Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

January – March 2014

Forthcoming Events

WEA Course

Thursdays 8.00 pm at the Observatory

6th February – 13th March

Public Open Evening

(for National Astronomy week)

(note Friday)

7th March: 7.30 pm

New format will be that Public Open Evenings will be on a Thursday evening and will comprise a talk or film show, with a clear night for observation being a bonus!

Section meets at the Observatory every Tuesday evening at 8.00 pm

Inside

Inserts

Star chart

Sunset, sunrise, moonset and moonrise times

The Rare Meteor, Asteroid and Comet Events of 2013.

In 2013 there were several very rare astronomical events. An asteroid passing by the Earth at what was reported to be the closest ever distance, another substantial object from the asteroid belt exploding over a Russian city in the strongest atmospheric blast since 1908, and a special sun-grazing comet on a first time visit to the inner region of our solar system.

It was a more amazing surprise that the first two of these events happened on the same day - on the morning and evening of February 15th.

The asteroid which exploded over the Russian city of Che1yabinsk came from the east at sunrise on that remarkable day, when no telescope was able to see its arrival, until it was first seen from the ground shortly before exploding violently. It seems that many Russian drivers have cameras fitted in their cars, for evidence in the case of an accident, and the asteroid's descent and explosion were captured on film. When the many filming records were examined scientifically, it was found that the asteroid was travelling at around 40,000 mph before exploding into meteorite fragments. The object was estimated to have been about 17 metres in diameter before fragmenting, and with a weight of around 10,000 tons. The massive explosion, about twelve to fifteen miles above the surface, was estimated to be about thirty times more powerful than one of the first atomic bombs, at Hiroshima. It was the most powerful event since the Tunguska, Siberian forest meteor airburst of June 30th 1908, to the north of Lake Baikal. In the most recent event over the city of Chelyabinsk, a large number of people were injured, mostly by flying glass from broken windows and the strong shock wave.

A large number of meteorite fragments were collected, and analysis showed that the meteor had been of a stony and iron composition. Further examination from records of the event produced information including the duration, direction and energy released by the object. The path and direction of the object was found from a study of the changing length and angle of lamp post shadows in the very bright airburst, and the object was found to have come from the asteroid belt between Mars and Jupiter. Many people also reported feeling heat from the object as it passed and exploded high in the atmosphere. Scientists mostly dismissed these claims, because of the altitude of the event, but later accepted the reports when it was calculated that the radiation from the object could have been as great as the temperature of the Sun's surface.

On the evening of the same day, an asteroid designated 2012 DA14 was reported to be passing very close to the Earth, at a distance of less than a tenth of the Moon's distance. It was reported that the object would pass by about 17,000 miles above Indonesia, but with an assurance to the public

from NASA that there was no danger of a collision.

This was reported to be the closest ever passing by of a substantial asteroid, and Paul Chodas - of NASA's Near-Earth Object Programme, commented that it was incredible that two significant and rare events had happened on the same day.

The last event of the year involved a comet, one of the quite rare sun-grazing type comets. This one was discovered by Russian astronomers in September 2012, making observations as part of the International Scientific Optical Network. Comet ISON was first seen when it was still beyond the orbit of Jupiter. This was further out than would be expected for a comet discovery. The surprising brightness of the comet at this time suggested that it would become very bright as it approached close to the Sun. The comet was an important one, being the only one known to be at the same time a very close sun-grazer and a first time visitor to the inner region of the solar system, unlike many other comets which have shorter period orbits around the Sun, and are therefore seen on regular visits even if these can be a great many years apart in some cases.

Comets, however, are very unpredictable in their appearance and development as they come closer to the centre of the solar system. As it turned out in Comet Ison's case, and was expected could happen, this comet passed too close to the Sun. It came within less than one diameter of the Sun's surface, and mostly broke up as it made a tight turn around the Sun to continue on its outward return path.

Geoff Falla

Astronomical Events in 2014
as seen from Guernsey

This year we have a Mars opposition, and can expect good views of Jupiter and Saturn. Again no eclipses, but two daytime occultations of planets by the Moon, and two favourable meteor showers.

PLANETS

Mercury will be visible in the periods around its greatest elongations:

Date	Elongation	Direction to look	Time
31 January	18º Eastern	Low in west	After sunset
14 March	27º Western	Low in East	Before sunrise
25 May	25º Eastern	Low in West	After sunset
12 July	21º Western	Low in East	Before sunrise
21 September	25º Eastern	Very low in West	After sunset
01 November	19º Western	Low in East	Before sunrise

The best times will be the mornings in mid-July and late October/early November, and in the early evenings in late January/early February, and mid to late May.

Mercury will undergo a daylight occultation by the Moon on 26 June (see below for details).

After inferior conjunction on 11 January, **Venus** appears as the 'Morning Star' in the east from mid-January, reaching maximum brightness (-4.6) on 11 February, and maximum elongation on 22 March. It is at superior conjunction on 25 October, and in December it will appear low in the west after sunset. It is in conjunction with Jupiter on 18 August (see details under 'Jupiter', below).

At the beginning of the year **Mars** rises at midnight, rising earlier and earlier as the weeks go by. It will be at opposition in Virgo on 08 April at a distance of 93 million km (58 million miles), with a magnitude of -1.5, and subtending an angle of 15 arc-seconds. It will continue to be visible for the rest of the year, getting low in the southwest as the year progresses.

Jupiter is at opposition on 05 January in the middle of Gemini, and, as last year, will be dominating our evening skies in the first few months of the year, especially as it will be high in the sky at a declination of almost +23º. Being amongst fairly bright stars, it will be interesting to watch its weekly movement during this period, especially as it will be making a loop, reversing direction at the end of the first week of March. We will virtually lose it in the evening twilight by the end of June. After superior conjunction on 24 July it will start to appear before sunrise in July, low in the east, moving higher in ensuing months.

We can expect excellent views of its moons, atmospheric bands on its disc, and the Great Red Spot. Transit, shadow and occultation events involving Jupiter's moons can be calculated using a Java script at http://tinyurl.com/24kp25 (remembering to enter the date in the US format: month/day/year). They can also be simulated on software such as StarryNight (http://www.starrynightstore.com/).

The transit times of the Great Red Spot can be found at http://tinyurl.com/muladt. They can also be seen on StarryNight software, but remember to set the Jovian System longitude to the current value (203º at the time of writing) as shown on the *Sky and Telescope* website. It should be entered at *Local Disk (C:) → Program Files → Starry Night Pro Plus 6 → Sky Data → JupiterGRS*.

At 06.00 BST on 18 August Jupiter will appear just 12 arc-minutes from Venus, with the Beehive (Praesepe) open cluster nearby – a fine sight in binoculars, very low in the East-Northeast.

Saturn starts the year as a morning object, rising in the east in the constellation Libra about 03.00 UT. It

will rise earlier and earlier, and by mid-March will be rising about 23.00. It will reach opposition on 10 May, rising as the Sun sets and visible all night. It will remain visible, progressively as an evening object, until October. With a low declination (about -15°) it will never reach a very high altitude. However, with the rings at over 20° it will still present a beautiful sight in telescopes, and its brightest moons, especially Titan, should be visible. Saturn will be occulted by the Moon during daylight on 25 October (see below for details).

Uranus will be at opposition in Pisces on 07 October, at magnitude 5.7. **Neptune** will be at opposition in Aquarius on 29 August, at magnitude 8.

Star charts showing the positions of planets are available on a number of websites, such as www.heavens-above.com (follow the direct link from the ISS page on our website www.astronomy.org.gg).

MINOR PLANETS

Dwarf planet **Pluto** will reach opposition on 04 July, at magnitude 14, in Sagittarius. Dwarf planet **Ceres**, the largest asteroid, reaches opposition on 16 April, in Virgo at magnitude 6.5, coincidentally with the brightest asteroid **Vesta** (magnitude 5.4), which is at opposition on 14 April, also in Virgo. With Mars's opposition also in Virgo about the same time this should be a good opportunity to see these three objects together. Vesta and Ceres will be 2½º apart, and some 13º north of Mars.

NASA's Dawn spacecraft, which left Vesta in September 2012, is due to arrive at Ceres in February 2015. For more information see http://dawn.jpl.nasa.gov/

The other three named dwarf planets (Eris, Makemake and Haumea) are too faint to be seen in most amateur telescopes.

ECLIPSES

Yet again a year noted for its absence of notable eclipses, at least as far as Guernsey is concerned.

Ardent observers could see just the start of a lunar eclipse on 15 April, when the Moon enters the Earth's penumbra just before it sets. It starts at 05.51 BST, and the Moon sets at 06.19, well before the start of the umbral phase at 06.57. Hardly worth getting up for, especially as the Sun will be rising at the same time, making this penumbral eclipse virtually invisible!

A total lunar eclipse on 08 October will not be visible from Guernsey.

An annular eclipse of the Sun will be visible from Antarctica, Australia and the southern Indian Ocean on 29 April. A partial solar eclipse on 23 October will be seen from North America.

The good news is that eclipses of both the Sun and Moon will be visible from Guernsey in 2015!

OCCULTATIONS

A daytime occultation of Mercury by the Moon will take place between 12.43 and 13.31 BST on 26 June. The Moon will be just a very thin sliver of a crescent, so it is likely to be very difficult to observe this event. Also, as the Sun will be only 10° away great care should be taken to shield the Sun from view.

Saturn will be occulted by the Moon (again a thin sliver) on 25 October, between 16.07 and 18.07 BST, ie just before sunset. If trying to observe this event, avoid looking at the Sun, especially with a telescope or binoculars.

CONJUNCTIONS

Date	Approx time	Objects	Separation (º)
02 January	16.30 UT	Moon, Venus	1.5
22 February	01.00 UT	Moon, Saturn	2.1
26 February	04.30 UT	Moon, Venus	0.25
21 March	01.30 UT	Moon, Saturn	1
17 April	05.30 BST	Moon, Saturn	2
14 May	11.00 BST	Moon, Saturn	0.6
08 June	23.00 BST	Moon, Mars	2
10 June	21.00 BST	Moon, Saturn	1.5
21 June	03.00 BST	Moon, Uranus	0.5
06 July	03.00 BST	Moon, Mars	0.3
08 July	04.00 BST	Moon, Saturn	1
18 August	05.00 BST	Venus, Jupiter	0.2
27 August	21.00 BST	Mars, Saturn	3.6
31 August	21.00 BST	Moon, Saturn	0.25
11 September	02.00 BST	Moon, Uranus	1.1
15 September	01.00 BST	Moon, Aldebaran	0.4
12 October	05.00 BST	Moon, Aldebaran	3
04 November	17.00 UT	Moon, Uranus	0.1
08 November	18.45 UT	Moon, Aldebaran	0.4
13 November	17.30 UT	Venus, Saturn	1.6
02 December	00.30 UT	Moon, Uranus	0.4
06 December	06.00 UT	Moon, Aldebaran	0.5

Further planetary conjunctions are listed at:
http://en.wikipedia.org/wiki/List_of_conjunctions_(astronomy).

METEORS

The **Quadrantids** have a short peak of up to 100 meteors per hour on the 03 January. With New Moon on 01 January, conditions are very favourable. Although the peak activity is predicted to be about 19.30 UT, more meteors might be seen later in the night.

The **Perseids** peak on 12/13 August, again with up to 80 per hour. Conditions, however, are not favourable, as this year it coincides with a very bright Moon.

The **Leonids**, characterised by fast meteors with persistent trains, peak on 17 November, but are not expected to be particularly active this year, with a maximum of perhaps just 15 per hour.

The **Geminids** will probably be the best meteor shower of the year, with some 100 per hour at its peak on the night of 13/14 December. This year the Last Quarter Moon will not rise until 23.30 pm, so evening observation will be favourable.

There are, of course, many other, more minor meteor showers during the year, and sporadics may be seen at any time. The International Meteor Organisation's calendar at www.imo.net/calendar/2014 give full details of meteor showers.

COMETS

After the roller-coaster excitement of **Comet ISON** (C2012 S1) last year, resulting in disappointment only partially ameliorated by the appearance of Comet Lovejoy, there is little to expect in 2014, barring the unexpected discovery of a new bright one. **Comet Lovejoy** (2013R1) will continue to be well placed in the morning sky, but fading.

The best one might be **Comet PanSTARRS** (2012 K1), visible faintly for much of the year, but brightening to perhaps 6th magnitude in September, when it will be a morning object in Hydra.

The European Space Agency's *Rosetta* spacecraft, launched in 2004, is due to enter orbit around Comet 67P/Churyumov–Gerasimenko in May. In November it will release a lander named *Philae*, which is due to attach itself to the comet.

Detailed comet predictions for 2014 are available on the website of the British Astronomical Association's Comet Section: www.ast.cam.ac.uk/~jds/preds14.pdf, and star charts showing comet positions can be found on the Heavens-Above website (www.heavens-above.com).

THE SUN

Sunspot numbers (and solar activity) have varied considerably over the last couple of years, and the solar cycle appears to be past its peak. Nevertheless, displays of the aurora borealis (and australis) can be expected at high latitudes, and may occasionally be spotted from Guernsey, possibly as a red (or green)

glow over the northern horizon. Details of sunspot numbers are at www.ips.gov.au/Solar/1/6, and auroral alerts, with lots of other information, is at www.spaceweather.com.

EQUINOXES AND SOLSTICES

The following are the dates and times of the equinoxes and solstices in 2014:

Vernal Equinox	20 March	16.56 UT
Summer Solstice	21 June	11.51 BST
Autumnal Equinox	23 September	03.28 BST
Winter Solstice	21 December	23.02 UT

SATELLITES

The International Space Station (ISS) is regularly visible from Guernsey, looking like a very bright star crossing our skies from west to east. Also of interest are flashes from the Iridium satellites, and periodic launches of the ISS servicing spacecraft such as Soyuz or SpaceX Dragon. Many other, fainter, satellites appear every night. Details of the times and directions of visibility (together with sky charts and much more) can be obtained from www.heavens-above.com, linked from our website, www.astronomy.org.gg.

WEA COURSE

The Astronomy Section's annual six-week WEA "Star Gazing" course at the Observatory runs from 06 February to 13 March. It is usually over-subscribed, and early enrolment is recommended. The 2015 course is likely to be announced first at www.wea.org.gg in November 2014, or telephone WEA Guernsey at 237888.

OPEN DAYS

An Open Evening at the Observatory will be held from 18.30 UT on 09 January, in association with BBC TV's *Stargazing Live* series. A further Open Evening will be held from 19.30 UT on 07 March in association with *National Astronomy Week*.

A special Open Day will be held on Bank Holiday Monday, 26 May, from 10.30 to 12.30 BST for solar observation.

The Observatory will be open on Thursday evenings after dark during the summer school holidays, from 24 July to 28 August.

A final Open Evening will be held from 18.00 UT on 30 October.

Details will apppear in the Astronomy Section newsletters, in local media, and are on the Astronomy Section website (www.astronomy.org.gg).

REFERENCES

SkyMap Pro and *Starry Night Pro* software

RAS diary 2014

The Handbook of the British Astronomical Association 2014

Wikipedia

CALENDAR OF ASTRONOMICAL EVENTS

Month	Date	Time	Event
January	02		Earth at perihelion
January	02	16.30 UT	Conjunction of Moon and Venus (1.5º)
January	03		Quadrantid meteor shower (favourable)
January	05		Jupiter at opposition in Gemini
January	08		Comet ISON near Polaris
January	09	18.30 UT	Observatory Open Evening
January	11		Venus at inferior conjunction
January	31	After sunset	Mercury at greatest eastern elongation
February	06	19.30 UT	WEA course starts at Observatory
February	11		Venus at maximum brightness (-4.6)
February	22	01.00 UT	Conjunction of Moon and Saturn (2.1º)
February	26	04.30 UT	Conjunction of Moon and Venus (0.25º)
March	07	19.30 UT	Observatory Open Evening
March	13	19.30 UT	WEA course – final class
March	14	Before sunrise	Mercury at greatest western elongation
March	20	16.56 UT	Vernal Equinox
March	21	01.30 UT	Conjunction of Moon and Saturn (1º)
March	30	01.00 UT	BST starts
April	08		Mars at opposition in Virgo
April	14		Vesta at opposition in Virgo (mag 5.4)
April	15	05.51 BST	Penumbral eclipse of the Moon
April	16		Ceres at opposition in Virgo (mag 6.5)
April	17	05.30 BST	Conjunction of Moon and Saturn (2º)
May			*Rosetta* spacecraft orbits comet
May	10		Saturn at opposition in Libra
May	14	11.00 BST	Conjunction of Moon and Saturn (0.6º)
May	25	After sunset	Mercury at greatest eastern elongation
May	26	10.30 – 12.30 BST	Observatory Open Day
June	08	23.00 BST	Conjunction of Moon and Mars (2º)
June	10	21.00 BST	Conjunction of Moon and Saturn (1.5º)
June	21	03.00 BST	Conjunction of Moon and Uranus (0.5º)
June	21	11.51 BST	Summer Solstice
June	21	12.43 – 13.31 BST	Daytime occultation of Mercury by Moon
July	04	All night	Pluto at opposition in Sagittarius (mag 14)
July	04		Earth at aphelion
July	06	03.00 BST	Conjunction of Moon and Mars (0.3º)
July	08	04.00 BST	Conjunction of Moon and Saturn (1º)
July	12	Before sunrise	Mercury at greatest western elongation
July	24	21.00 BST	Observatory Open Evening
July	31	21.00 BST	Observatory Open Evening
August	07	20.30 BST	Observatory Open Evening
August	12/13		Perseid meteor shower (unfavourable)
August	14	20.30 BST	Observatory Open Evening
August	18	05.00 BST	Conjunction of Venus and Jupiter (0.2º)
August	21	20.30 BST	Observatory Open Evening
August	27	21.00 BST	Conjunction of Mars and Saturn (3.6º)
August	28	20.30 BST	Observatory Open Evening
August	29		Neptune at opposition in Aquarius (mag 8)
August	30	20.30 BST	Observatory Open Evening

August	31	21.00 BST	Conjunction of Moon and Saturn (0.25º)
September		Morning	Comet PanSTARRS 6th magnitude
September	11	02.00 BST	Conjunction of Moon and Uranus (1.1º)
September	15	01.00 BST	Conjunction of Moon and Aldebaran (0.4º)
September	21	After sunset	Mercury at greatest eastern elongation
September	23	03.28 BST	Autumnal Equinox
October	07		Uranus at opposition in Pisces (mag 5.7)
October	12	05.00 BST	Conjunction of Moon and Aldebaran (3º)
October	25		Venus at superior conjunction
October	25	16.07-18.07 BST	Daytime occultation of Saturn by Moon
October	26	01.00 UT	BST ends
October	30	18.00 UT	Observatory Open Evening
November			*Rosetta* spacecraft's *Philae* lands on comet
November	01	Before sunrise	Mercury at greatest western elongation
November	04	17.00 UT	Conjunction of Moon and Uranus (0.1º)
November	08	18.45 UT	Conjunction of Moon and Aldebaran (0.4º)
November	13	17.30 UT	Conjunction of Venus and Saturn (1.6º)
November	17		Leonid meteor shower
December	02	00.30 UT	Conjunction of Moon and Uranus (0.4º)
December	06	06.00 UT	Conjunction of Moon and Aldebaran (0.5º)
December	13/14		Geminid meteor shower (favourable)
December	21	23.02 UT	Winter Solstice

John Herschel (1948-2013)

Members who peruse the *Family Notices* page of the Guernsey Press may have noticed a recent announcement of the death in the island of John Herschel on 30 November 2013, at the relatively early age of 65. The announcement was followed by an obituary. He had been Manager of Stonelake's the chemist in Smith Street, which firm was, I understand, owned by the family.

Sir John Herschel (1792-1871) was, of course, a famous astronomer, and his father was the even more famous Sir William Herschel (1738-1822), discoverer of Uranus. It appears that the Guernsey John Herschel could claim descent from these illustrious men. This was brought to my attention in 2009 when the Cambridge astronomical historian Michael Hoskin visited us to give a lecture to La Société on the orientations of megalithic tombs. Dr Hoskin has published extensively on the Herschels, and our John Herschel attended the lecture and met him.

There are undboubtedly other descendents of the 19th century Sir John, and who carry the Herschel line, but the Guernsey line continues through John Herschel's son David.

David Le Conte

Christmas Cracker

Watchers of BBC's Christmas University Challenge on 30 December will have seen astronomers Heather Couper and Nigel Henbest on the University of Leicester's team. Heather and Nigel opened our Observatory on 13 March 1991, and gave a lecture on the subject of the possibility of alien life in the universe at a packed Beau Sejour Leisure Centre theatre. This was in the form of a debate, Heather advocating the likelihood of life elsewhere, while Nigel took the opposing view (being dragged off the stage by two 'aliens' at the end of the lecture!). The *Guernsey Press* article on the event had the clever headline: "ET RSVP ASAP".

At the Royal Astronomical Society's National Astronomy Meeting, held in Guernsey in August 1999 to coincide with the total solar eclipse, Heather gave eclipse lectures to conference delegates and to the public.

Leicester beat Sussex hand-down, thanks largely to Nigel's answers to Jeremy Paxman's challenging questions (only a couple of them astronomical ones). A cracking good performance!

David Le Conte

Geoff Falla's regular roundup of articles from popular Astronomy and Space Journals

The Suns Heliosphere. A set of articles focusing on the extensive region surrounding the Sun, varying with the level of solar magnetic activity; including the solar wind outflow - electrically charged particles which cause aurora effects near Earths polar regions and can cause more disruptive effects, and the progress of the spacecraft Voyagers 1 and 2, launched in 1977 and now approaching the outer limit of the heliosphere. (Astronomy Now, September 2013)

Water on Mars - Possibilities of Life? The presence of water ice on Mars, as a major component of its ice caps, has been known for some years. There is now also evidence of past water flows on the planet, and that ice exists just below the surface or at greater depths, over the whole of Mars - but has water on the planet lasted long enough in the past for life to have evolved? (Sky and Telescope, September 2013)

New Analysis of Universe Composition and Age. The first results have been announced from observations made by the Planck spacecraft, launched in 2009 to study the microwave background radiation. The spacecraft, in a position at one of the distant Lagrangian points of neutral gravity, has refined the composition and age of the universe, and is discovering more galaxy clusters than were previously known. (Astronomy, October 2013)

Top Ten Exop1anets. Since the discoveries began in 1995, almost 1,000 planets have been discovered orbiting other stars. Ten of the most interesting and varied exoplanets include one almost Earth-mass planet discovered in 2012, and found to be in orbit around a Sun-like star, in the closest star system to our own Sun. (Astronomy, October 2013)

Comet Ison and Comets in Science and History. Great Comets and Sungrazing comets can be some of the rarest appearances in the night sky. As Comet Ison makes its very close turn around the Sun, information on this comets progress since discovery in September 2012, its path through the sky, and if it survives the close solar encounter, a chance to see it continuing on its outward return journey. (Astronomy, November 2013)

SOFIA - An Airborne Infrared Observatory. A report on a flight into the stratosphere on board a special Boeing 747 airliner, converted into an infrared telescopic observatory. The complex joint project, by NASA and the German Space Centre, involved ten years of development to build and install the 2.5 metre telescope. (Astronomy, November 2013)

The Most Powerful Telescope Ever Built. The ALMA telescope array, a large millimetre to submillimetre array

of antenna dishes, has been built in Chiles Atacama Desert. Observations at these wavelengths are far better than with other telescopes of this kind, and sharper than those obtained from the Hubble Space Telescopes visible light images. (Sky & Telescope, November 2013)

Great Comets of the past Hundred Years. With Comet Ison completing its very close turn around the Sun, a summary of some of the best and brightest naked-eye comets of the past hundred years. (Sky & Telescope, November 2013)

Maths in Astronomy. Calculations are not usually needed to enjoy astronomy apart from knowing, on a solar system scale perhaps, how long it takes for light to reach us, but at a professional level the study of objects involves physics and maths. The Dutch physicist Hendrik Lorentz was a key figure in discovering an equation, which was used by Albert Einstein to describe his special theory of relativity. (Astronomy, December 2013)

Spacecraft Missions, Past and Present. A detailed summary of the various spacecraft missions, what they have achieved in discoveries, and the continuing progress of some of the more recent missions. (Astronomy, December 2013)

Mysterious Travellers. There is still much that is unknown about comets, including their different compositions - ice and other solid material, and why the different compositions of a comet nucleus may lead to a breakup in passing close to the Sun. (Sky & Telescope, December 2013)

Super Galaxies. Some giant galaxies are found to be many times the size of our own Milky Way Galaxy system, up to a thousand times larger than this - but how do such large galactic systems form? (All about Space, Number 19)

Is Life from Mars? Mars is the most Earth-like of all our planets, and it seems quite likely to have developed some kind of life in the past. With water now locked in its ice caps and below the planets surface, evidence of a more substantial atmosphere, running water and active volcanoes also in the past. It is possible that meteorites - with several already found to have a Martian origin, may even have brought life to our own planet.
(All about Space, Number 19)

The Giant Magellan Telescope. A telescope with the worlds largest optical system is now under construction in Chile, at a high altitude site in the Atacama Desert region having remarkably dry air and clear skies. With large mirrors and adaptive optics to fine-tune the image resolution, the telescope is planned to produce images about ten times sharper than can be obtained from the present Hubble Space Telescope. (All about Space, Number 19)

Hunting Exoplanets in the Future. The number of planets now discovered in orbits around other stars has

reached more than a thousand. Many of these have been found by NASAs Kepler Space Telescope, with a great many more awaiting confirmation. The hunt continues for more Earth-like exoplanets, now that the first planetary atmospheres of these have been detected and analysed, and a number of advanced missions are being planned for this purpose. (Astronomy Now, December 2013)

Comets. A set of articles focusing on Comets: a comets life; the inner workings of comets; sungrazer comets (like comet Ison), and the European Space Agency's Rosetta mission, on course to touch down on a comet's core surface in November 2014. (Astronomy Now, December 2013)

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