Visitors
On most Tuesdays in June, July and August we have had visitors to the Observatory. Numbers have varied from a handful to, on one evening, over 70 people! We have often been kept busy from the time we arrive at the Observatory until we leave, usually quite late. We tried to structure the viewing a little but with large numbers it has been difficult. People do seem to have enjoyed themselves with several visitors from previous years returning and others coming each Tuesday that they were on holiday in Guernsey.

Saturn Occultation
Look out for the occultation of Saturn on 3rd November. The planet disappears behind the Moon's bright limb at 9pm and emerges from the dark limb at 10pm.

The Moon
Frank Dowding will be giving a talk about the Moon on Tuesday 13th November at the Obsevatory. Come along and find out more about this popular object. Starts at 8 pm.

Open Evening
Once again the Observatory will be open to the public on 20th November. Previous open evenings have drawn large numbers. Jupiter and Saturn will be on view. We hope for clear skies.

Christmas Get Together
For those of you who have been put off by the Christmas Quiz, we are not having one this year. There will just be a get-together on Tuesday 11th December. Come along with a contribution to the shared supper.

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Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

October - December 2001

Forthcoming events

The Moon
Talk by Frank Dowding
Tuesday, 13th November
8 pm at the Observatory

Public Open Evening
Tuesday, 20th November
at the Observatory

Christmas Get Together with shared supper
Tuesday, 11th December
7.30 pm onwards
at the Observatory

In addition, the Section meets at the Observatory every Tuesday evening, and Friday if clear for observing.

In this issue

Inside

Centre inserts

Star chart
Moon phases
Sunset and sunrise times

Our Fund Raising

***Debby Quertier** reports on recent events*

As advised in the last Sagittarius, Alien City has been out and about and has been a success. The Town Show, scheduled for the end of August, was cancelled, leaving us with the North Regatta, Harbour Carnival and the Rocquaine Regatta, all in July.

The North Regatta was not a great success for us, mainly due to the miserable weather. In fact we had to hastily pack up when the rain became too heavy. Our takings were only about £60, but that's £60 more than we would have had if we had stayed at home and not bothered.

The Harbour Carnival was blessed with glorious weather and was very well attended. we were busy for most of the evening. One group of people who worked at a nearby restaurant liked the aliens and glowing stars so much that I think we supplied the whole staff. The silver 4' 6" Alien was popular and we soon sold out of him. (Do you recall that our gold one ended up on the cover of the Guernsey Press when we were fund-raising in the run up to the eclipse?) We had already sold a fair few of the glow-in-the-dark wands and bands by the time we were packing up on the Albert Pier at about 9.15 pm when we suddenly saw a great mass of people heading for the Pier to view the fireworks. Never one to miss a sale, Jessica dressed up in glowing necklace and earrings and as the people came by us we couldn't supply them fast enough.

Once the fireworks had finished Jessica, Susan, Laura (my thirteen year old daughter) and I went wandering amidst the crowds on the town front to sell a few more. We did okay but by now it was 11 pm and our feet were aching. That, and the possibility of being arrested for hawking without a licence, made us decide to call it a day, and a fun day it had been.

The Rocquaine Regatta was fun too. The heat was blistering and the Regatta well attended. We did not do as well as at the Harbour Carnival but it was still worthwhile.

Thanks go to David and Dorothy Le Conte, Susan Chamberlain, Cathy White and Julie Coquelin who helped make the fund-raising a success.

A lot of the stock that we purchased has been sold but we have kept a "stall" at the Observatory on Tuesdays which has continued to make sales and boost our funds.

Maureen Pitman has given us some of the T-shirts she had left over after the eclipse. We have been selling them with the proceeds going to our funds. If anyone would like a T-shirt, we have the "diamond ring" and "total eclipse" designs, it can be yours in return for a donation.

Debby Quertier

Upside Down Astronomy

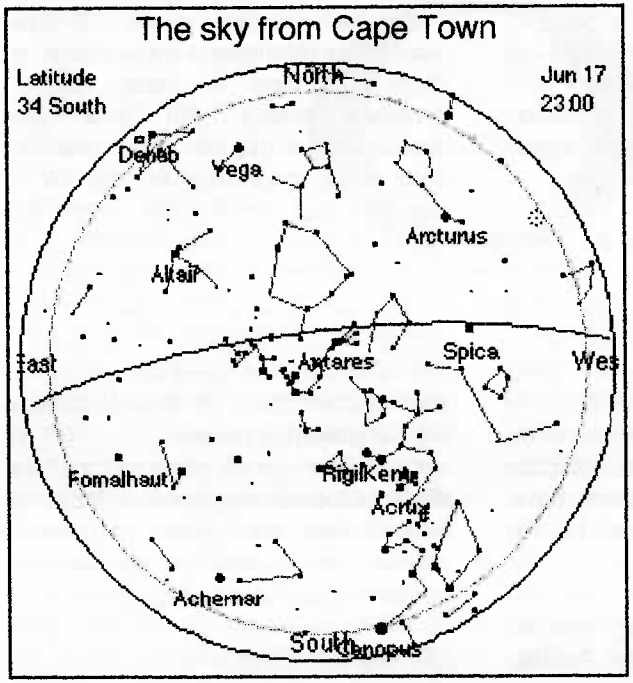
by David Le Conte

During my recent trip to southern Africa to view the total solar eclipse I had the opportunity to experience first-hand what to us northern dwellers are the peculiarities of astronomical phenomena in the southern hemisphere.

My first notable difficulty (as well as that of my fellow travellers) was to establish my orientation. Where was north? From Cape Town, some 34 degrees south latitude, in June, at the summer - no, winter - solstice, the Sun reaches a maximum altitude of 33 degrees in the north. While still, of course, appearing to move from east to west, the southern hemisphere perspective translates this movement into a right to left one, rather than our perceived left to right passage. It took a couple of days to get used to this reversal, and quickly to orientate to the other compass directions.

The confusion was compounded by the fact that Cape Town does not face south, as one might expect, but north, being in a sheltered bay reached, if travelling by ship in a westerly direction, after rounding the Cape. So, looking out of our east-facing hotel window on the waterfront, we could see Table Mountain lit up by the red rays of the setting Sun.

In the town's Company's Gardens we passed a horizontal sundial, and I pointed out to my companions that the numbers on the dial went the opposite way from that which we are used to, as the shadow of the dial's gnomon moves anti-clockwise instead of clockwise. (Indeed, if civilisation had developed first in the southern hemisphere, no doubt "clockwise" would have meant the opposite of what it now does.) I also pointed out that if one took a horizontal southern hemisphere dial to the appropriate latitude in the northern hemisphere (ie the complement of the southern latitude) one could mount it vertically on a south-facing wall and it would work fine. So a dial designed for Cape Town at 34 degrees south latitude could be used vertically in Edinburgh at 56



degrees latitude. Who knows when such a piece of information might come in useful!

From Cape Town we went to Malelane at the Kruger National Park, 8 degrees further north. There we were able to observe the stars in a sky virtually free of light pollution. Of greatest interest, of course, were the southern hemisphere objects which we cannot see from our northern latitude here in Guernsey. These included the Southern Cross (the constellation Crux), the Jewel Box open cluster (NGC 4755), the bright stars of Centaurus (Rigil Kentaurus and Hadar), and the brightest globular cluster of them all, Omega Carinae (NGC 5139), a marvellous object even in binoculars. Rigil Kentaurus, alpha Centauri, is the third brightest star. I could not glimpse the second brightest, Canopus, as it was too low. Nor, unfortunately, could I see the Magellanic Clouds, nearby galaxies which appear like misty patches to the naked eye.

It was not easy to recognise the familiar northern constellations in their upside-down state

Mars, however, which during the recent opposition reached only a disappointing 12 degrees altitude as seen from Guernsey, was high in the sky, at 70 degrees. It was, of course, in the vicinity of Scorpio, and that constellation was spectacular, its complete Scorpion-like shape evident. From Guernsey it remains low in the south in our summer skies, and cannot be appreciated to its full extent.

What was perhaps surprising was the difficulty in identifying more familiar constellations and stars. Arcturus, Spica, Regulus and Altair were all above the horizon, but without the reassuring shape of Ursa Major identifying the north direction, it was hard to decide which star was which. And of course there is no south pole equivalent of the (north) Pole Star. It was also not easy to recognise the familiar northern constellations in their upside-down state. Indeed, we get so used to our own, home sky, that the positions and orientations of constellations seen from any other latitude seem strange at first.

I would advise anyone travelling to the southern hemisphere and wanting to observe the stars while there, to prepare beforehand by studying what objects will be visible, and go armed with a star chart for that latitude. Southern hemisphere planispheres are available, and these days there are many computer programs which will give good simulations of the sky seen from any location and at any time and date (we use some at the Observatory). For such journeys, however, I tend to rely on the Collins Gem Guide "The Night Sky". It is tiny, and is, therefore, little trouble to slip into one's baggage, but it contains lots of information about the best objects, and detailed charts of constellations, as well as general sky charts.

So be prepared, be aware that things will look strange and appear to move in reverse, and add to the pleasure of a holiday to faraway destinations.

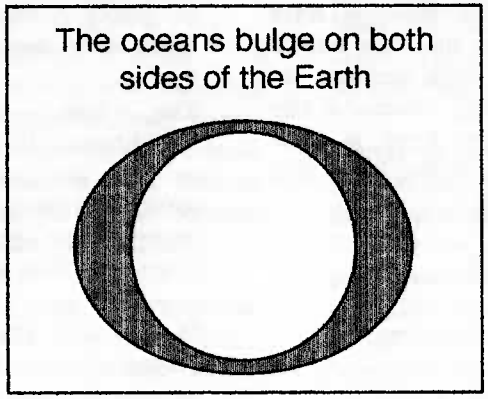
David Le Conte

The Moon and the Tides

***Frank Dowding** has been researching the Moon's tidal effects on the Earth.*

As the Moon circles the Earth its gravitational attraction produces a 'bulge' in the oceans directly underneath it. As the Earth is rotating faster than the Moon circles it the Earth experiences a high tide when passing under this bulge. The question is why do the oceans in fact have **two** bulges? One is directly under the moon, as you would expect, but there is another on the **opposite** side of the Earth, on the far side from the Moon, so that when it is high tide in Britain it is also high tide in Australia.

The following is my interpretation of the reason for this phenomenon.



Firstly, let us imagine the Earth with no Moon. The oceans would not experience high or low tides. The surface water would remain at the same level. Now let us introduce the Moon. At first we will put it further away than it is at the moment then gradually bring it closer, but not moving around the Earth at this stage. As we bring it closer we start to see it pulling at the ocean closest to it due to the Moon's gravitational attraction, but only on the side closest to the Moon. As it becomes closer still the oceans on the 'sides' of the Earth are getting shallower as the Moon has pulled these round to make the bulge. The far side has not really been affected because the Moon's gravity is not strong enough.

If we place the Moon closer than it normally is, but still not circling the Earth, it would attract all the water from the front, rear and sides, but we will not do that. Instead, we will put the Moon where it should be. With a bulge underneath it, the sides shallower and the rear relatively unaffected.

Now we put the Moon in motion around the Earth. The Moon is quite large and when it is orbiting, the gravitational attraction between both Earth and Moon results in them almost circling one another. They do not actually do this because the Earth is larger. But it is very similar to the movement of a hammer thrower. Imagine two children holding hands and circling, pulling each other around. To be accurate in representing the Earth/Moon system one child would have to bigger than the other, but the principle still applies. There are two forces at work here. One is the children pulling towards each other, which

represents the gravitation between Earth and Moon. The other force is acting equal and opposite and is known as the **centrifugal force**. This can be seen if the children now wear a shoulder bag across their shoulders. As they swing around, the shoulder bags will swing outwards behind them. If they swing around faster, their grip on each other would have to increase and the shoulder bags would swing further out.

This is what is happening with the oceans. The Earth and Moon are pulling on each other as they spin around. This produces the first bulge closest to the Moon because the attractive force is more powerful than the centrifugal force at this point. But on the other side of the world another bulge appears, just like the shoulder bag, because at this point the centrifugal force is more powerful than the attractive force. It is being flung outwards.

Frank Dowding

Astronomy and Space - References for further reading *compiled by Geoff Falla*

Unveiling the Infrared Universe. Our view of the Milky Way is obscured by dense dust clouds. A new infrared survey of the entire celestial sphere is providing highly detailed colour images. *Sky and Telescope, July 2001*

Asteroid Bicentennial. It is now 200 years since the first asteroid, Ceres, was discovered by Italian astronomer Guiseppe Piazzi on January 1st, 1801. The origin and evolution of the asteroid belt. *Sky and Telescope, July 2001*

Mars - Old and New. A changing view of Mars, and the processes that have formed its present surface - as currently being discovered by Mars Global Surveyor. *The Planetary Report, July/August 2001*

Globular Star Clusters. Some of the most spectacular deep sky objects are the globular star clusters at the edge of our galaxy. A selection of these clusters which can be observed.

The Sun - Our Nearest Neighbour. All life on Earth depends on the Sun, and by studying it astronomers have been able to discover how a star generates its energy. *Astronomy Now, August 2001*

Moons of the Solar System. Photographs and descriptions of many of the very different moons discovered in our solar system. A special 14 page supplement. *Astronomy Now, August 2001*

Galaxy Formation. A set of articles, including the structure and evolution of galaxies, the enigmatic subject of dark matter, and what may happen when galaxies collide. *Astronomy Now, August 2001*

Hubble Telescope Landmark. The Hubble Space Telescope has now been in orbit for 11 years. It has just taken its 100,000th photograph. Some of the special photographs taken, with an Internet poll selecting the Horsehead Nebula as the most popular image. *Astronomy and Space, August 2001*

Planetary Nebulae. Details of some of the best planetary nebulae to be seen - particularly in summer and autumn skies, including the Ring Nebula in Lyra, and the Dumbbell in Vulpecula, and how these interesting objects are formed at the end of a star's life. *Astronomy and Space, August 2001*

Getting Started with a Telescope. A set of articles, including choosing a telescope, the many objects that can be observed with even a small telescope, and practical work such as making drawings of lunar features. *Astronomy Now, September 2001*

Comet Rendezvous. The September rendezvous of space probe Deep Space 1 with comet Borelly, and a look back at the only previous comet encounter - the Giotto flyby of comet Halley in 1986. *Astronomy Now, September 2001*

Gravitational Lenses. Unusual images obtained by the gravitational bending of light from distant sources. Different effects, how they occur, and some examples photographed by the Hubble Space Telescope. *Sky and Telescope,September 2001*

A New Sky Survey. A new deep wide-field sky survey by the National Optical Astronomy Observatory, providing a much wider angle view than the Hubble Deep Field surveys, is expected to help astronomers in tracking and understanding the evolution of the Universe. *Sky and Telescope, September 2001*

The African Solar Eclipse. Darkness on the Dark Continent, a report on the total solar eclipse of June 21st.

Mars - the Best View from Hubble. The most detailed view of Mars yet obtained from the Hubble Space Telescope. **Astronomy and Space, September 2001**

Water in the Universe. It was once thought that only the Earth had water, an essential element of life as we know it. Now we know that other planets, moons and comets also have water, and astronomers have discovered its presence in gas clouds in the process of star formation. *Astronomy, August 2001*

Stepping Stones to Mars. As plans develop for a manned flight to Mars in the not too distant future, it is thought that a manned mission to a near-Earth asteroid would be a useful trial run, as well as being the first steps in obtaining rare minerals from asteroids. *Astronomy, August 2001*

Geoff Falla

The Astronomical Equation

by David Le Conte

As a sundial enthusiast I frequently use the term *Equation of Time*, which is the difference between the time shown by a sundial, based on the irregular apparent movement of the Sun, and that shown by a clock, based on the defined uniform progress of time. The Sun's irregular motion as seen from the Earth is caused by the fact that the Earth's orbit is elliptical, not circular, and also the tilt of its axis with respect to the ecliptic (the plane of the Earth's orbit). So the Equation of Time is the given by the difference the True Sun and the conceptual Mean Sun, upon which clock time is founded.

the word 'equation' does not accord with its use in mathematics, and, indeed, it is used to mean something quite different.

What often strikes me is the use of the word 'equation' in this sense. It does not accord with its use in mathematics, and, indeed, it is used to mean something quite different.

The *Oxford English Dictionary* gives three main definitions of *equation*. Firstly it is "the action of making something equal", especially the division of the celestial sphere into equal divisions, or 'houses' for astrological purposes, but also in phrases such as 'equation of demand and supply'. Its second meaning of "statement of equality" is primarily used in mathematics and chemistry. Its third meaning, however, is "reduction to a normal value or position", and this is the use to which it put in astronomy.

Several examples are given in this dictionary and specialist astronomical dictionaries of its use in the astronomical sense, in addition to the equation of time. The *equation of the centre* means the difference between the true and mean anomaly of a heavenly body. (The 'true anomaly' is a measure of the variable motion of a body such as a planet in its elliptical orbit, while the 'mean anomaly' is a measure of the uniform motion of a hypothetical body travelling in the same orbit.) The *equation of the equinoxes* is the difference between mean and apparent places of the equinoxes (due to precession and nutation), and, therefore, the difference between the apparent sidereal time and the mean sidereal time. The *equation of light* is a correction applied to the time taken for light to travel between celestial bodies and the Earth because of the motion of the Earth in its orbit.

Of particular interest, however, is the *personal equation*, which is "the correction required in astronomical observations in consequence of greater or less inaccuracy habitual to individual observers", in other words, the systematic bias of an observer when making measurements. The personal equation used to be of significant importance in astronomical observation, specific correction factors being applied to individuals' measurements of, for example, transit, occultation and variable star observations. With the advent of photography, and mechanical and electronic measurement, however, the personal equation has become less significant. Thus, Norman Lockyer is quoted as saying in *Nature* in 1881: "Photography has no personal equation." In perusing correspondence by the 19th century Astronomer Royal, George Biddell Airy, I have come across references to these individual corrections, and, indeed, Airy was very much aware of the benefits of automation, and tried to introduce it wherever he could in the astronomical operations of the Royal Observatory at Greenwich. However, while encouraging the development of photographic methods of observation, notably by the Guernsey-born Warren de la Rue, he did not introduce photographic means of measurement at Greenwich.

Earlier this year I was present at an event celebrating the 150th anniversary of the first observation with Airy's Transit Circle (which defines the Prime Meridian) at Greenwich. Also present were several observers who had used this telescope during its final years in the 1950s, including the man who made the last observation. At that time transit measurements were still being made by eye, with electric recording being initiated by the observer. Clearly, it was still important, then, to make corrections in accordance with the personal equations of each observer.

With some occultations coming soon, and indeed the transit of Venus in 2004, it might be interesting to compare our own 'personal equations'.

David Le Conte

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The Compact Edition of the Oxford English Dictionary, Oxford University Press, 1971

A Dictionary of Astronomy, edited by Ian Ridpath, Oxford University Press, 1997.

Collins Dictionary of Astronomy, edited by Valeris Illingworth, Harper Collins Publishers, 1994.

Daytime Planets

***David Le Conte** describes how he and Geoff Falla used a lunar occultation to see Jupiter and Venus in the daytime*

It is not often that we have an easy opportunity to see planets in the daytime. However, on the afternoon of the 12th September 2001 Geoff Falla and I were able to get telescopic clear views of Jupiter and Venus. It is well known that Venus can be seen in daylight; the problem, however, is being able to locate it.

We grasped the opportunity afforded by a grazing occultation of Jupiter, as predicted by astronomical software. Although hampered by cloud were able to pick out the waning crescent of the Moon. Swinging the 16-inch Meade telescope towards it, we rapidly picked up Jupiter, at magnitude -2, apparently clinging near the lunar limb. The time of closest approach was near, and, inevitably, the increasing cloud started encroaching on our view. According to the computer, Jupiter and the four Galilean moons - Europa, Ganymede, Io and Callisto - should just have grazed the limb of the Moon, but of course the moons were too faint to be seen.

Such grazing occultation have been important indicators of the profile of the lunar limb (ie the profile of the mountains and other surface features at this point).

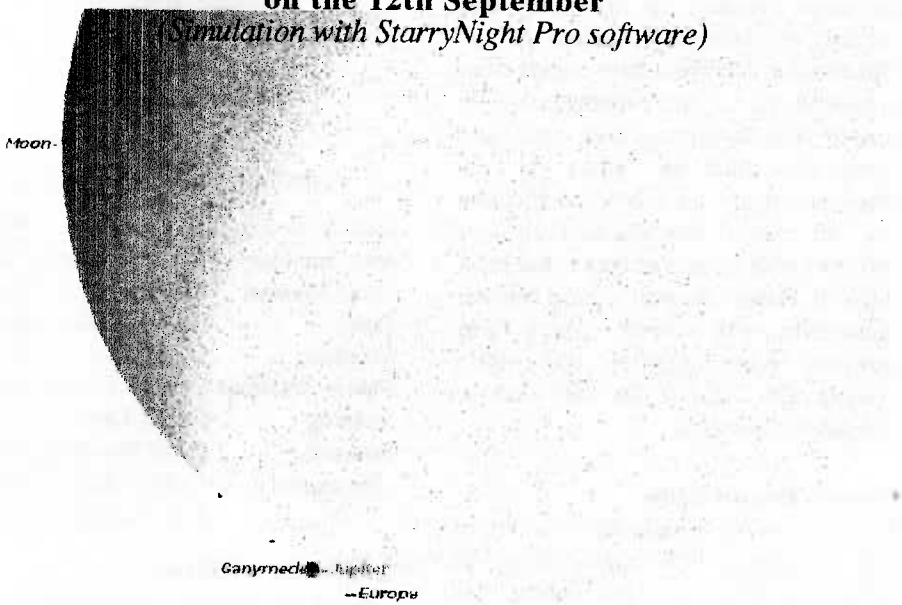
Having successfully calibrated the telescope's drive by using the known position of Jupiter, we were then able to use its electronic prowess to swing around to Venus. Sure enough, there was the bright (magnitude -4) planet, glinting in the middle of the field. We had the impression that it would be easy to see with binoculars, provided, again, that one knows exactly where to look. While we rarely have the opportunity of such a close approach of the Moon to guide us to a planet, there are many occasions when the daytime Moon passes within a few degrees, and it would be worthwhile looking for planets at these times.

Having successfully calibrated the telescope's drive by using the known position of Jupiter, we were then able to use its electronic prowess to swing around to Venus

Although Jupiter was not quite occulted on this occasion, as seen from Guernsey, it was occulted from the UK, and I am sure that some people will, therefore, have seen it. However we soon have two good night-time occultations of Saturn and its moons, on the 3rd November (9.00 pm to 10:00 pm), and on the night of the 31st November/1st December (2.25 am to 3.25 am).

David Le Conte

The limb of the Moon almost occulting Jupiter and its moons on the 12th September
(Simulation with StarryNight Pro software)



Traditional Names for the Full Moon in the Northern Hemisphere

January	Old Moon, Moon after Yule (Christmas)
February	Snow Moon, Hunger Moon, Wolf Moon
March	Sap Moon, Crow Moon, Lenten Moon
April	Grass Moon, Egg Moon
May	Planting Moon, Milk Moon
June July	Rise Moon, Flower Moon, Strawberry Moon
August	Thunder Moon, Hay Moon
September	Fruit Moon, Harvest Moon
October	Hunter's Moon
November	Frosty Moon, Beaver Moon
December	Moon Before Yule, Long Night Moon