Their fuel is generally a composite material very similar to what is used in the solid fuel boosters of the Space Shuttle. As the rockets become larger in size and more sophisticated, then altimeters,

Most rocketeers start out small, as did the author himself at this very same level. A rocket of this size can still do over 1,000 ft and is always exciting to watch. Kids just love it! The smallest size rockets like this one use motors made from black powder instead of an ammonium perchlorate composite used in larger motors.

There is no such thing as an amateur rocket being too big. Rockets very much smaller than this can do well over 20,000 ft.

on-board computers, GPS devices and multiple stages become part of the space adventure.

The New Zealand Rocketry Association (NZRA) is a group of people, both male and female who are interested in model rocketry, who build model rockets, and launch them into the atmosphere. Ages can range from 6 to 106 and the NZRA is open to everyone who wishes to join us in reaching for the skies. The NZRA has been in existence in various forms since 1991 and is now having a resurgence in membership.

Model rocketry opens up many avenues for learning, and the great thing is, just like astronomy, the learning never stops. There is always more to explore and if you keep at it, you can become a true rocket scientist. Much of the learning is about science. There are all manner of rocket motors and rocket sizes: fat ones - thin ones, designs built for speed and altitude and some having 2 or even 3 stages. You learn what slows a rocket down and what makes it sleek and efficient. You learn how to measure the altitude that your rocket reaches and in some instances learn how to communicate with your rocket via the GPS satellite network. You can even mount a camera on your rocket and watch the Earth recede as the rocket reaches for the sky. Above all, you learn how much fun all this learning can be!

No matter what your level of skill or knowledge, there is always the personal pleasure of making something that can soar thousands of metres into

the sky, the thrill of the liftoff, and the feeling of relief and satisfaction of a successful recovery.

One of the foremost aspects of model rocketry is that of safety. This is always a prime consideration in the construction of any model rocket as well as in its launching. When handled and built properly, a model rocket is simply not dangerous. At every NZRA launching, there are qualified experts on hand with many years of experience to supervise and control every aspect of rocket safety.

Nothing, but nothing, beats the thrill of a liftoff.

Every February we have a special Rocket Day launch to which the general public is invited to attend and participate in. This past year we had hundreds of people come along to our designated launch site in Taupiri, which is not far from Huntly. Dozens of young kids built 'have-a-go' rockets, learned a thing or two about Newton's Laws, and had a whale of a good time in the process. Several launch events for members and their families are also scheduled throughout the year.

So please won't you come and join us. It will be love at first flight! The NZRA website is full of rocketry information about our organization and how you can get started, and is where you can also join up for a mere $10 per year:

http://www.nzrocketry.org.nz/.

YouTube URL is: http://www.youtube.com/watch?v=Nv35OPKzCQw&feature=player_ embedded/

The author with his best friend who he hopes is destined for higher things. The carbon fibre components come as a kit

Another rocket kit, built by the author, in full flight

An Unsung Hero of Astronomy – Rabbi Levi ben Gershon (1288-1344)

by Dr Bernie Brenner

Introduction

Rabbi Levi ben Gershon receives scant praise in astronomical texts and books.

In 1328 he was the first to publish about the "radius astronomicus" or "cross staff". This late medieval invention was used for over 300 years not only for astronomical measurements but also surveying and for navigation. The longevity of its use and also its practicality surely justifies the choice of Rabbi Levi ben Gershon as an unsung hero of astronomy. Unfortunately his influence was not as great as it might have been, due to the complexity of his scholarship, his writing style and his rationalist philosophy.

Biography

Levi ben Gershon, the Ralbag (the capital letters of his name) also known as Gersonides and Leo Hebraeus, was born in Bagnols in the south of France in 1288. (The commentary in the Virtual Moon Atlas (Le Grand 2002) incorrectly lists his birth place as Jerusalem). It seems there was not much known about his personal life other than that he was born into a family of scholars. One of his grandfathers was the great Spanish Jewish philosopher Maimonides (RaMBam). It is not known what his occupation was. Generally Jews in 14th century Provence were money lenders, physicians, craftsmen and merchants. (Simonson 2000). Life for the Jews at this time in France was difficult but easier in Provence where the Pope was self-exiled in Avignon and he afforded protection to the local Jews. He is recognized as being a Rabbi, philosopher, astronomer, scientist, biblical commentator and mathematician. As previously mentioned, he is said to have had a rather difficult and longwinded writing style That may have impaired full appreciation of his true worth.

He wrote more than 12 books on commentary to the Old Testament, and several books on mathematics. Although he wrote exclusively in Hebrew many of his works were translated into several other languages. He was a very committed Jew but some of his works were unpopular in the Jewish community at the time. His major philosophical work was called "Wars of God".

His achievements in mathematics are interesting. Levi's first book on mathematics was called The Art of Calculation (Maaseh Hoshev) and was published in 1321. The book contains many theorems and proofs about arithmetic, algebra and combinatorics (a branch of discrete mathematics).

He obviously wrestled with the problem of π which was not well understood in the 14th century but he seems to have accepted it as an irrational number. "The Mathematics of Levi ben Gershon" (Simonson 2000) explains his theories and clearly demonstrates a man who was obviously anachronistic. He wrote a commentary on Euclid (in Hebrew), introduced trigonometric concepts of sine and cosine and wrote a book on harmonic numbers at the request of the Bishop of Meaux. This work was immediately translated into Latin. Also translated into Latin was a book on trigonometry and a description of Jacob' staff – De Sinibus, Chordis et Arcubus. He introduced concepts of sine and cosine but did not mention the tangent function. (Simonson 2000)

Unfortunately for him and because he was really before his time his works were complex and his writing style was considered to be longwinded – this perhaps impeding recognition for his true worth.

Primary work deserving recognition

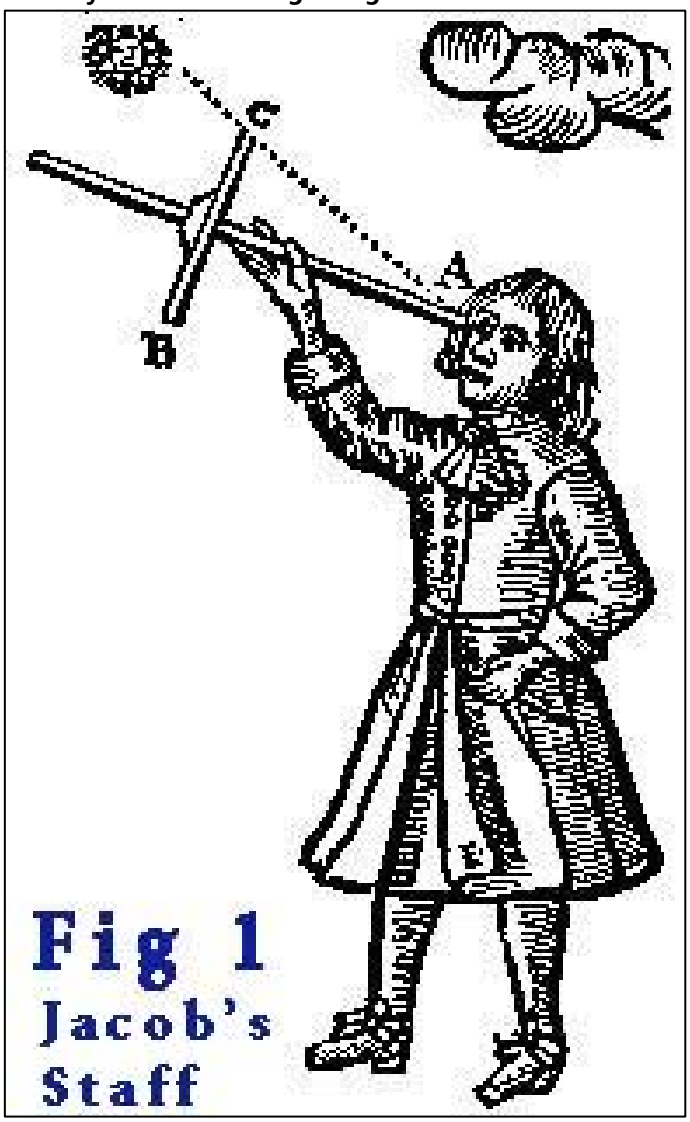


Fig 1
Jacob's Staff

The radius astronomicus or cross-staff or Jacob's staff was an instrument used by astronomers to measure celestial co -ordinates. (Figure 1). The actual inventor may have been Jacob ben Makir who lived at the same period in Provence and was a well known physician and astronomer. The first description of Jacob's staff is acknowledged as coming from Levi in 1328 although he is also described as the inventor by some. (Simonson 2000)

In any event here was an instrument used by astronomers, surveyors and navigators for over 300 years. It was light, very easy to build, dismantle and transport. The cross staff was made of wood. It consisted of two pieces with cross section of around 3 x 3 cm. The cross piece was called the transom or trasversal. This is depicted in adjacent figure and is labeled BC. The staff component was graduated in trigonometrical graduations so that angles could be measured by holding the staff to the eye and moving the vane or transom until its ends were level with the points that were to be measured. Using the instrument thus it was possible to directly measure the angular distances between stars or planets or indeed the diameter of the Sun and Moon. It was also used to measure a comet's tail. The earlier instruments were only of wood where the transom was cut straight across but they were later fitted with brass ends and holes which helped improve observation. It was common to have several transoms – each one measured differing ranges of angles. As the design was improved the later models had a single transom with pegs which indicated the ends.

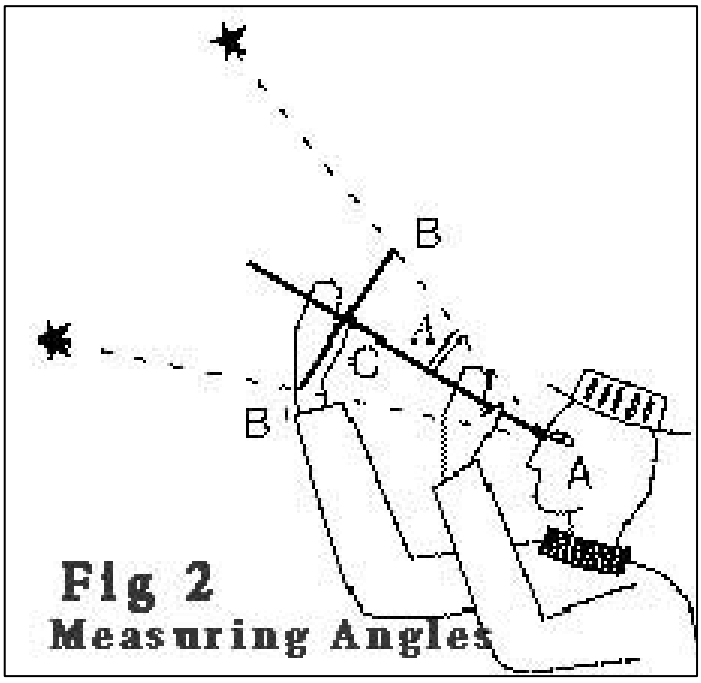


Fig 2
Measuring Angles

Measuring the angle between two stars

The use of the instrument for astronomical use appears fairly straight forward and is well described. (Stern 2005) The staff is placed below the eye (Fig 2) and the cross piece is slid up and down until the sight B covers one star and sight B[1] covers the other star. The distance AC is measured. A is the angle between the staff and one star and so tanA = BC/AC. The distances of BC and AC are known and so using a table of tangents the angle A can be calculated.

(An interesting paradox is noted here. As has been earlier documented Levi wrote a book on the introduction to trigonometry and introduced sine and cosine functions but did not mention the tangent function. The methodology for using Jacob's staff as described above (Stern 2005) is based on using tangent to solve the angles. It is possible I suppose that Levi measured the distance BA say with a piece of string and could then derive the value of A being sinA = BC/BA)

Using the cross-staff for navigation

The original cross-staff as described by Levi was not used at sea. Its design was however improved on whereby the rod was graduated in degrees. It was however not easy to use at sea and when measurements were made by looking directly at the Sun, the glare was difficult to tolerate. The device was eventually replaced by easier to use instruments like the backstaff or quadrant in the first place and then later by the octant and sextant.

Use in surveying

Even though the nomenclature has been retained the Jacob's staff in modern surveying is a very different instrument from the earliest description. The original was however used in measuring terrestrial latitudes and in practical terms, it was employed in determining heights, lengths and distances.

Recognition

The International Astronomical Union has recognized the contribution of Rabbi Levi by naming a lunar crater after him. Its position is 23.0 deg East and 34.7 deg South. The crater is described as a damaged circular formation. It has a dimension of 49 x 49 miles. The commentary associated with the position of the crater acknowledges a 14th century Jewish philosopher and scientist who authored a treaty of arithmetic and trigonometry and who invented "Jacob's stick". (Le Grand 2002).

Conclusion

As stated in the introduction Rabbi Levi's influence was not as great as it might have been, due to the complexity of his scholarship, his longwinded writing style and his rationalist philosophy.

Nevertheless his contribution to medieval astronomy was enormous keeping in mind that there were no calculators or computers at that time and the invention of a device that was easily constructed, easy to use and valuable as an astronomical tool was surely worthy of great merit. To find practical application in astronomy and navigation and to have a longevity of use for 300 years must confer an even greater honour on the inventor or first person to describe it. Rabbi Levi ben Gershon was an anachronism. He was indeed a genius. His contribution was not fully acknowledged in his time perhaps because of his writing style and unfortunately he is obviously even today not fully appreciated (if appreciation can be measured by inclusion of works in prominent texts on the history of astronomy)

.References:

Le Grand, C. (2002). Virtual Moon Atlas.

Simonson, S. (2000). The Mathematics of Levi ben Gershon, Bar-Ilan University Press.

Stern, D. P. (2005). "The Cross Staff." From Stargazers to Starships, from istp.gsfc.nasa.gov.

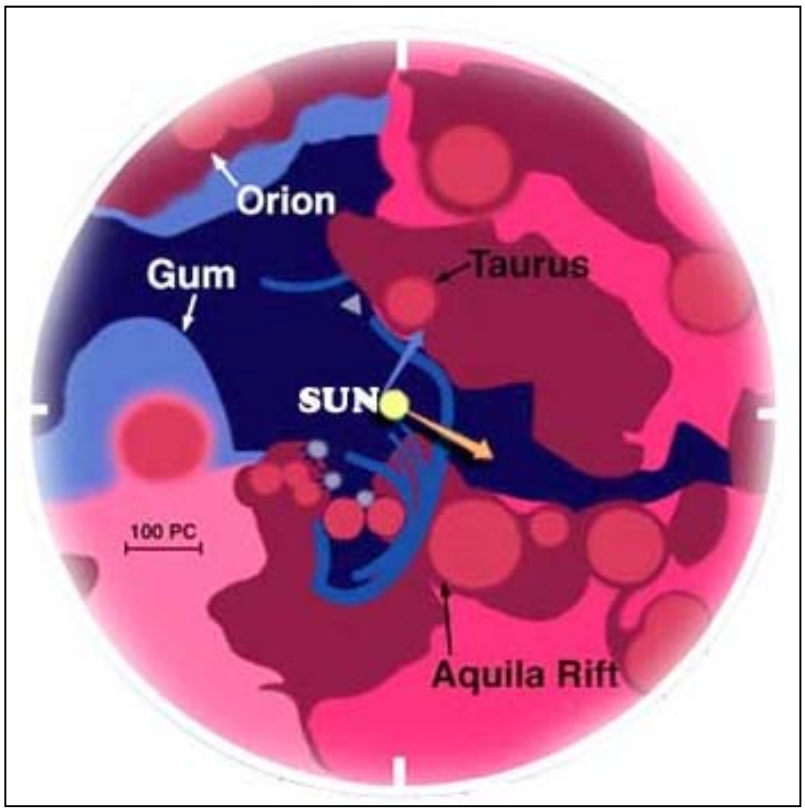
Galactic Superbubbles

around the Solar Neighbourhood & our Local Chimney

The first detailed map of space within about 1,000 light years of Earth places the solar system in the middle of a large hole that pierces the plane of the galaxy, perhaps left by an exploding star one or two million years ago.

Source miqel.com

The new map, produced by University of California, Berkeley, and French astronomers, alters the reigning view of the solar neighbourhood. In that picture, the Sun lies in the middle of a hot bubble - a region of million-degree hydrogen gas with 100-1,000 times fewer hydrogen atoms than the average gas density in the Milky Way - and is surrounded by a solid wall of colder, denser gas.



Local gas voids and bubbles near the Sun

Instead, said astronomer Barry Welsh of UC Berkeley's Space Sciences Laboratory, the region around the Sun is an irregular cavity of low-density gas that has tunnels branching off through the surrounding dense gas wall. Welsh and his French colleagues suspect that the interconnecting cavities and tunnels, analogous to the holes in a sponge, were created by supernovas or very strong stellar winds that swept out large regions and, when they encountered one another, merged into passageways.

"When we started mapping gas in the galaxy, we found a deficit of neutral gas within about 500 light years, suggesting that we are in a bubble-shaped cavity perhaps filled with hot, ionized gas," Welsh said. "But the Local Bubble is shaped more like a tube and should be called the Local Chimney."

If this system of interlocking, gaseous cavities is characteristic of the entire galaxy, it presents a dramatic confirmation of a 30-year-old theory of the Milky Way, Welsh said.

Welsh is presenting the findings on Thursday, May 29, at the American Astronomical Society meeting in Nashville, Tenn.

At the moment, the origin of the cavities is anybody's guess, Welsh said. The local cavity has been around for a few million years and could easily have been caused by a supernova punching through the top and bottom of the galactic disk, the intense stellar winds from 10 or so hot stars, a powerful gamma-ray burst, or even a large star moving through the area. Each of these could theoretically sweep dense gas out of the region, leaving only tenuous, ionized hydrogen.

Astronomers have known since the 1970s that the Solar Neighbourhood lies in the middle of an enormous "Local Bubble" of million-degree, ionized hydrogen gas, surrounded by a wall of colder, denser neutral gas. Within this hot bubble, gas density is much sparser, with some 100 to 1,000 times fewer hydrogen atoms, than the average density of the rest of the Milky Way's spiral disk. The Local Bubble was thought, at first, to be an asymmetric cavity of 330 to 490 light-years (ly) -- 100 to 150 parsecs (pc) -- in diameter.

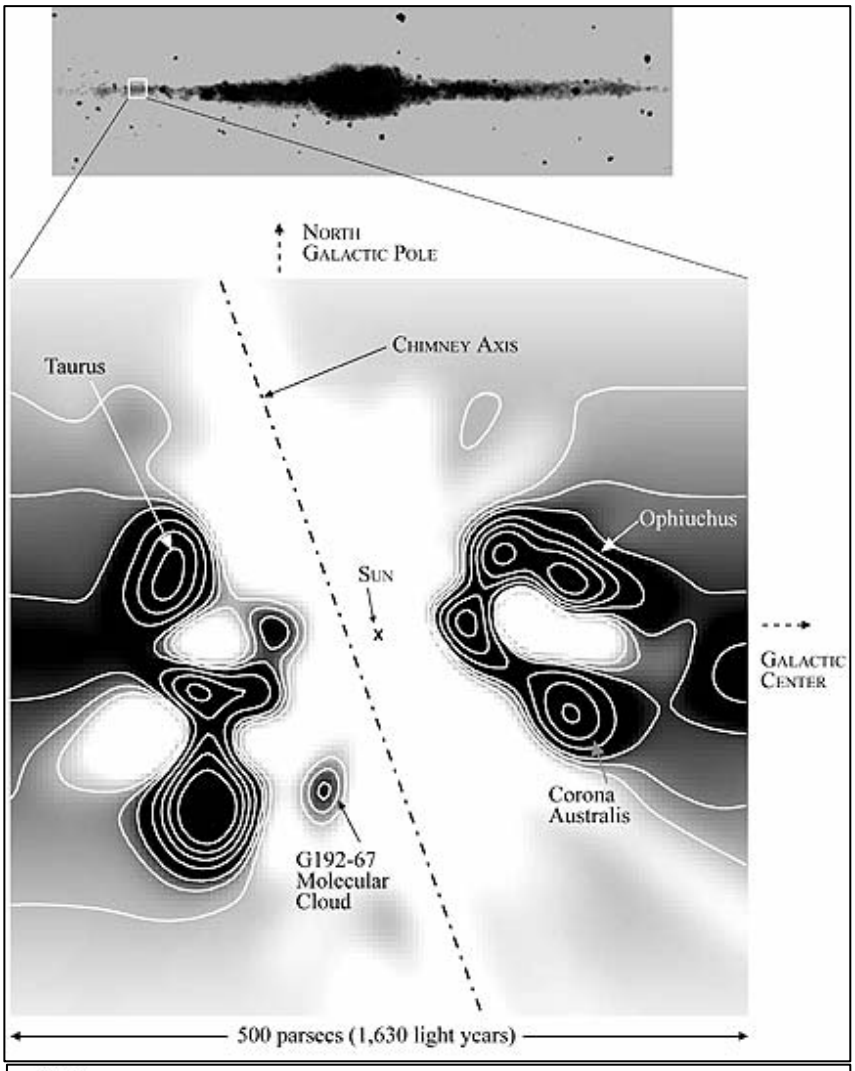
A Tubular Cavity Penetrating the Local Disk

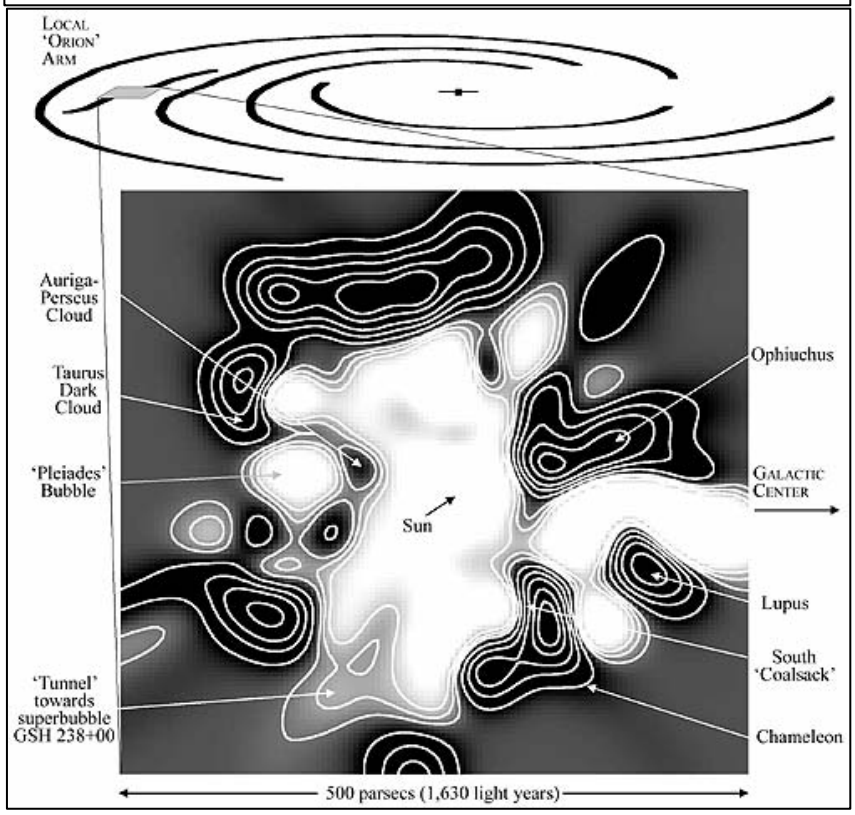
On May 29, 2003, a team of astronomers (including Barry Welsh, Rosine Lallement, Francoise Crifo, Daphne Sfeir, and Jean-Luc Vergely) presented the first detailed map of interstellar space within 1,000 ly (300 pc) of the Solar System. They also announced confirmation of the hypothesis that the so-called Local Bubble of the spiral disk's gas clouds actually pierces the disk of the galaxy, perhaps as the result of exploding stars around one or two million years ago (CNRS press release).

The tubular cavity of hot, low-density gas was found to be irregular with tunnels branching off through the surrounding dense gas wall, which is suspected of having interconnecting cavities and tunnels like an interstellar sponge, as first suggested by astronomers nearly 30 years ago (Cox and Smith, 1974). The astronomers hypothesize that energetic supernova explosions created fast-moving expanding bubbles of hot gas that collided with the surrounding cold gas of interstellar space, which in turn became compressed into thin shells. Eventually, these shells of cold gas met other expanding hot cavities and broke up to form small tunnels or pathways between the expanding voids (U.C. Berkeley press release; and Welsh et al, 1999). Such "hot chimneys" have been detected in other galaxies.

One portion of the Local Bubble's wall appears to have collided and merged with the shell of another enormous bubble of hot, ionized gas that's called (Radio) Loop I. Located far above the galactic plane, within 490 ly of the Local Bubble, Loop 1's brightest feature is the North Polar Spur, which is thought to be created by supernovae and stellar winds from the 13-million-year-old, Scorpius-Centaurus Association of young and massive, OB-type stars (more discussion and illustrations). In addition to Loop I, astronomers have also detected also two other expanding bubbles nearby, called LOOP II and LOOP III.

Over the last five to 10 million years, the Solar System has been moving through the lower density region of interstellar gas of the Local Bubble. As a result, Earth and its life forms have avoided dangerous flows of cosmic radiation and gas. Astronomers, however, have discovered a denser cloud of interstellar gas about 25 ly (7.7 pc) in diameter called the "Local Fluff" (or "Local Interstellar Cloud") that is moving towards the Solar System. Stretched out towards Constellation Cygnus, the stellar winds of young stars in a star-forming region of the Scorpius-Centaurus Association near the Aquila Rift (a high-density molecular cloud) have been blowing the Local Fluff so that its denser parts may reach the Sun's heliosphere in around 50,000 years (Straizys et al, 2003).





Mysterious Cosmic 'Dark Flow' Tracked Deeper Into Universe

From Science Daily

Distant galaxy clusters mysteriously stream at a million miles per hour along a path roughly centred on the southern constellations Centaurus and Hydra. A new study led by Alexander Kashlinsky at NASA's Goddard Space Flight Center in Greenbelt, Md., tracks this collective motion -- dubbed the "dark flow" -- to twice the distance originally reported.

"This is not something we set out to find, but we cannot make it go away," Kashlinsky said. "Now we see that it persists to much greater distances -- as far as 2.5 billion light-years away." The new study appears in the March 20 issue of *The Astrophysical Journal Letters*.

The clusters appear to be moving along a line extending from our solar system toward Centaurus/Hydra, but the direction of this motion is less certain. Evidence indicates that the clusters are headed outward along this path, away from Earth, but the team cannot yet rule out the opposite flow. "We detect motion along this axis, but right now our data cannot state as strongly as we'd like whether the clusters are coming or going," Kashlinsky said.

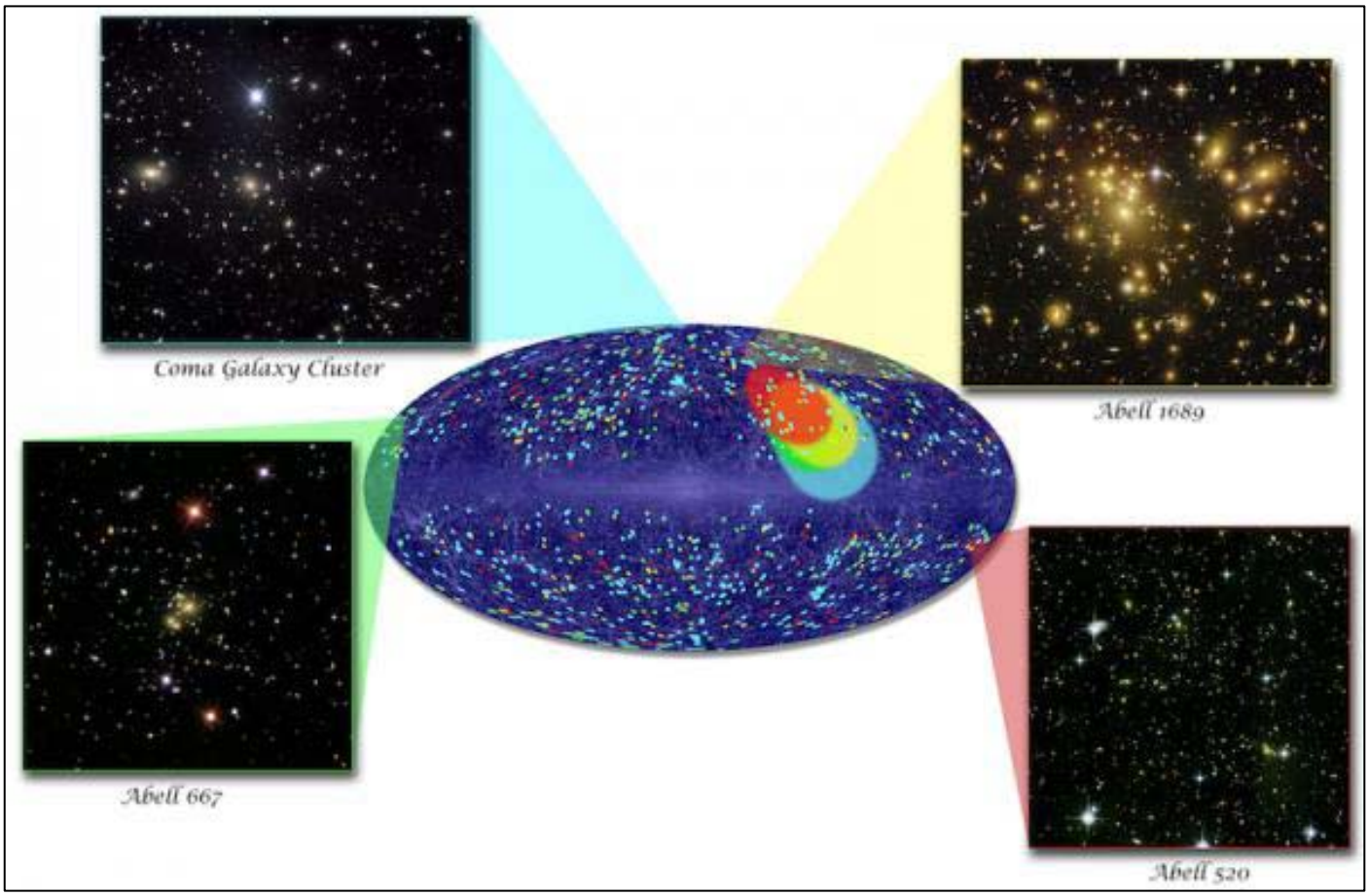
The dark flow is controversial because the distribution of matter in the observed universe cannot account for it. Its existence suggests that some structure beyond the visible universe -- outside our "horizon" -- is pulling on matter in our vicinity.

Cosmologists regard the microwave background -- a flash of light emitted 380,000 years after the universe formed -- as the ultimate cosmic reference frame. Relative to it, all large-scale motion should show no preferred direction.

The hot X-ray-emitting gas within a galaxy cluster scatters photons from the cosmic microwave background (CMB). Because galaxy clusters don't precisely follow the expansion of space, the wavelengths of scattered photons change in a way that reflects each cluster's individual motion.

This results in a minute shift of the microwave background's temperature in the cluster's direction. The change, which astronomers call the kinematic Sunyaev-Zel'dovich (KSZ) effect, is so small that it has never been observed in a single galaxy cluster.

But in 2000, Kashlinsky, working with Fernando Atrio-Barandela at the University of Salamanca, Spain, demonstrated that it was possible to tease the subtle signal out of the measurement noise by studying large numbers of clusters.



The coloured dots are clusters within one of four distance ranges, with redder colours indicating greater distance. Coloured ellipses show the direction of bulk motion for the clusters of the corresponding colour. Images of representative galaxy clusters in each distance slice are also shown. (Credit: NASA/Goddard/A. Kashlinsky, et al.)

In 2008, armed with a catalogue of 700 clusters assembled by Harold Ebeling at the University of Hawaii and Dale Kocevski, now at the University of California, Santa Cruz, the researchers applied the technique to the three-year WMAP data release. That's when the mystery motion first came to light.

The new study builds on the previous one by using the five -year results from WMAP and by doubling the number of galaxy clusters.

"It takes, on average, about an hour of telescope time to measure the distance to each cluster we work with, not to mention the years required to find these systems in the first place," Ebeling said. "This is a project requiring considerable follow-through."

According to Atrio-Barandela, who has focused on understanding the possible errors in the team's analysis, the new study provides much stronger evidence that the dark flow is real. For example, the brightest clusters at X-ray wavelengths hold the greatest amount of hot gas to distort CMB photons. "When processed, these same clusters also display the strongest KSZ signature -- unlikely if the dark flow were merely a statistical fluke," he said.

In addition, the team, which now also includes Alastair Edge at the University of Durham, England, sorted the cluster catalogue into four "slices" representing different distance ranges. They then examined the preferred flow direction for the clusters within each slice. While the size and exact position of this direction display some variation, the overall trends among the slices exhibit remarkable agreement.

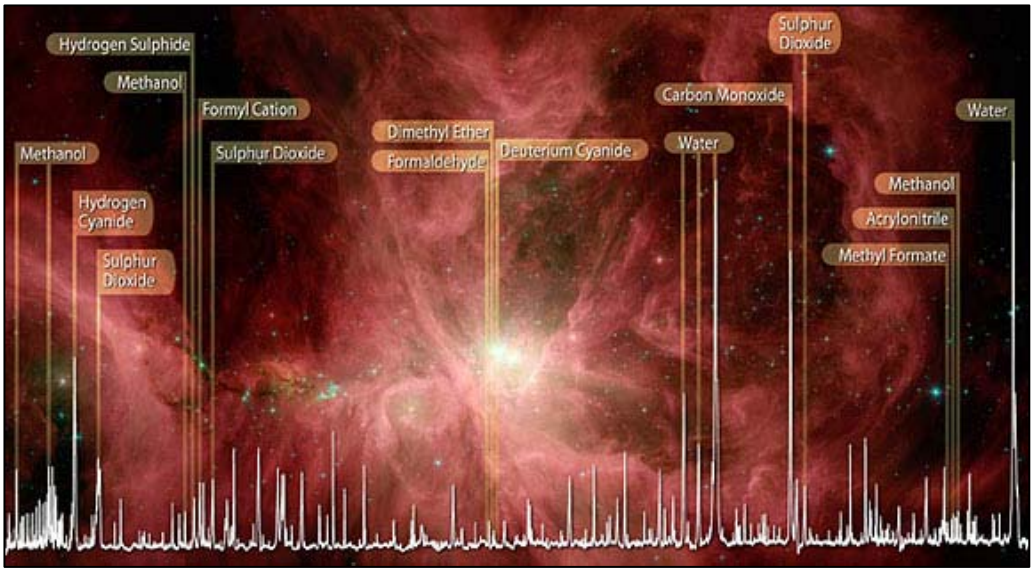
The researchers are currently working to expand their cluster catalogue in order to track the dark flow to about twice the current distance. Improved modelling of hot gas within the galaxy clusters will help refine the speed, axis, and direction of motion.

Future plans call for testing the findings against newer data released from the WMAP project and the European Space Agency's Planck mission, which is also currently mapping the microwave background.

Herschel Finds Possible Life-Enabling Molecules in Space

From Astrobiology.net

The Herschel Space Observatory has revealed the chemical fingerprints of potentially life-enabling organic molecules in the Orion nebula, a nearby stellar nursery in our Milky Way galaxy. Herschel is led by the European Space Agency with important participation from NASA.



The new data obtained with the telescope's heterodyne instrument for the far infrared, one of Herschel's three innovative instruments, demonstrates the goldmine of information that Herschel will provide on how organic molecules form in space.

The Orion nebula is known to be one of the most prolific chemical factories in space, although the full extent of its chemistry and the pathways for molecule formation are not well understood. By sifting through the pattern of spikes in the new data, called a spectrum, astronomers have identified a few common molecules that are precursors to life-enabling molecules, including water, carbon monoxide, formaldehyde, methanol, dimethyl ether, hydrogen cyanide, sulphur oxide and sulphur dioxide.

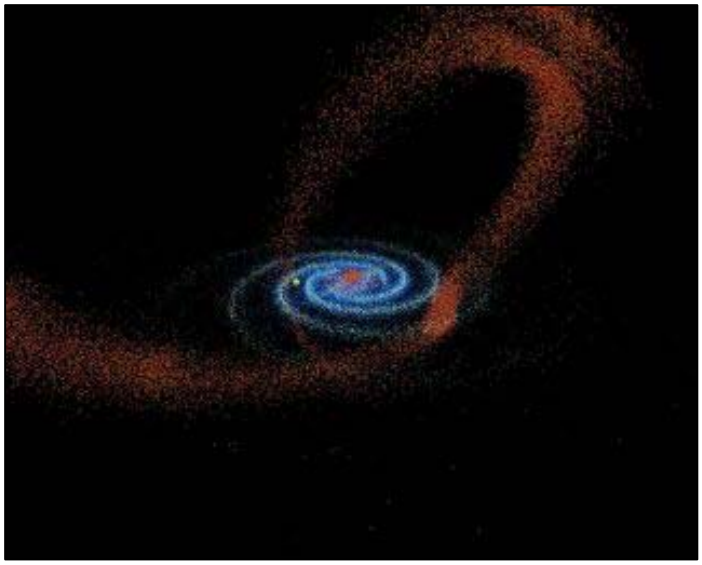
Herschel is a European Space Agency cornerstone mission, with science instruments provided by a consortia of European institutes and with important participation by NASA. NASA's Herschel Project Office is based at NASA's Jet Propulsion Laboratory, Pasadena, Calif. JPL contributed mission-enabling technology for two of Herschel's three science instruments. The NASA Herschel Science Center, part of the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena, supports the United States astronomical community. Caltech manages JPL for NASA.

Milky Way's Dark Matter Halo

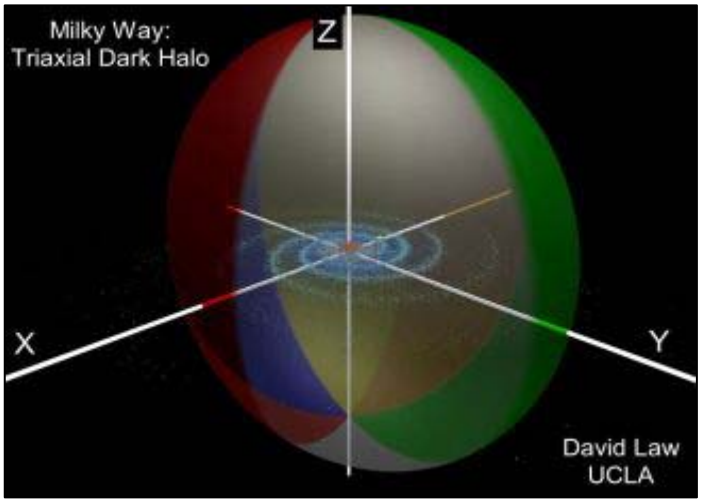
From solstation.com

In January 2010, a team of astronomers announced at the 215th Meeting of the American Astronomical Society that the cloud of dark matter that surrounds our Milky Way galaxy appears to be shaped like a "squashed beach ball" that is oriented perpendicularly to the galaxy's spiral disk. The team studied the path of a dwarf galaxy called the Sagittarius dwarf elliptical or spheroidal galaxy, whose stars have been "shredded" into a long tidal stream as the smaller galaxy was gravitationally drawn into a merger with the Milky Way beginning some three billion years ago. Their hypothesis is that the gravitational pull of the Milky Way's immense halo of surrounding dark matter should have shaped the trajectory of the tidal stream of stars ripped from the Sagittarius galaxy as it was drawn in.

Their study of this "debris" stream of stars suggests that the distribution of dark matter around the Milky Way is very different from that of the galaxy's stars and gas matter seen in luminous ordinary matter. Although computer simulations had suggested that the halo should mimic the Milky Way's spiral disk of stars, the team's results indicate that the dark halo is oriented roughly



The "tidal stream" of a small galaxy merging into the Milky Way (SagDEG), detected using red (M) giant stars from the Two-Micron All Sky Survey (2MASS), was analysed to suggest the shape of the Milky Way's halo of dark matter.



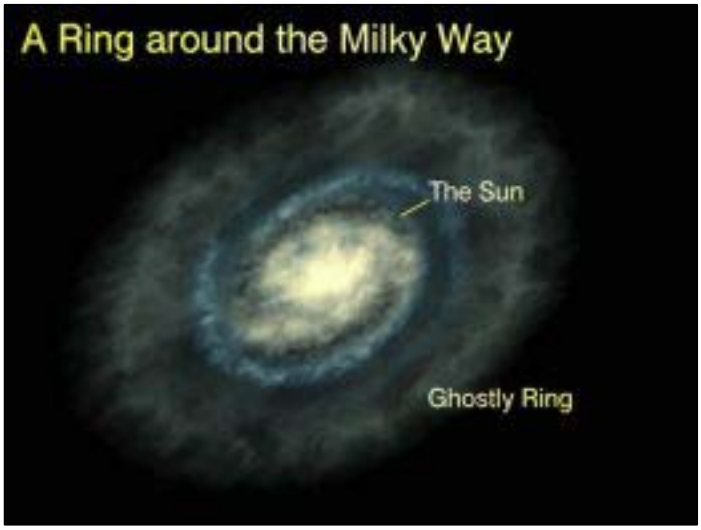
The Milky Way's halo of dark matter is oriented roughly perpendicularly to the spiral disk in the shape of a squashed beach ball -- Sol's location is marked by the yellow dot

perpendicular to the disk and is distributed roughly half as thick as it is wide.

Dark Matter in the Cosmos

Our universe may have suddenly inflated from a tiny point during the Big Bang (now estimated to have occurred around 13.7 billion years ago) to create dark energy (74 percent) and dark matter (22 percent), as well as a small amount (four percent) of ordinary matter in the form of electrons and quarks in a superhot plasma. Small clouds of dark matter have been coalescing and gradually merging together through gravitational attraction ever since that incredible explosion. Although dark matter makes up as much as 85 percent of all the matter in the universe, astronomers do not actually know what it is composed of. When a sufficient amount of dark matter has gathered, it attracts ordinary matter (mostly hydrogen and helium gas) to form stars that may eventually form a luminous galaxy at the core. While particles of ordinary matter readily interact with one another and, if electrically charged, with electromagnetic radiation, dark matter is comprised of particles that do not react with such radiation, although dark matter interacts gravitationally just like ordinary matter .

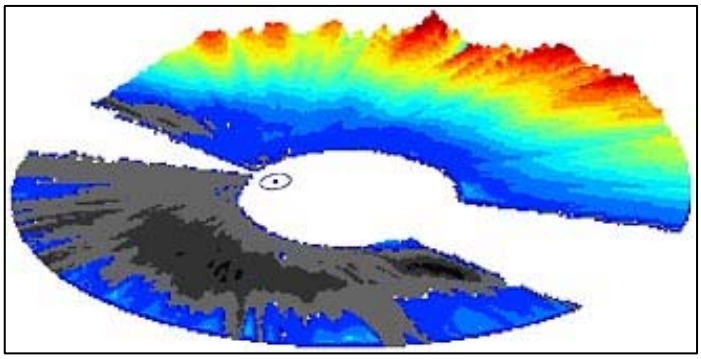
On January 7, 2007, a team of astronomers announced that they had used observations obtained with the Hubble Space Telescope to create a three-dimensional map of the large-scale distribution of dark matter in part of the universe. This map provides the best evidence to date that normal matter, largely in the form of galaxies, accumulates along the densest concentrations of dark matter. It depicts a loose network of dark-matter filaments that grew over time and intersect in massive structures at the locations of clusters of galaxies. Stretching halfway back in time to the beginning of the universe, the map shows how dark matter has grown increasingly "clumpy" as it collapses under gravity. The map supports theories of how structure developed in the evolving universe, which has transitioned from a comparatively smooth distribution of matter at the time of the Big Bang. Dark matter filaments began to form first and so provided an underlying scaffolding for the subsequent development of stars and galaxies from ordinary matter.



The Milky Way's bright ordinary matter is composed of a spiral disk and outer ring, which in turn is embedded in a larger luminous halo that is only the visible part of an even larger halo of dark matter.

The presence of dark matter around the Milky Way was first detected by its gravitational effect on the galaxy's rotation curve, the orbital velocity of the observable stars or gas clouds in orbit around the galactic core. Astronomer Vera Cooper Rubin found over decades of radio observations that the rotational velocity of clouds of ionized hydrogen (HII regions) in spiral galaxies like the Milky Way was not decreasing at increasing distance from their galactic cores, like the velocity of the planets around the Sun. Rubin's finding of relatively flat rotation curves far beyond the reach of the visible matter of galaxies is believed to be possible only if the observed galaxies have large amounts of non-luminous mass in their extended haloes.

Dark Halo around the Milky Way



An image, to scale, of the asymmetric, warped hydrogen layer of the Milky Way newly mapped by UC Berkeley astronomers. The coloured contours are warped "up" with regard to the galactic plane, while the grey contours are warped "down." The white area at the centre is where most of the stars are, and the position of the Sunn is given by the dot with a circle around it. The Sun orbits the centre of the galaxy and is moving to the upper right in this view. The white areas, including the wedges, are difficult to study from Earth because of our position within the disk. (Credit: Leo Blitz/Carl Heiles/Evan Levine-UC Berkeley)

The Milky Way's dark halo is believed to outmass the galaxy's normal matter by around a factor of 20. While the inner edge of the luminous hypothesized outer ring that surrounds the spiral disk of the Milky Way may be around 120,000 light-years (ly) across, the dark halo encompasses and permeates even the enormous luminous halo of scattered individual stars and globular clusters, extending some 300,000 to 400,000 ly out from the galactic centre in radius (twice that in diameter). In 2006, a team of scientists modelled the process by which dark matter "clouds" are attracted to form the Milky Way's dark halo. They simulated the development and movement of 234 million "cloudlets" as they come together to form a dark halo about the same size as that around the Milky Way. Their simulations show that there should be at least 10,000 separate "sub-haloes" of dark matter within the overall galactic halo, each at least a few thousand light years across. Over time, a fair number of these galactic "seeds" should have attracted ordinary matter (mostly hydrogen and helium gas) to form star clusters. About 120 of the larger clumps of dark matter should have become large enough to have attracted enough gas to become dwarf galaxies, although astronomers have identified about 15 dwarf satellite galaxies around the Milky Way thus far.

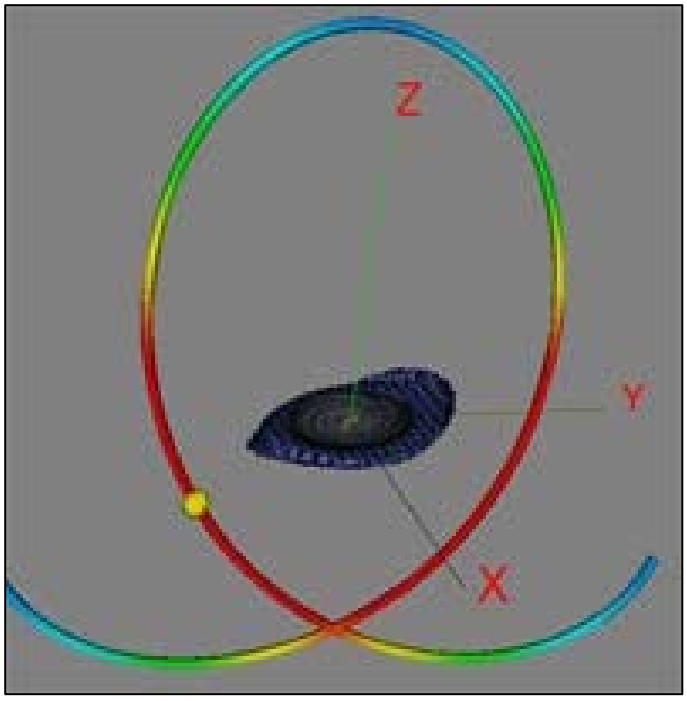


Illustration shows how the Magellanic Clouds (yellow bead) produce the warp observed in the hydrogen gas layer of the Milky Way Galaxy, which is in the middle. The position of the Sun is about halfway out in the picture of the galaxy along the line marked X. The cross-hatched area represents the warped hydrogen layer at the present time. The looping line is the orbit of the Magellanic Clouds and the position of the bead on the line represents the location of the clouds at the present time. The orbital period is about 1.5 billion years. (Credit: Martin Weinberg/Leo Blit

It is possible that many sub-haloes did not form dwarf galaxies because dark matter has some property that prevents it from forming dense clumps. For example, it might be unexpectedly hot, and therefore hard to compress. Many astronomers currently believe, however, that there are other explanations for the paucity of observed satellite companions around the Milky Way. It may be that most of the sub-haloes were sterilized by ultraviolet light from the earliest stars, which heated up intergalactic gas so that that it has been more difficult for sub-haloes to capture. In addition, supernova explosions may have blasted gas out of many early dwarf galaxies, halting their continued development.. In November 2009, two astronomers revealed supporting evidence that Smith's Cloud may be surrounded by a massive dark halo.

Astronomers have detected evidence that dwarf satellite galaxies are disturbing the cocoon of dark matter around the Milky Way and causing its disk to warp. In 1957, astronomers surveying galactic hydrogen gas discovered that the Milky Way is not flat but warped near its edges like a fedora hat, with one side of its spiral disk curving as much as 20,000 light years above the main galactic plane and the other dipping a little less below it. While some researchers suspected the warp was caused by the two Magellanic Clouds (nearby satellite galaxies that orbit the Milky Way every 1.5 billion years), subsequent calculations showed they alone were not massive enough to produce the disk's warp. In January 2006, a team of researchers announced finding evidence that the Magellanic Clouds can account for the warp but only because their motion around the Milky Way generates a powerful gravitational wake within the massive dark halo. As the Magellanic Clouds orbit the Milky Way, computer simulations indicate that the galactic disk ripples over time and its edges ruffle "like a table cloth in the breeze". On January 9, 2007, astronomers announced that new measurements of the velocities of the Magellanic Clouds through space suggest that the Milky Way's combined dark and visible mass must be twice as much as originally thought if the Clouds are truly orbiting satellites of the galaxy.

GOD : the failed hypothesis.

How science shows that god does not exist."

Presenter **: Glenn Urquhart. (Past President of Auckland Astronomical Society. Previous Director of Auckland Observatory. Forty years experience in science education.)**

Where : Owen Glenn Building, University of Auckland.

When: Tuesday 18th of May at 7:30 pm. (FREE admission)

Abstract

The immense size and complexity of the Universe, and the strangeness of the micro-world has led lay people and some scientists alike to assume that nature must forever remain largely shrouded in mystery. In the 21st century however, we now have a very good understanding of what centuries ago seemed like unfathomable mysteries.

Modern Physics and Cosmology provides us with a huge data base of information and evidence gathered by our senses and scientific instruments. Far from representing unfathomable mysteries, existing Physics and Cosmology describe a Cosmos that is well within the grasp of our intellect.

The existence or non-existence of gods , is by definition, a scientific question simply because the god hypothesis makes certain claims about the nature of the Universe. The science of Astronomy and in particular Cosmology are so poorly understood that what is now known about the Cosmos is largely unknown to most of humanity. Not only is there a total lack of any evidence for god, but the evidence clearly points to his non-existence.

Scorpius

The Mythology of the Constellations

By Ivan Vazey, with thanks to the Hawaiian Astronomical Society

In Greek mythology Orion the hunter is tied in with Scorpius. Orion liked to bore the fairer sex with tales of his prowess (as a hunter of course). Hera, Zeus's wife, got a trifle annoyed and sent a poisonous scorpion to kill him. Orion fought with the scorpion for days but when his back was turned the creature stung him to death.

Zeus felt pity for him (and anyone else that got on the wrong side of Hera) and placed him in the heavens to watch over Greece. Hera was far from finished. She placed the Scorpion to the other side of the sky to annoy Orion.

Orion continues to avoid Scorpius by hiding below the horizon until the creature has disappeared before arising himself. Scorpius still receives punishment as Zeus carefully placed Sagittarius above Scorpius so that when they are in the Eastern sky, boiling hot water from the teapot pours all down Scorpius. You can see the steam from it arising as the Milky Way.

An interesting fact from Hawaii is that Scorpius's sting is actually their demi-god Maui's fishhook. Maui was out fishing with his brothers, when he hooked a huge object. While his brothers paddled, Maui proceeded to pull the land of Hawaii up out of the ocean. (True story. Sorry if it sounds familiar to you.)

There are a multitude of beautiful Clusters to look at in this area.

M7 NGC 6475, also known as Ptolemy's cluster, is not far from Scorpius's stinger. (Ptolemy summarised the ancient knowledge of astronomy as well as geography and music. (Some of his ideas have withstood the test of time)

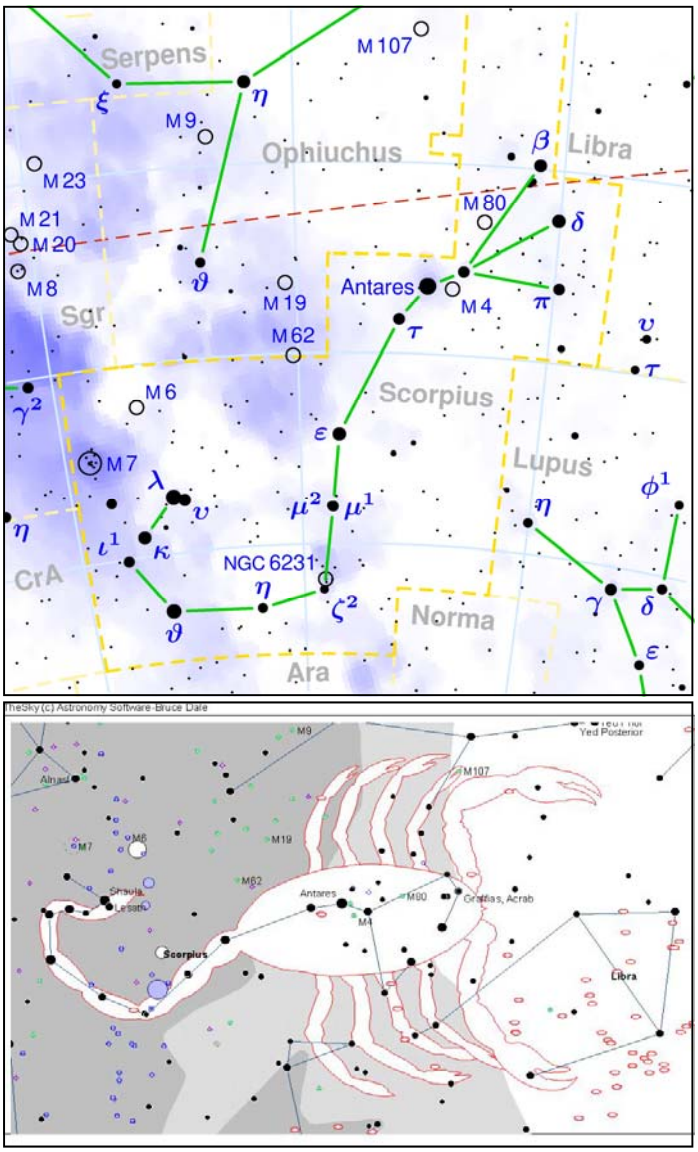
NGC6441 2.3 deg SSW of M7.

M6 NGC6405, 5deg NNE of Shaula.

Bug Nebula Caldwell 69 4deg W of Shaula.

M4 1.3deg W of Antares was described by Dreyer as an Open Cluster, but is now defined as a loose Globular.

M80 NGC6093 4.5deg NW of Antares, a poor cousin to M4, being far more condensed.



Scorpius rising in the south eastern sky from about 10:00pm from early May

Society Telescopes For Hire

The society has a wide range of telescopes for hire to members.

If you are looking to purchase or upgrade a telescope and are not sure what to buy, this is a very good way to evaluate some of the available equipment. See also the advertisement on the back page.

To inquire about hiring or for advice on what to buy and for information about equipment, contact Ivan Vazey, curator of instruments, on (09) 535-3987

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