New Zenith

The Monthly Magazine of the Vectis Astronomical Society

Vol 21 Issue 3 — April 2013

When Printed, this Newsletter costs VAS at least £1

Society News

Junior Night

My attempt to attract junior members (*see February NZ page 1*) was very disappointing. Anyhow, I intend to start a monthly, junior only club night starting on **Friday April 5th at 7pm -** *this will run as a trial for 3 months.*

Junior members and their parents are welcome to attend and as Friday is not a school night, we should have plenty of time to get some observing done. Of course we are reliant on good weather for that but whatever happens I hope "Junior Night" will become a regular fixture on the first Friday of each month.

Tools and Equipment

We have recently purchased a selection of new, good quality tools to help with maintenance and general repairs at the observatory. Everything is kept in a toolbox so please return all tools after use.

Observatory Visits

Recent visits by Scouts and Brownies have been well received and have resulted in almost £100 in additional donations to VAS in the last month or so.

There are more bookings (*see page 2*) for later this month and April.

IW Astronomy Equipment

Good news this month from Paul England at the Island Planetarium.

Paul has added the SkyWatcher and Vixen brands to his dealership. For more details and contact information, please see his advert on page 9.

Articles Needed

If you have pictures or articles you would like to share with other members, please send them to the Editor before 6th of each month. Contact details are at the top Right of this page - any file format is OK, *even paper ;)*

Clear Skies!
Brian Curd
Observatory Director

VAS Website: www.wightastronomy.org

Submissions or letters to New Zenith are always welcome and should be sent to:

The Editor New Zenith
35 Forest Road
Winford
Sandown PO36 0JY
Tel: **01983 864303** or email: **editor@wightastronomy.org**

Material for the next issue by the 6th of the month please.

VAS Registered Office

35 Forest Road, Winford, Isle of Wight, PO36 0JY

The Vectis Astronomical Society and the Editor of the New Zenith accept no responsibility for advice, information or opinion expressed by contributors.

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Observatory Diary

Monday, 19.30hrs	Members Only by arrangement Telescope and night sky training. Contact Barry Bates 01983 872979
Thursday, 19.30hrs	Members and Public. Informal meeting and observing.

Contents this Month

Monthly Meeting Calendar 2013

Check the website for up to the minute information.

Travel for our monthly speakers is sponsored by:

Date	Subject	Speaker
22 Mar	Active Galaxies	Nick Hewitt
Apr	Answering the biggest questions with the biggest surveys Pt II	Dr Tom Kitching
May		
28Jun	Little Green Things- Detecting Life on Earth and Exoplanets	Martin Williams
Jul		
24 Aug	Cosmic Rays - to infinity and beyond **AGM - Start at 19.00hrs**	Chris Woods
27 Sep		
25 Oct	Radio Astronomy	Dr Sadie Jones
Nov		

All details correct at time of publication.

Do You Know a Speaker?

As you can probably see, we are have some spaces at the moment. If you know anyone who can help, or perhaps you would be prepared to have a go, please contact Elaine Spear at ***progorg@wightastronomy.org***

VAS Contacts 2013	
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Others	Barry Bates Mark Williams

Observatory Visits Booked

We have bookings for the observatory on the following dates - Visits by external groups are important to fund raising, please try to avoid using the facilities on these dates.

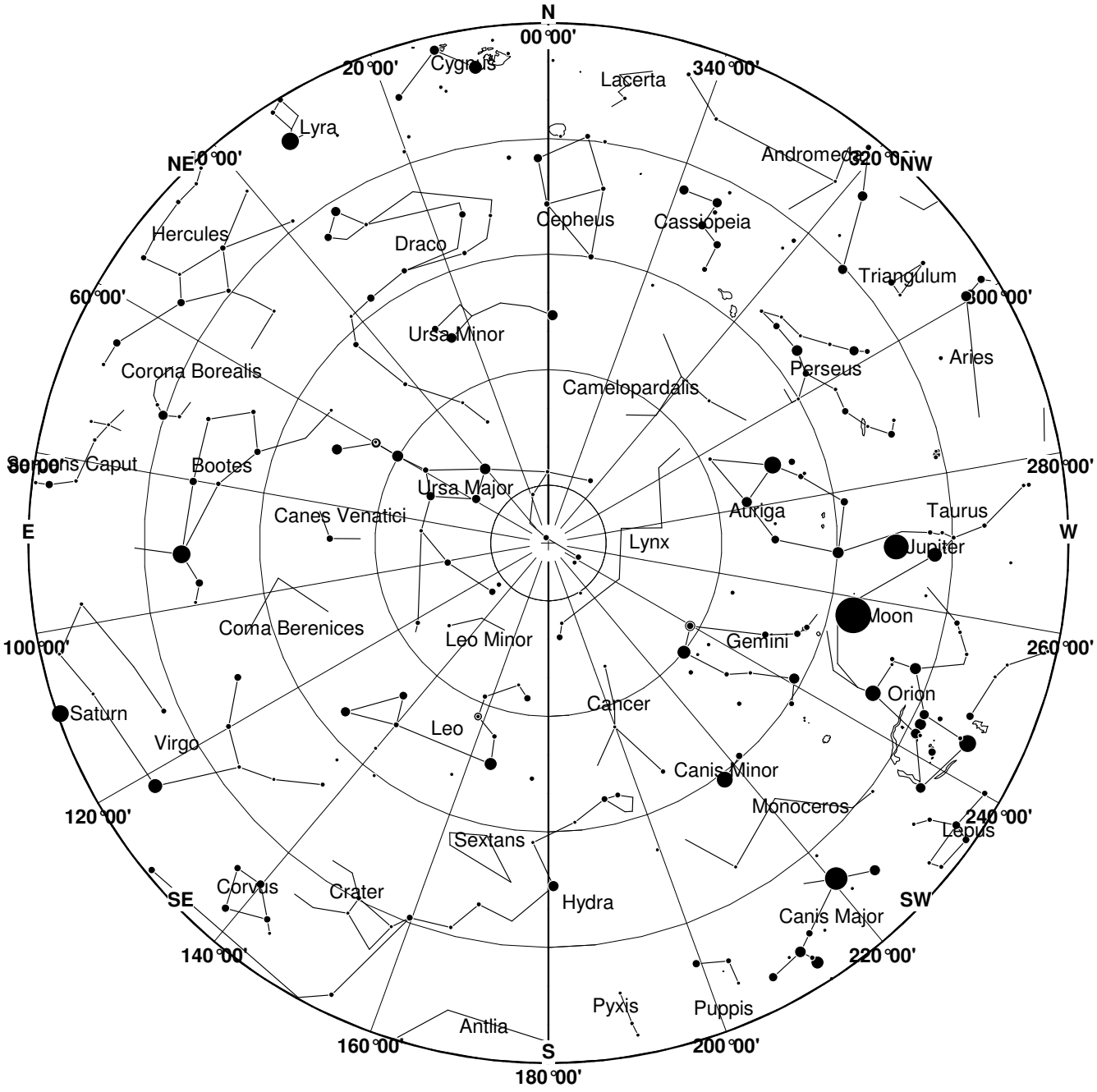
Day & Date	Booking Group
Tue 26 Mar	*Cowes Wine Club* - 19.30-22.30
Fri 4 Apr	*Junior Night* - 19.00-21.00
Mon 8 Apr	*Island Interest Group* - 13.00-1400
Thu16 May	*VAS Member's BBQ* - 19.30-22.00

All details correct at time of publication.

National Trust - Talk at the Needles

Brian and Nigel visited the Needles Battery last Saturday for an evening with the National Trust. Unfortunately the weather was against us with stormy winds etc. However, following a talk to the 15 visitors who braved the conditions, the skyies cleared and we were able to view the Moon, Jupiter, Andromeda and M42 quite well.

April 2013 Sky Map



View from Newchurch Isle of Wight UK - 2100hrs - 15 April 2013

NGC 5866 is a relatively bright lenticular or spiral galaxy in the constellation Draco. Probably discovered by Pierre Méchain or Charles Messier in 1781, and independently found by William Herschel in 1788. NGC 5866 has an extended dust disk, which is seen exactly edge-on. This dust disk is highly unusual for a lenticular galaxy. The dust in most lenticular galaxies is generally found only near the nucleus and generally follows the light profile of the galaxies' bulges. This dust disk may contain a ring-like structure, although the shape of this structure is difficult to determine given the edge-on orientation of the galaxy. It is also possible that the galaxy is a spiral galaxy that was misclassified as a lenticular galaxy because of its edge-on orientation, in which case the dust disk would not be too unusual

April 2013 Night Sky

Moon Phases

New	1st Qtr	Full	Last Qtr
10th	18th	25th	3rd

Planets

Mercury

Mercury makes a very poor appearance in the morning during the first few days of the month. At our latitude it will not be visible, being at best only about 5 degrees above the horizon at sunrise.

Venus

In the last week of the month Venus may be glimpsed very low on the western horizon just after sunset. As the month ends it is only 8 degrees east of the Sun.

Mars

Mars is too close to the Sun to be visible.

Jupiter

Jupiter is now passed its best for this apparition. At the start of the month it can be found high in the south western sky as darkness falls, but with the reducing hours of darkness, by the end of the month it is quite close to the horizon. Make the most of this planet while you can.

Saturn

This month and next Saturn is as well placed for observation during this apparition, and better placed than it will be for several years to come. Look for it in the south at around midnight in constellation of Libra close to the border with Virgo, about half way between the bright stars Antares and Spica, the brightest stars in Scorpius and Virgo.

Uranus & Neptune

Both outer planets are too close to the Sun to be observed until late summer.

Deep Sky Objects

NGC5866/M102 Spindle Galaxy RA 15h 7m Dec 55° 44' mag 10.5

Is this really M102 ? Did Messier ever see this galaxy or was it all a great mistake, and just a duplicate observation of M101, perhaps we will never know. An almost perfectly edge on galaxy, visually it lives up to its name, small telescopes show it as a silvery spindle of light against a hopefully dark background. Larger 'scopes may, if the seeing is good enough show a thin dust lane cutting through the central bulge.

M101 The Pin Wheel Galaxy RA 14h 3m Dec 54° 18' mag 8.5

In contrast to M102 this is a large, almost perfectly face on galaxy. Covering an area of sky about a quarter of that of the ful moon this galaxy is visually not as bright as its magnitude might suggest, but as galaxies go it is still quite easy to find and is visible as a dim smudge on the sky in a pair of binoculars.

NGC2903 Galaxy RA 9h 32m Dec 21° 28' mag 9.6

When comet hunting Charles Messier did not find all the fuzzy objects that could be mistaken for these elusive visitors to our skies. There are many relatively bright galaxies that he could have put into his catalogue if his telescope had happened upon them. NGC2903 is one of these; commonly regarded as one of the best NGC objects for small telescopes it is a large almost face on barred spiral galaxy. This is a young galaxy with a much higher rate of star formation than our own Milky Way. In larger telescopes this activity can be glimpsed in the spiral arms which have a mottled appearance when viewed with averted vision.

Peter Burgess

Higgs Boson Discovery Confirmed

GENEVA — *It helps solve one of the most fundamental riddles of the universe: how the Big Bang created something out of nothing 13.7 billion years ago.*

In what could go down as one of the great Eureka! moments in physics – and win somebody the Nobel Prize – scientists said Thursday that after a half-century quest, they are confident they have found a Higgs boson, the elusive subatomic speck sometimes called the "God particle."

The existence of the particle was theorized in 1964 by the British physicist Peter Higgs to explain why matter has mass. Scientists believe the particle acts like molasses or snow: When other tiny basic building blocks pass through it, they stick together, slow down and form atoms.

Scientists at CERN, the Geneva-based European Organization for Nuclear Research, announced in July that they had found something that looked like the Higgs boson, but they weren't certain, and they needed to go through the data and rule out the possibility it wasn't something else.

On Thursday, they said they believe they got it right.

"To me it is clear that we are dealing with a Higgs boson, though we still have a long way to go to know what kind of Higgs boson it is," said Joe Incandela, a physicist who heads one of the two main teams at CERN, each involving about 3,000 scientists.

Galaxy & Mass Assembly, GAMA

Lecture report 22 February 2013

Dr. Jon Loveday

Astronomy Centre - University of Sussex

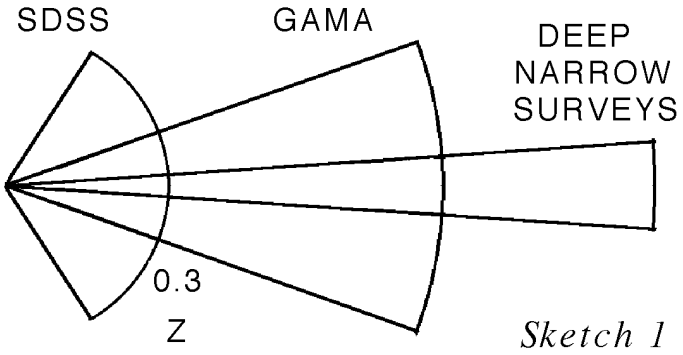
Amateurs are familiar with a number of popular writers who have associations with Sussex University's well-known Astronomy Centre, founded in 1965 in collaboration with the Royal Greenwich Observatory, then at Herstmonceux. In this lecture, the contrast between the work of amateurs making visual studies of individual objects and professionals observing millions of galaxies using computer strategies and the world's best instruments in space and on mountain tops, was very apparent. Often their output is graphical or statistical, concerning clustering, merging, star formation rates, luminosity distributions and so on, but this lecture also contained visual simulations, photographs of telescopes and galaxies, dust and dark matter mapping, all in the interests of finding out the properties of our Universe.

The lecturer is co-author of the following very useful small reference book, well-illustrated with portraits, pictures, and diagrams: "Oxford Companion to Cosmology" Andrew Liddle and Jon Loveday, Oxford University Press, 2009.

In this report, the few approximate Sketches are from notes, giving mere glimpses into this lecture.

1 pc = 1 parsec = 3.26 light years.
1 kpc = a thousand pc. 1 Mpc = a million pc.
1 Gyr = a gigayear =1 billion years.
1 square-degree = 5 full Moon areas - see March NZ lecture report.
z = redshift.

Surveys like UKIRT, VISTA, VST, SDSS, GALEX MIS, GMRT, ASKAP, Herschel-ATLAS and WISE were listed according to their wavelength coverages, from ultraviolet light to radio. The 'windsock' diagram of the evolution of the Universe took us from the Big Bang, via inflation and the dark ages, to the first stars and galaxy formation, arriving today at WMAP and the cosmic microwave background.



Sketch 1

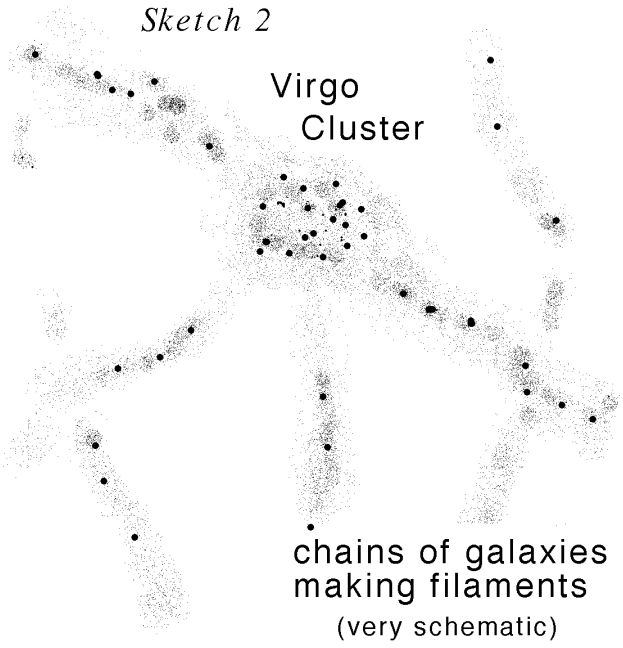
The GAMA project, begun in 2008, uses the facilities of the Anglo-Australian Telescope AAT and the AAOmega spectrograph. It fills an observational gap, ***Sketch 1***, between the wide-angle, shallow (i.e. small z range = small distance range) Sloan Digital Sky Survey SDSS and the deep but narrow angle or pencil beam surveys made, for example, with the Hubble Space Telescope.

GAMA is a multi-wavelength photometric and spectroscopic survey, looking at structure on scales of 1 kpc to 1 Mpc, aiming to find out how matter assembled into filaments, clusters, groups and galaxies, seeking particularly information on:-

- the mass distribution in haloes of dark matter,
- how stellar masses depend on halo mass,
- which baryon feedback processes are the most important in determining galaxy stellar mass functions.

The GAMA-1 survey covered three 48 square-degree regions centred on the equator. Two regions, Gama-09 and Gama-15 (the numbers are right ascensions to the nearest hour) correlate with primary targets in the SDSS catalogue to red-magnitudes of 19.4, going deeper to 19.8 in the Gama-12 region. The shifts of spectral lines of magnesium, calcium and other metals, enable redshifts to be measured. The spectrograph covers wavelengths 400 - 800 nanometres, using 350 galaxy fibres placed into position by a robot.

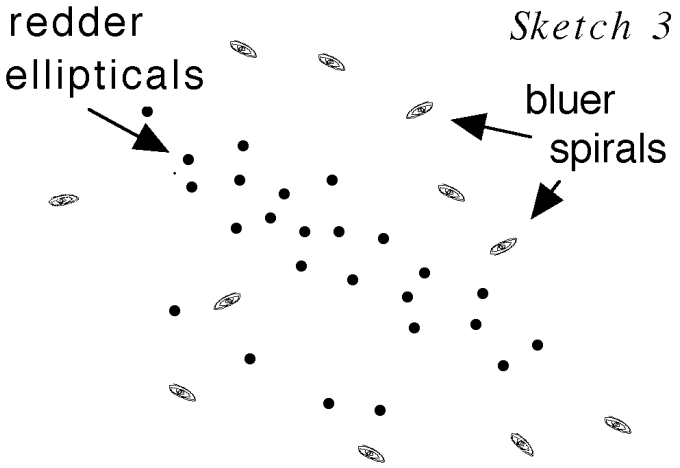
Sketch 2



The first release of the GAMA database was in June 2010, the second release is due this month[1]. GAMA-2 covered 360 square degrees, containing 375,000 targets, analysis is continuing.

The galaxy formation era was put into perspective with the familiar computer simulation of the evolving Universe, looking at spongy structure formation within a 15 Mpc thick slice, from a box of 700 Mpc side-length (2 billion light-years) containing 10 billion particles, done on a supercomputer[2]. The box edges 'comove' with the expanding universe, like sampling a rising sponge cake with an expanding sample volume, so the sample always contains mostly the same material. During cosmic evolution, slight over-densities caused the condensation of cold dark matter, made of particles travelling much slower than the speed of light. This was followed by baryons (normal matter). We saw structural snapshots at z=18.3 and 5.7, arriving today at z=0. When magnified, clusters like Virgo are seen sitting on straggly chains of galaxies forming filaments winding through voids, see ***Sketch 2***.

Galaxies form within dark matter haloes, containing a central luminous galaxy with numerous fainter satellite galaxies and spiral galaxies occur around clusters of elliptical galaxies, ***Sketch 3***.

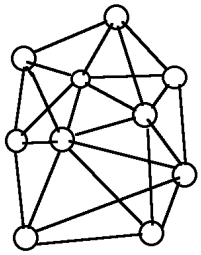


Sketch 3

Finding GAMA-MM1 - an Analogue of the Milky Way with its own 'Magellanic Clouds' and an 'M31' nearby. To understand galaxies in the distant Universe, it helps to understand the Milky Way and the local group of galaxies and make comparisons. This is just like studying the Sun helps us to understand stars and, *vice versa*, understanding stellar histories, places our Sun into historical context and tells us about its future.

The Small and Large Magellanic clouds (of the Southern hemisphere) are difficult to simulate by computer, and their physics is not easy to understand, especially as there are *two* of them. What is their cosmic history?

To answer this (and many other questions) GAMA has catalogued hundreds of thousands of 'neighbour relations' between galaxies, ***Sketch 4***, using 'Friends-of-friends' computer algorithms. This is not easy because distances to galaxies estimated by Hubble's law and z measurements, are additionally affected by 'peculiar velocities' which include components perpendicular to the observer's line of sight. These cannot be measured directly because galactic angular speeds across the sky are infinitesimally close to zero. Oversimplifying - there's a lot of physics here involving hierarchical granulations - the procedure is to model the motions of the galaxies until the group exhibits isotropic behaviour, otherwise peculiar velocities can make galaxies seem further away than they really are.


Sketch 4

Having done this, it is then possible to search the GAMA catalogue, 'dialling in' specific characteristics, particularly searching for those galaxies possessing two Magellanic cloud analogues at approximately the correct distances from the host galaxy with a mass close to that of the Milky Way. This task is impossible to do manually since the sky is brimming with galaxies of various types and computer data-handling techniques are essential to measure their separations, masses and so on. Finding the answer would yield more data about our Milky Way and its environment (gas, dust, dark matter, etc) that favoured its formation, and *vice versa*, we would know more about the physics of galaxy groups out there which resemble our own Local Group. The rather extraordinary result was only one such system closely resembling the Milky Way was found within the angular limits of GAMA.

Having located this system, its Right Ascension and Declination enabled the exact image to be found in the SDSS catalogue. It is pictured in reference[3] together with a Table of precise RA and DEC data, including the counterpart Magellanic Clouds and an amazing nearby galaxy resembling M31. This Milky Way analogue galaxy has a red magnitude of 15.25 (similar to Pluto) and is near to Canis Minor. Its z is 0.05. This corresponds to a recession speed of 0.05 times the speed of light = 15000 km/sec. Using the Hubble constant of 73 km per sec per Mpc (see the reference book in the preamble) gives its range as 205 Mpc about twice as far as the Coma cluster.

This illustrates how statistical information can be used to 'home in' on very interesting individual targets. It also illustrates the term 'environment' in relation to the evolution of galaxies because it appears that the presence of M31 is not just coincidental to the Milky Way, but may increase the chances of binary infalling galaxies such as the Magellanic clouds, during the formation of our galaxy. By widening the specifications, other similar Milky Way mass galaxies at different stages in their formation have been observed, suggesting that binary Magellanic clouds might participate in vigorous merger events later[3]. Only 0.4% of such galaxies have close star-forming companions of similar mass to the Magellanic Clouds.

The larger picture appearing from GAMA involves cone diagrams and many graphs, helping to answer other questions such as - how important are 'mergers'? -

suggested by the brightness of isolated large galaxies. Thus a picture is being assembled from galactic mass, halo mass, luminosity functions, velocity dispersions, photometry, dynamical mass determinations using the Virial equation and clustering correlation functions - these measure the excess probability, above random, of finding two galaxies at specified separations and allow for line of sight overlapping and field edge effects, needing 'random catalogues'. The Abell radius (1.5 Mpc) used to count the number of galaxies within this distance from a cluster centre, defines 'richness' - but if you ask what sort of galaxies should be included then today you meet modern subjects such as "Group statistics", and so on. This explains all the mathematics, all the computing and the large graphical output of this subject, including the many functions and trends that characterize our Universe.

Some broad conclusions expressed verbally are:-

- *the star formation rate peaks at z=1, declining slowly toward z=6 (in the early universe).*
- *the comoving number density of blue galaxies increases with redshift, while that of red galaxies decreases.*
- *brighter galaxies are more strongly clustered.*
- *simulation underpredicts luminosity variation.*
- *faint red galaxies are very strongly clustered on small scales whereas isolated galaxies tend to be bluer.*
- *blue galaxies are more numerous at higher redshift (earlier in the Universe) dominating the overall luminosity density at z > 0.2.*
- *at lower densities, luminosity density is dominated by red galaxies.*
- *For z<1 (nearer universe) galaxies evolve more passively as the stars age, with occasional activity when galaxies collide.*
- *the first major burst of star formation is delayed for low mass galaxies.*
- *there are fewer low-luminosity galaxies than predicted by cold dark matter simulations.*
- *interpretation of these simulations is subject to uncertainties in baryon physics. More effective feedback in low mass haloes might suppress the faint end of the luminosity function.*
- *the number of dwarf galaxies may have been underestimated due to a correlation between luminosity and surface brightness, making them hard to detect.*
- *there are relativity few faint galaxies in groups.*
- *the fraction of faint galaxies decreases with increasing group richness and mass.*

This all places tighter constraints on theories of galaxy formation and evolution[4].

Additional information included the gas content of the edge-on galaxy **NGC 891** measured by radio. Analysis of other passbands of the cosmic spectral energy density will follow, reprocessing data in a consistent way.

Discussion

A question about "random catalogues" and boundary conditions led to - What stops all the material within the computer box simulation of the evolving Universe from collapsing into the middle? It was understood that the box is repeated so it tessellates space, preventing gravitational collapse within the given box. These simulations do not involve matter moving faster than light. Dark matter has a simpler physics than compressible gases and determining the halo mass function is a good way to set the initial conditions. There are galaxies beyond the cosmic horizon and their light hasn't yet had time to reach us. An intrepid question from the back was, "What are the goals of this research?" A quick resumé of the goals brought us to coffee time.

References

(For arxiv refs, enter "arxiv" and the number into Google search, abbreviated titles are used below.)

[1] www.gama-survey.org
[2] http//www.mpa-garching.mpg.de/galform/press/
[3] arxiv 1208.4293 - Robotham A.S.G et al, "GAMA: In Search of MMAs"
[4] arxiv 1111.0166 - Loveday J et al "GAMA: luminosity functions"

Competition

I will donate **three prizes** of the *Oxford Companion to Cosmology* to any VAS members who produce angularly calibrated photographs or sketches of the region of nightsky showing *the location* of GAMA-MM1 (see [3] Table 2 for data) using their home or VAS equipment, which may include use of the Observatory.

Submit entries to the Editor please and they might be seen at a Newport meeting and be published in the NZ with discussion of equipment, methods, etc.

Dr. Guy Moore

Essays from a beginner:

On Lurking

Q: *How many astronomers does it take to change a lightbulb?*
A *None. Astronomers aren't afraid of the dark.*

This is just as well, as I have been skulking about in some very black places recently. How dark is dark? At present VAS has a project to assess the night sky across the whole Island, so I borrowed the society's sky quality meter to help find out. Unfortunately this requires a sacrifice: abandoning the telescope on a decent observing night. I called up a Puritan ideal of service, and dumped myself into the car.

In principle, you and the gadget need a clearish but moonless night. You stop; map your location; turn off car lights so as not to confuse the meter; point thing at zenith; press button; beep beep beep beep beep; wait for a figure to display in friendly red digits; write down. Repeat five times to check consistency of readings. Move on and do it again... and again... and again... until your chosen bit of the Island is covered with little dots for the survey.

I soon learned the following:

1. Stop in a car park or layby unless you like the excitement of near-miss road accidents
2. Quite modest potholes grow huge and deep in the dark and become ankle-breakers
3. Clouds love sky quality meters, so be quick before they all come to join you
4. Leave the keys in the ignition or you'll be playing hunt-the-slipper in the dark
5. Tie the pencil onto the clipboard (or ditto)
6. Don't put the meter down randomly (ditto ditto)
7. If the meter doesn't seem to be working, try turning it right way up
8. Be ready to explain yourself to passing drunks, property owners and policemen

The meter collects up photons and calculates a mysterious number described as 'magnitudes per square arc second'. Please don't ask me what this means - except that a well-lit room might give a reading of 10, the sky above a heavily lit street 17 or 18, and a dark sky more than 20. It was very simple to use - no fiddling in the dark required.

Town centre readings were predictably horrible, but I was surprised to find that in a semi-rural car park with street lights on two sides the meter consistently read 20 plus. The darkest sky I found was in the backblocks behind Yarmouth with readings in excess of 21.9. And the scariest place was the layby right on the edge of the cliff on Afton Down. I pulled in cautiously, knowing that cars have occasionally gone over the edge, but was not alarmed until I turned the car lights off and everything disappeared into solid blackness. Paradoxically, the drop was far more vertiginous when invisible, and I judged it discreet to remain RIGHT by the car.

And the result? Twenty or so snapshots in time: a tiny step towards understanding the sky.

Rebecca Mitchelmore

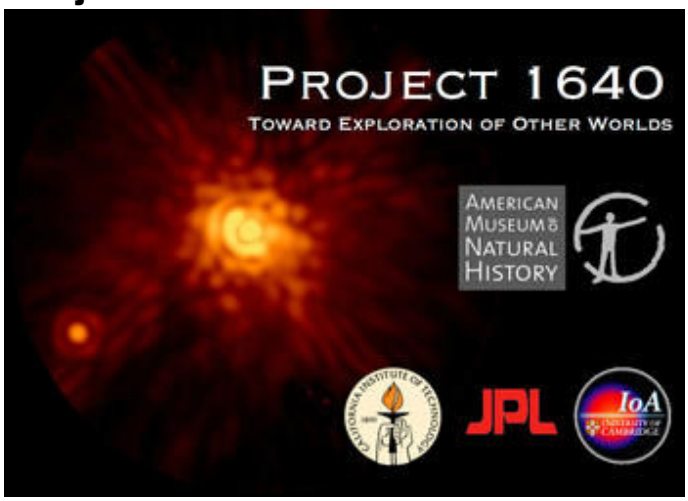
Magnitudes per Square Arc Second

Magnitudes *are a measurement of an objects brightness, for example a star that is 6th magnitude is brighter than a star that is 11th magnitude.*

The term ***arcsecond*** *comes from an arc being divided up into seconds. There are 360 degrees in an circle, and each degree is divided into 60 minutes, and each minute is divided into 60 seconds. A square arc second has an angular area of one second by one second.*

The term ***magnitudes per square arc second*** *means that the brightness in magnitudes is spread out over an square arcsecond of the sky. If the SQM provides a reading of 20.00, that would be like saying that a light of a 20th magnitude star brightness was spread over one square arcsecond of the sky.*

Project 1640



Project 1640 conducts remote reconnaissance of planetary systems around stars other than the Sun. Specifically it is designed to image planets orbiting nearby stars and to acquire low-resolution spectra of them simultaneously. It is currently the most advanced and highest contrast imaging system in the world and was successfully installed at the Palomar 200-inch telescope July 2008, with a major upgrade and additional control systems added by June 2012. The project involves optical instrumentation, built at the AMNH, Cambridge University's Institute of Astronomy, the Jet Propulsion Laboratory and Caltech.

Observations at Palomar are on-going for a 3-year survey of some 200 nearby stars to find any type of object orbiting them. The primary goal is comparative spectroscopy of young, warm giant planets around these stars, to understand the range of planets extant, and how they form and evolve.

The combination of an extreme adaptive optics system, an advanced coronagraph and hyperspectral imager, and a unique wavefront sensor calibration unit, allows for the detection of objects up to ten-million times fainter than a star within a field of view of 4 arc seconds. This project involves efforts in science-grounded instrument conception and design; optical, mechanical and electrical engineering; development of novel techniques for the manipulation and control of light from distant stars at the level of λ/1000; systems engineering and integration; control and data reduction software; software for the identification and spectrum extraction of possible stellar companions—an effort that includes expertise from the field of computer vision; advanced detector control; and all of the tools of modern astronomy brought to bear on the fundamentally difficult problem of high-contrast imaging: astrometry, coronagraphy, spectroscopy, photometry and various aspects of point-source analysis and signal processing.

More at: ***The American Museum of Natural History***

New Curiosity 'Safe Mode' Status Expected to Be Brief

Mar. 18, 2013 — NASA's Mars rover Curiosity is expected to resume science investigations in a few days, as engineers quickly diagnosed a software issue that prompted the rover to put itself into a precautionary standby status over the weekend.

Curiosity initiated this automated fault-protection action, entering "safe mode" at about 8 p.m. PDT (11 p.m. EDT) on March 16, while operating on the B-side computer, one of its two main computers that are redundant to each other. It did not switch to the A-side computer, which was restored last week and is available as a back-up if needed. The rover is stable, healthy and in communication with engineers.

The safe-mode entry was triggered when a command file failed a size-check by the rover's protective software. Engineers diagnosed a software bug that appended an unrelated file to the file being checked, causing the size mismatch.

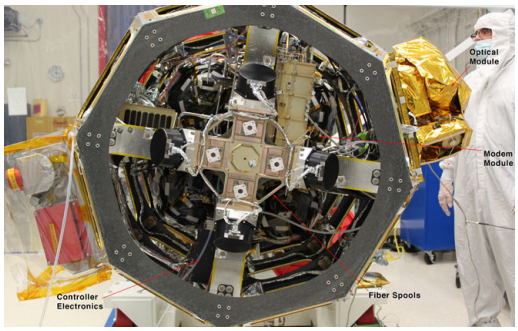
"This is a very straightforward matter to deal with" said the project manager for Curiosity, Richard Cook of NASA's Jet Propulsion Laboratory, Pasadena, Calif. "We can just delete that file, which we don't need any more, and we know how to keep this from occurring in the future."

More at: ***http://www.sciencedaily.com***

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

Space Laser Communication System, Ready for Launch



A new NASA-developed, laser-based space communication system will enable higher rates of satellite communications similar in capability to high-speed fiber optic networks on Earth.

The space terminal for the Lunar Laser Communication Demonstration (LLCD), NASA's first high-data-rate laser communication system, was recently integrated onto the Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft at NASA's Ames Research Center, Moffett Field, Calif. LLCD will demonstrate laser communications from lunar orbit to Earth at six times the rate of the best modern-day advanced radio communication systems.

"The successful testing and integration of LLCD to LADEE is a major accomplishment," said Donald Cornwell, LLCD mission manager at NASA's Goddard Space Flight Center in Greenbelt, Md. "It demonstrates that this new technology is robust and ready for space. This is the first time NASA has had such a communication system pass all its tests and be certified flight ready."

The real challenge of LLCD will be to point its very narrow laser beam accurately to ground stations across a distance of approximately 238,900 miles while moving. Failure to do so would cause a dropped signal or loss of communication.

"This pointing challenge is the equivalent of a golfer hitting a 'hole-in-one' from a distance of almost five miles," said Cornwell. "Developers at the Massachusetts Institute of Technology's (MIT) Lincoln Laboratory have designed a sophisticated system to cancel out the slightest spacecraft vibrations. This is in addition to dealing with other challenges of pointing and tracking the system from such a distance. We are excited about these advancements."

More at: ***NASA Website***

NASA's Webb Telescope Gets Its Wings

Mar. 18, 2013 — A massive backplane that will hold the primary mirror of NASA's James Webb Space Telescope nearly motionless while it peers into space is another step closer to completion with the recent assembly of the support structure's wings.

The wings enable the mirror, made of 18 pieces of beryllium, to fold up and fit inside a 16.4-foot (5-meter) fairing on a rocket, and then unfold to 21 feet in diameter after the telescope is delivered to space. All that is left to build is the support fixture that will house an integrated science instrument module, and technicians will connect the wings and the backplane's center section to the rest of the observatory. The center section was completed in April 2012.

More at: ***Science Daily***

Observatory

For your own safety, when visiting the VAS observatory, please bring a torch. Also, please make sure you close and lock the car park gate if you are the last to leave - if you need the combination to the lock, please contact a member of the committee.

Articles Needed

New Zenith needs letters, articles or pictures related to all aspects of astronomy. Contributions to the Editor please at the email or postal address on the front page.

"I ask you to look both ways. For the road to a knowledge of the stars leads through the atom; and important knowledge of the atom has been reached through the stars."

Sir Arthur Eddington

Quotations

"When you are courting a nice girl an hour seems like a second. When you sit on a red-hot cinder a second seems like an hour. That's relativity"

Albert Einstein

"Physics is experience, arranged in economical order"

Ernst Mach