The Newsletter

of the

Orwell Astronomical Society (Ipswich)

Registered charity No 271313
www.oasi.org.uk

2009 OCTOBER No 445

Noctilucent Clouds
Taken on the evening of 14th July by Sue Collinson
one of our members.

Society News (Roy Gooding)

1 Committee Meeting

2 Access into the School Grounds and Observatory Tower

Please use the third gate into the school grounds, this is the gate behind the Gym. If the Black door entrance at the base of the observatory tower is locked, you will have to phone someone in the observatory to let you in. My mobile number is [redacted]. (Roy Gooding) alternatively the Observatory mobile is [redacted] during meeting hours. The gate code is on the back of your membership card

3 Welcome to New Members

No new members

4 Events for International Year of Astronomy 2009 (IYA 2009)

Autumn Meetings	Venue	Date
Autumn Open Weekend	**Orwell Park**	**Saturday & Sunday 24th & 25th October 19:30 to 22:00**
Talk and Telescope Evening	**Nacton Village hall**	**Monday 26th October 19:30**
Talk and Telescope Evening	**Nacton Village hall**	**Tuesday 27th October 19:30**
Sidewalk Astronomy (Night Observing)	**The Ship Levington**	**Thursday 29th October 19:30**
Astronomy in the Park Solar observing	**The Reg Driver Visitors Centre Christchurch Park (Bolton Lane entrance)**	**Saturday 31st October & Sunday 1st November 11:00 to 15:00**

Our Autumn contribution to IYA is a very busy week. This is the first time we have run 7 public events over a 9-day period. The success of our contribution to IYA 2009 is dependent on the enthusiasm of our members. Telescopes are needed for events at, The Ship, and Astronomy in the Park (preferably solar ones if available)

The event that requires the most support is the Open Weekend

Please come along to as many events as you can.

For more information please contact Paul Whiting or Roy Gooding

5 Other Society Events

Meeting	Venue	Date
FAS Convention	The Institute of Astronomy Cambridge	Saturday 3rd October
Geminid meteor watch	The "Dip" Felixstowe	To be confirmed
Christmas Meal	The Fountain Tuddenham	Wednesday 16th December 20:00

6 Christmas Meal at The Fountain Pub Tuddenham at 20:00

Meal price £20.95
Deposit £10

Starters:

Roast tomato basil & cream soup
Crayfish & crab salad
Chicken & leek terrine

Mail:

Roast Suffolk turkey
Grilled sea base fillet
Char grilled Scottish ribeye steak
Roasted vegetable & chestnut crumble

Puddings:

Christmas pudding
Warm chocolate brownie pie
Raspberry crème brulee
British cheeses

URL: www.tuddenhamfountain.co.uk

7 FAS Convention Saturday 3rd October

The 2009 FAS Convention will be held at the Institute of Astronomy, Madingley Road, Cambridge, CB3 0HA, on October 3rd 2009. Tickets £8.00 on the door. As part of your ticket each delegate will get a free FAS Astrocalendar 2009/2010. Doors open to public 9:00

Speakers:

Lord Prof. Martin Rees - The next Generation of Telescopes
Dr. Chris Lintoft - Galaxy Zoo
Damian Peach - Planetary observing
Dr. Haley Gomez – Herschel unveiling the cool universe

Night Sky (October)

All times GMT

Moon

Full Moon	3rd Quarter	New Moon	1st Quarter
4th	11th	18th	26th

Object	Date	Times		Mag.	Notes
		Rise	Set		
Sun	1	06:06	17:42		
	31	06:58	16:38		
Mercury	1	04:33	17:16	-1.0	Mercury is in the morning sky at the beginning of the month. This will be the best morning apparition in 2009. Greatest western elongation on the 6th, 18°
	31	06:38	16:35		
Venus	1	03:39	17:07	-3.9	Venus is still a very bright pre-drawn object.
	31	05:13	16:12		
Mars	1	22:46	15:11	0.6	Mars starts the month in Gemini and moves into Cancer by the end.
	31	22:08	13:59		
Jupiter	1	16:09	01:20	-2.6	Jupiter is visi8le in the western sky this month
	31	14:12	23:20		
Saturn	1	04:55	17:33	1.1	Saturn is slowly moving out of the morning twilight sky this month
	31	03:17	15:41		
Uranus	1	17:14	04:52	5.7	Uranus is in Pisces and will be well placed to observe
	31	15:14	02:48		
Neptune	1	16:18	02:01	7.8	Neptune is in Capricornus,
	31	14:20	23:57		

Meteor Showers

Shower	Maximum	Limits	ZHR
Piscids	Sept. 8th Sept. 21st Oct. 13th	Sept. to Oct.	10 5 ?
Orionids	Oct. 20th	Oct. 16th to 27th	25

Meteor source is the BAA Handbook

OCCULTATIONS DURING OCTOBER

The table lists lunar occultations which occur during the month under favourable circumstances. The data relates to Orwell Park Observatory, but will be similar at nearby locations.

Date	Time (UT)	D R	Lunar Phase	Sun Alt (d)	Star Alt (d)	Mag	Star
13 Oct	01:20:52	R	0.31-	-41	11	5.2	omicron 1 Cnc
26 Oct	21:22:01	D	0.58+	-42	13	5.9	ZC 3064
27 Oct	22:59:54	D	0.67+	-50	11	5.6	lambda Cap
28 Oct	17:48:11	D	0.75+	-12	25	5.9	ZC 3285

James Appleton

Astronomy Workshops

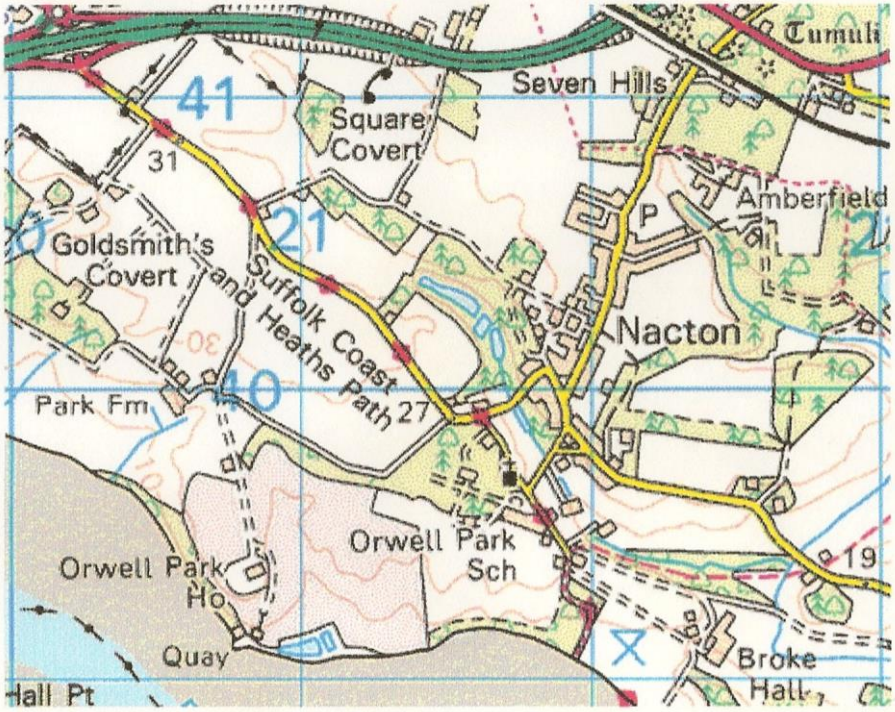
Doors open at 7:30pm.
Workshops START at 7:45pm
Venue: NACTON VILLAGE HALL IP10 0EU

If you are a new OASI member, or haven't been to one of these workshops before – they are a mixture of events ranging in nature including beginners talks, interactive workshops, hands-on observing sessions, suitable for all. Also a chance to chat with other members over a cup of tea.

Date	Event	Run by...
7th October 2009	**One small step for man... Apollo Moon Landings: 16mm Film Night** Apollo 11 touched down on the moon 40 years ago. I'll be using a 16mm projector of similar vintage to show a 30 minute film about that landing, made by NASA shortly after the event. Intermission with tea, coffee & biscuits, followed by another film from OASI's Apollo film archives.	**Mike Whybray**
11th November 2009	**Millennium Telescope observing night** We'll be setting up the 19 inch Millennium Telescope outside the back of the village hall for a general observing session. Please bring any binoculars or other portable observing equipment, skymaps etc. No moon so a good night for deep sky observing – weather permitting!	**Mike Whybray** **Neil Morley** We will need assistance collecting the 'scope from Orwell Park School, and taking it back afterwards. **Please contact us before the night if you are able to help.** (See committee contacts)
9th December 2009	**More to come – dates and topics still being finalised.**	

Mike Whybray
Workshops organiser
07917 024759 (Mobile)
01473 659679 (Home)

Map of Nacton. Workshops venue: NACTON VILLAGE HALL IP10 0EU (next to the small village school, just below and left of the N in Nacton on the map)



Chairman's Chat

Two local people have been featuring in the astronomical press this month. Firstly, congratulations to Tom Boles who recently discovered his 125th Supernova and has broken the record set in 1973 by Fritz Zwicky, a Bulagarian astromoner who coined the term "Supernova" and predicted the existence of Neutron stars. Tom runs the Coddenham observatory at www.coddenhamobservatories.org. Secondly, congratulations to Mike Harlow who featured his Schmidt Camera in a two-page spread within this Month's "Astronomy Now". If that was not enough, if you turn over the page, he has a further article printed explaining how to use a familiar DIY material, silicone bathroom sealant, to make pitch laps for polishing telescope mirrors. We should have a copy of the September "Astronomy Now" in the Belverdere meeting area, So no excuses!

This month, I have been reading an excellent book by the American Author, Rod Mollise on choosing and using Schmidt-Cassegrain Telescopes. It was not the sections on choosing from a bewildering choice of scopes that drew my attention, but the chapter on observing. More often than not, we get a telescope out, look at a few brighter and more familiar objects, only to put it away shortly afterwards. We haven't really been stretching the limits of our own abilities. For this reason, many scopes tend get used on the same brighter objects, time and time again. Instead, Mollise suggests setting observing goals, choosing a constellation on an individual basis, then researching and selecting a number of deep sky objects in order of increasing difficulty to push observing skills. Towards the end of the evening, he recommends going back to some more familiar brighter objects, not necessarily in the same constellation! A star atlas is essential, and I have just come across one that can be freely downloaded from the internet at http://www.cloudynights.com/item.php?item_id=1052. The Northern Hemisphere is sub-divided into around 20 files, one per page, with stars shown down to Magnitude 7.

With that in mind, the Small Telescope Evenings are due to recommence on the evenings of on October 5rd and 19th with the observational targets being Cassiopeia, Cygnus, Moon & Jupiter. The location is the Belverdere

area within the Observatory commencing at 8pm using a selection of smaller telescopes and binoculars. Gerry Pilling who runs these evenings with Paddy O'Sullivan reported via email "on 5th October we will have a bright moon to contend with so Moon and Jupiter will be best".

This is an opportunity to view our closest celestial neighbour and perhaps use a lunar to identify major features and craters. Also a possible chance to see the recent Jupiter impact. The evening of the 19th is better suited to observing fainter Deep Sky Objects (Messiers and the like) assuming as Gerry says "it is not the usual rain, cloud or wind!"

Some of you may have read about and quite possibly seen the giant impact scar on Jupiter . On the evening of 19th July, Anthony Wesley, an Australian amateur astronomer based in New South Wales happened to be observing Jupiter and at 12:40am he was thinking of packing up for the night. It wasa then he then began to notice a dark mark coming into view from the hidden side of the planet. Thinking it was initially another Jovian storm, he was about to discount it but kept observing until it had come fully into view. Because it was not a brownish hue, as expected for a Jovian storm, this was something different! A phone call to NASA and the rest is history. Also on 19th July, a brightening of a portion of Venus's cloud surface was discovered by another amateur astronomer, Frank Melillo, from New York. More clear evidence of the contributions made by amateurs.

Words by Neil Morley.

Sunshine, Sausages and Shooting Stars

For this year's Orwell Astronomical Society (Ipswich) Summer barbecue we returned to Newbourne Village Hall, the venue we used last year. The event was well attended, helped I'm sure by the late arrival of the predicted Barbecue Summer. A weather station in Newbourne – on the 'wunderground.com' network - recorded a temperature peak of 27 C that day.

The afternoon started with the popular outdoor game of gazebo erection, which the strong breeze threatened to turn into a kite flying display; and after a particularly strong gust - parascending! During the afternoon, as well as usual barbecue partying, there was an opportunity to do some solar observing (in "H Alpha" and "White Light") and some planet spotting (i.e. Venus)*.

Martin Cook did an excellent job supplying and setting up the barbecue grill. It did get a bit smokey at one point, but I think this was due mainly to the veggie burgers I overcooked. Said burgers, not being fit for human consumption, or consumption by any living creature to be honest, were added to the coals

The grounds of the hall and the surrounding countryside are very pleasant and with the event starting from 2pm and finishing very late there was ample time to try some of the short walks in the area.

In advance of the event an invitation was made to members to present astronomy talks in the early evening, between sunset and it's getting dark enough to do night-time observing. I'm not sure whether there was a typo in the invite, but Paul Whiting gave us a Chinese gastronomy talk instead. Actually, to be fair, it was a talk about the food provided on an eclipse trip and cloudy skies had limited what could be said about the eclipse itself! Paul also provided an excellent quiz. No astronomical expertise was needed; our knowledge of confectionary and music (theme tunes) were tested. Notably, it was one of the more recent TV theme tunes which had our team stumped: clearly we do not need to get out more!

In the evening the clear dark skies allowed observing to continue, this time the targets included Jupiter and several deep sky objects. Several meteors were spotted during the informal evening watch including one real gem: the majority were sporadic meteors rather than Perseids.

Thanks are due - and given by me and our chairman Neil Morley - to everyone who helped make the event a success. The timing meant that a number of people couldn't make it this year but with luck we can find a more mutually convenient date next time. Any suggestions for next year would be welcome.

Pete Richards

* Telescopes made available for people to use included: Bill Barton's 4" Vixen refractor; John Wainwright's 200mm Skywatcher Newtonian reflector on its first outing after its recent conversion to a Dobsonian mount; the Society's Meade ETX-125 Maksutov-Cassegrain and a couple of Coronado PST solar telescopes (one of which was OASI's own, the other being Paul Whiting's).

The Tomline Refractor to appear on The Discovery Channel

After days of planning, Pioneer Productions turned up at the front gate of the School ready for a day's filming in the Observatory at 9am on Friday 14th August.

Pioneer, a film company based in London, had spotted the potential of the Observatory and Tomline Refractor as a potential backdrop to filming after viewing our website. They had initially contacted the Society and were referred on to the School. Despite there only being a skeleton staff at the School over the holiday season, permission was duly given and Neil and I were approached to host them.

The technicians turned up first, quite early in fact. Apparently this is normal with the production staff always turning up late (the cameraman said !). To be fair the production staff were only a few minutes on the drag.

So a cameraman, soundman, director, production assistant and an intern plus arm loads of equipment were set to gain access to the observatory. Luckily the old entrance door was left open which enabled access. The problem was the interior door, being on a fob it was only accessible inwards and so there was no way to get out of the Observatory. Luckily as there were summer school activities going on in the school, a host of young children happened to be in the right place at the right time to press door releases for us!

After an hour of setting up, the professional astronomer interviewee turned up. She was Prof. Fran Bagenal of Boulder University, Colorado. She was a very interesting lady, a former Brit who (in her own words) had joined the brain drain of planetary astronomers to the US. She was most interested in the Society and the history of the observatory. Perhaps a potential speaker the next time she comes to the UK?

After ninety minutes of being interviewed in front of the Tomline, they took some atmospheric shots of Fran standing in front of the dome whilst being rotated (ably by Neil). Finally they wanted an external shot of the observatory from the playing field. Problem - how to get from the front of the School, through the locked doors to the back field, whilst carrying heavy kit. Luckily the young children came to the rescue and pushed the door releases again.

The director was most impressed with the school building and the Observatory and was impressed with our willingness to provide whatever they required.

The final outcome will be an 8 part series called "Engineering the Universe" being made for the Discovery Channel (US). It is hoped to be aired during quarter one next year – in America. It may take a little longer to be shown over here. We star (sorry!) in the Solar System chapter.

Paul Whiting

ORWELL ASTRONOMICAL SOCIETY

Charity number 271313

PUBLIC OPEN WEEKEND

ORWELL PARK OBSERVATORY

(Nacton Nr. Ipswich)

WILL BE OPEN TO THE PUBLIC ON

SATURDAY 24th October 19:30 to 22:00
SUNDAY 25th October 19:30 to 22:00

TO OBSERVE THE NIGHT SKY

All astronomical observations are dependent on the weather.
If you have a pair of binoculars please bring them with you.

2009 is International Year of Astronomy

This is one of many Public events we are holding this year. More details on our web site
http://www.oasi.org.uk

Entrance
Adult £3
Child £1.50
Concessionary £1.50

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Honorary Secretary
Roy Gooding
168 Ashcroft Road
Ipswich
IP1 6AE

The Longest, Darkest Eclipse

Paul Whiting *FRAS*

The promise of the longest eclipse of this century was not to be missed. 6 minutes 30 seconds of totality – but you had to be on a boat in the South China Sea to see this long lived phenomenon. Land based observers could only expect around 6 minutes.

So Team Whiting decided to catch a boat – undeterred by the fact that the eclipse occurred slap bang in the middle of Typhoon season. After various machinations including money changing hands, boat changes and celebrity authors booking the last suite, we ended up heading inland to Haining near Hangzhou (a few hundred kilometres south of Shanghai) with Oriental Travel. This gave the opportunity to visit the jewels of China (as one brochure put it), including Beijing and the Great Wall, Xi'an and the terracotta warriors and Shanghai and its mammoth rebuilding project. A romantic walk along the Bund in Shanghai now resembles stumbling through a building site. They are preparing to wow the world at the Expo 2010, at the cost of annoying the world in 2009!

The journey to China was blighted by the dreaded Swine Flu. Various official websites warned us beforehand that the Chinese authorities were treating the pandemic very seriously, and indeed they did. When we landed in Beijing we were treated to a number of technicians dressed in hazmat suits, who walked along the plane with space-age infrared temperature guns, taking all our temperatures. Most of the plane had been hacking, coughing and sneezing throughout the flight, but no-one dared make any such sound during the temperature taking. At last the temp squad left the plane and a stewardess smiled animatedly and put her thumbs up. We were to be allowed off the plane and not placed in quarantine. But that wasn't the end of the matter. There were at least two other occasions when arriving passengers were made to funnel through a gate being surveyed by an infrared camera, with masked onlookers ready to isolate anyone who glowed more than they should. Finally we were through the entry formalities, except that we were given a little note saying that we should self-monitor ourselves over the next 7 days and if we came down with a runny nose, sore throat, headache or coughs and sneezes we should phone the number given and we would be (quote) "taken away". Every hotel room had a thermometer provided for our use and we were even provided with official mouth masks that we were expected to wear during all of our internal flights – not that any of the westerners on board did !

And so to our first few days in Beijing. A nice 5 star hotel with all the facilities you would expect. Buffet breakfasts, multi-course lunches and even bigger multi-course dinners were the order of the day, every day. I found the breakfasts particularly good as they offered the choice of western as well as eastern goodies. Dim sum, Japanese sushi, bacon and omelette became a favourite. Lunch and dinner always included the first drink, be it beer, coke or sprite. That was the choice every meal. Not a diet anything anywhere, despite diabetic hospitals appearing on nearly every street corner. So beer it was. After the first freebie you

had to pay – usually about a pound for a 600ml bottle of quite nice beer, often Tsing Tao, the variety exported to the UK.

Our local guide was great. He took everything personally. Whenever anything went wrong (slow service, wrong orders etc) he insisted we had some form of recompense, usually in the form of free booze for the rest of the evening. Needless to say he got a good tip at the end of the tour.

Our tour group consisted of about 450 people, but we split into groups of about 20 or 30 until we finally met up at the eclipse site. At Beijing we also met up with the Sky & Telescope Travelquest group, who virtually took over the hotel.

The first sites we visited were Tiananmen Square and the Great Wall; luckily we went to the less well known section, and not the more popular site that I had been to before. This gave us another sight – the official 4 star toilet – officially displaying a plaque probably telling us that the water had been passed by the management. To get to the wall involved a gondola ride up a mountain. The cicadas were deafening. After a morning of intense exercise; climbing along 45 degree angled wall and often scree slopes, culminating in a gruelling final 455 steps to reach the utopian Turret 20 – in 45 degree heat and 90% humidity - we had a very nice picnic. I should point out at this stage that it was the other half of Team Whiting that did the exertion bit, I sat and looked after the bags, and as it turned out, the booze for the picnic. It was one of our members' birthday and the guides had organised a big cream cake with candles and champagne (real French champagne the label said, but then again real Rolexes were being sold throughout our tour at an average of "2 for a dollar").

The next astronomical highlight was a trip to the ancient Beijing Observatory. 100 steps up to the roof to find a number of ancient instruments for measuring star positions and movement. Each instrument had elaborate motifs of dragons and other mythical animals, which really summed up the early mixture of beliefs of the causes of the astronomical phenomena seen. Eclipses for example were believed to be caused by one or more dragons (or sometimes wolves) eating the sun, and only by banging drums and gongs would they be scared away. This they did and it worked every time, so it must be true. Another explanation for the eclipse was a bodiless beast that ate the sun, which then reappeared out of its open neck.

We then headed for a buffet lunch with about 1000 other western visitors. This was the confluence of at least four other tour groups, one of which was Wendy Wu Tours, which included two other OASI members. Despite checking each of the private dining areas in the restaurant Pete & Nicky were nowhere to be found.

Onwards to Xi'an, and after a 2½ hour delay we boarded our plane. Unlike at a British airport during flight delays, when you are lucky to get even a clue as to how long you will have to wait, here at Beijing we were told a new departure time and were issued with a substantial hot meal and drink. The meal contained rice and some form of chicken (hopefully!) but there was an intriguing looking (and quite nice tasting) pile of pink

spheres. No-one had any idea what it was so henceforward it was known simply as pink. Unfortunately we were not served with any pink again.

Xi'an is famous for its terracotta warriors and the new museum that has grown around it since I last visited ten years ago. What I didn't remember from the previous visit was the town wall, intact for the whole circumference of about 14 km. Here you can hire a bicycle to ride around. Again Team Whiting split at this point - the energetic one hired a bike and pedalled around the wall in the hour or so we had allowed to us. I chose to hire a rickshaw and be pedalled about an eighth of the way round and back. My driver looked about as old as the wall but was incredibly fit and gave a really good commentary in broken English.

Another strange happening here – whilst congregating at yet another pagoda, a strange little man with a walking sticking came slowly tapping his way towards me. Inch by inch he approached; definitely on a mission. When he got close enough he rubbed my stomach and then my moobs (man boobs) and then he toddled off. When questioned later our guide muttered something about it being lucky to run the Buddha's stomach …

We also witnessed a really good acrobatic show here in Xi'an, culminating in a nail biting motorbike display – five bikes zooming around (literally) inside a sphere.

Time to fly down to Shanghai. It was on this flight that we heard the tannoy call "Is there a doctor on board?". As luck would have it there were two doctors on board, one within our group. Someone had gone down with what looked like heatstroke, but when we landed the "Flu Squad" came on board ready to quarantine the lot of us. If it wasn't for our two docs insisting that it wasn't flu and not contagious we could all still be in an isolation sanatorium today.

Shanghai – another temple, another pagoda another factory for us to waste; sorry spend our money in the huge megamart that now seems to be de rigueur at these tourist factories. This time it was a silk factory. Last time I was brow beaten into buying a silk rug. This time a silk duvet and shirt.

A number of the group were quietly fomenting rebellion against yet another morning of pagodas, temples and shops, so some of us went our own way to explore Shanghai, including travelling on the fastest train in the world - the 7 minute maglev journey from the city to the airport reaching 431 kph for about a minute. We also tried to go up the (current) tallest building and walk over the glass floor a zillion feet above the ground. Unfortunately (or was that fortunately?) crowds and time defeated us as we had to rejoin our group for lunch prior to travel to the eclipse site. Despite being caught in Shanghai traffic for 45 minutes we made it just in time to grab a bite before departure to Hangzhou.

A three hour coach ride through the Cantonese countryside brought us to the Aigrette Resort, a wonderful get-away-from-it-all resort for the Shanghaiese. Again all the facilities you could ask for – it was just a shame we were only there for about 12 hours. Here we met our resident experts: Dr Alastair Gunn of Jodrell Bank and Robin Scagell.

The resort was large enough for our entire eclipse contingent to merge for the first time prior to travelling the few miles to the eclipse site at a public dam and waterworks on the banks of the Yangtze River (30° 24.17'N 120° 32.99'E). To get there through the morning traffic we travelled in a convoy of around 12 coaches with a police escort (this seemed familiar somehow – flashbacks to Libya). Roads and motorways were closed off for us to travel unaffected by the rush hour traffic.

We had arrived at the most luxurious eclipse viewing site you could imagine. Formal landscaped gardens with gazebos and chairs ready for the casual viewers, a vast assortment of sites appropriate for the more serious viewer and even one mains plug in case of battery failure !! More importantly there was a continuous buffet of crisps, snacks, biscuits, fruit and later sandwiches (who could forget the luminous spam they called ham). Also a never ending supply of cold drinks, juices and beer – everything free. Still no diet drinks so I had to drink the beer. Five bottles of champagne also appeared, but as it was a help yourself set up these bottles were soon helped away, including one our way.

So we were all set for the eclipse. Unfortunately the weather had other ideas. First we were entertained with a thunderstorm around an hour before first contact, then total cloud cover. I didn't even get the camera out. Then a cheer went up as the cloud thinned to reveal a partial eclipsed sun. I managed to get some excellent shots of the partial with the cloud acting as a filter. However as we were counted down to totality the clouds reconvened and obviously as the light disappeared there was nothing to force its way through any chinks in the cloud cover. So everything went dark – really dark – quite the darkest totality I've ever experienced. This is not surprising given the apparent larger size of the Moon and the length of eclipse. Six minutes later a thin sliver of sun reappeared behind the cloud filter. Again I managed to capture this quite effectively but nothing of the total phase. This was my first failure.

So much for spotting the umbral shadow approaching, shadowbands and identifying which stars and planets would become visible. However we did study the terrestrial effects caused by the eclipse. Street lights came on, cicadas stopped chirping, birds started to roost, insect life (mainly huge dragon flies) disappeared and the temperature dropped noticeably. I didn't notice any wind variance. Locals started a firework display (luckily a long way away from us, although as it turned out it would have given us something to look at!). They were obviously trying to scare the dragon away – it was a shame they didn't scare the clouds away.

The cloudy weather pattern was repeated pretty much across the whole Asian path – although high mountain sites appeared to be the best. Also rumour has that the ship based option would have been the best. I'll never forgive that famous author.

Still there's always next year and the Tahiti / Easter Island eclipse.

The final disappointment was the tidal bore up the Yangtze – due about an hour after the eclipse ended. Already billed as the largest bore in the world – further enhanced by the eclipse alignment of Sun and Moon, we were told to expect a 3m tide front. Police were

employed to keep us from the edge in case we got engulfed to our doom. After an hour waiting for it with bated breath, a "ripple" no more than 3 feet high at its highest slowly flowed passed us.

Finally on to Hong Kong – on our own now, so no more temples or pagodas – except for the ones in the included city tour!! Here we visited the Space Museum – quite good, obviously aimed at kids with lots of interactive displays. Unfortunately the most interesting exhibits weren't working. Finally to the highlight of the trip - given the eclipse failure – watching the new Harry Potter movie in Kowloon, in English with Cantonese subtitles!

The flight home was marred by a 2 hour delay in the flight from Hong Kong to Helsinki. Not a lot you may think, but enough for us to miss the connecting flight to London. So we were re-routed via Frankfurt. We were given 17 euro vouchers each for a meal. The last thing we wanted having had the best part of a fortnight being force fed Chinese food and then multiple meals on board the flight. Luckily the bar in Helsinki airport accepted these vouchers. Two more flights and two more meals later we arrived at Heathrow, just too late for our respective trains home.

Eclipse chasing – not for the faint hearted.

Just before 2nd contact ↑

Just after 3rd contact ↓

OASI Committee Contacts & Responsibities

Neil Morley	**Chairman**	☎	
Roy Gooding	**Secretary**	☎	**MAIN POINT OF SOCIETY CONTACT** Press Publicity with Chairman. Observatory Decoration. Visits by potential new members.
Paul Whiting FRAS	**Treasurer**	☎	**Finance.** Supervision of Grant Applications. Visits by outside groups. **IYA 2009 Coordinator**
James Appleton	Committee	☎	Committee Meeting Minutes. Web Site.
Martin Cook	Committee	☎	Membership. Tomline Refractor Maintenance.
Peter Richards	Committee	☎	Lecture Meetings. Email Distribution Lists.
Eric Sims	Committee	☎	Newsletter.
Mike Whybray	Committee	☎	Librarian & Workshops.
Bill Barton FRAS	Committee	☎	Safety & Security.
John Wainwright	Committee	☎	Forward planning & Strategy Equipment Curator

DIARY FOR OCTOBER

Monday 5th & 19th From 8pm	**SMALL TELESCOPES OBSERVING NIGHTS AT THE OBSERVATORY** Main observational targets: Cassiopeia Cygnus Moon & Jupiter ☎ Paddy O'Sullivan ☎ Gerry Pilling
Wednesdays **From 8PM**	**MAIN OBSERVATORY CLUB NIGHTS** Primary Observational targets: Nebulae and faint objects. ☎ Martin Cook (mobile) ☎ Roy Gooding (mobile)
Wednesday	**OASI WORKSHOP** Will resume in the autumn ☎ Mike Whybray
Thursday **8th 8pm** **15th 8pm** **22nd 8pm** **29th 8pm** **1st 8pm** **29th 7.30pm**	**OBSERVATORY VISITS BY LOCAL COMMUNITY GROUP** Norwich Astronomical Society U W Club In Good Company Private Group **Taster evening** ☎ Paul Whiting FRAS pavement Astronomy Levington Ship
Sunday 20th SEPTEMBER 7.30pm	**COMMITTEE MEETING** **Nacton Village Hall**

Observatory Open Weekend Saturday 24th Sunday 25th 19.30 to 22.00

Nacton Village Hall Talk & Telescopes Evenings Monday & Tuesday 26th - 27th

Astronomy in the park at Christchurch Park in Ipswich 19.30pm

Saturday 31st October & Sunday 1st November 11-00 15-00

At the Reg Driver Visitors Centre by the Bolton Lane entrance.

Society Primary Contacts

Chairman: Neil Morley ☎

Secretary: Roy Gooding ☎ (daytime) (evenings)

E-Mail queries: Ipswich@ast.cam.ac.uk

Society Trustees

Mr Roy Adams Mr David Brown Mr David Payne

Society Honorary President

Professor Allan Chapman D.Phil MA FRAS

Observatory Telephone Number

Meeting nights only

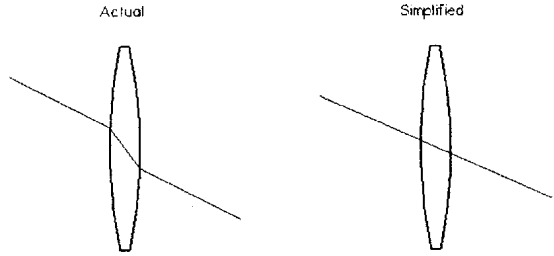
CONSTRUCTION OF OPTICAL RAY DIAGRAMS

Trefor Harries

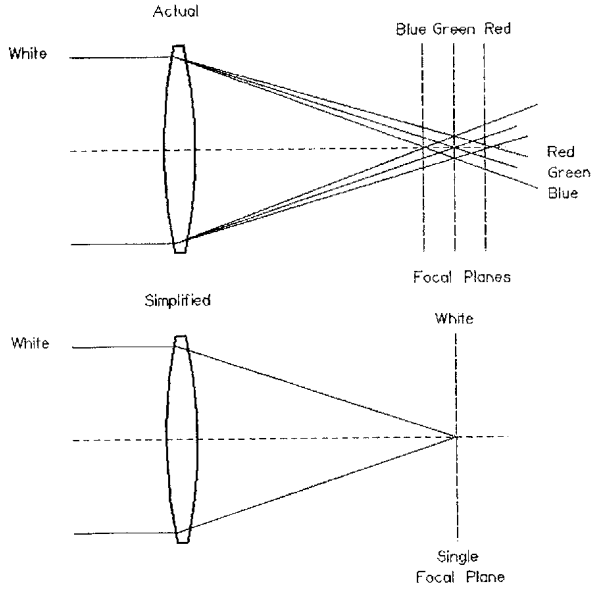
To facilitate understanding of the workings of optical instruments it is often desirable to be able to construct a ray diagram, or to understand a presented diagram. Construction can also help to determine if a particular optical combination is likely to work e.g. a Barlow lens with an extender.

Ray diagrams can be complicated but simplified constructions can be based on a few elementary principles. These are all idealisations, but are adequate to provide a good understanding of the basics of the optics. These principles can be presented as follows :

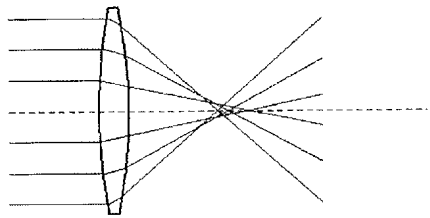
(1) A ray passing through the center of a lens (central ray) is undeviated. In truth the ray will undergo two refractions with the emergent ray exiting parallel to the incident ray but slightly offset from it.



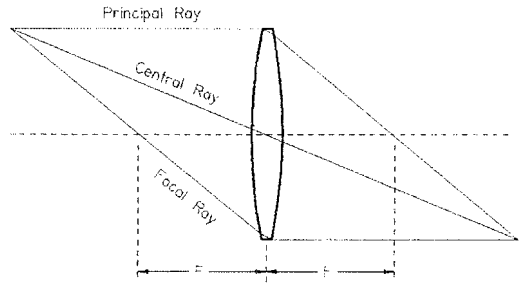
(2) A ray incident normal to a lens (principal ray) passes through the focal point. For a single lens this is usually true only for a specific frequency since the refractive index is a function of the wavelength. A combination of two or three lenses is necessary to bring an extended band of frequencies to a single focal point. The failure to bring all colours to the same focal point in a real lens is called chromatic aberration.



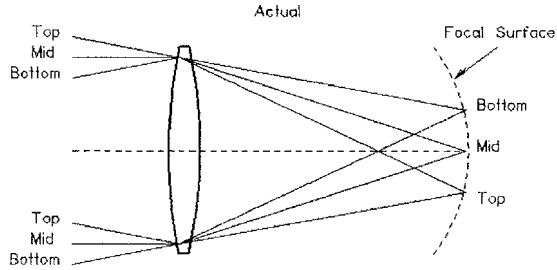
Also, rays incident further from the axis tend to be focused nearer than those closer to the axis. This is called spherical aberration.

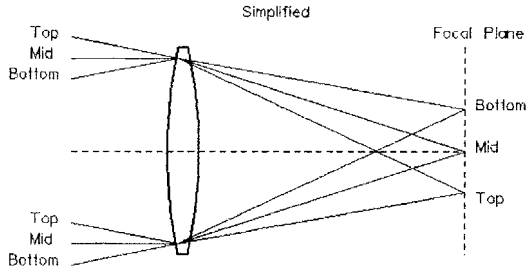


(3) A ray that crosses the optical axis at a distance before the lens equal to the focal length (focal ray) will emerge from the lens parallel to the optical axis. Rays from (1), (2) and (3) are shown.

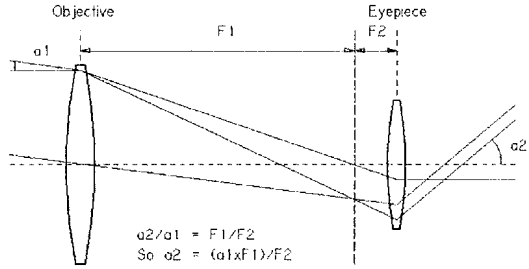


(4) All the parallel rays from any point on a distant object will be focused onto the same flat focal plane regardless of where they hit the lens. This is usually the way the lens is designed to work but in a real lens the focal surface is usually curved to some degree (usually concave as shown). This is called field curvature.



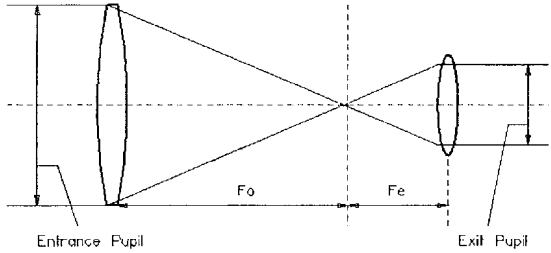


(5) If comparing two lenses of different focal lengths, e.g. as when constructing the ray diagram for a refractor, it is useful to note that any ray emergent from the eyepiece will have an angle to the optical axis given by the angle of the same ray when incident to the objective multiplied by the ratio of the objective focal length to the eyepiece focal length. This ratio gives the magnification of the telescope.



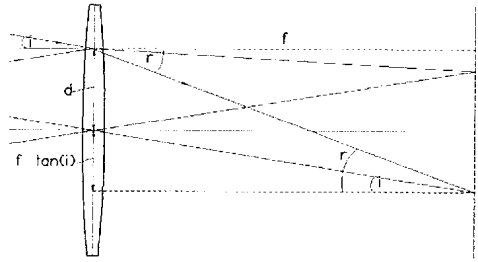
Also :

$$\frac{\text{Exit pupil}}{\text{Eyepiece focal length}} = \frac{\text{Entrance pupil}}{\text{Objective focal length}}$$



(6) **Refraction Angle**

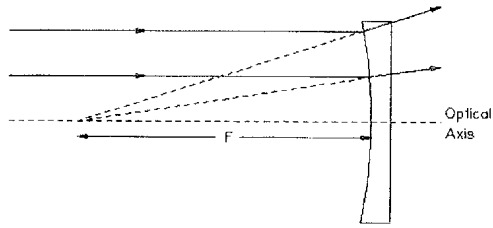
If the refraction angle of an incident ray needs to be calculated, this can be done from Fig. 1 which assumes a flat focal plane:
Fig. 1



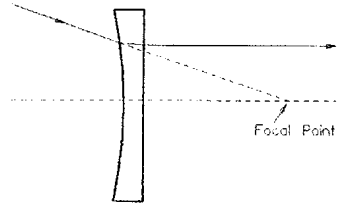
d Radial distance of incident ray
i Angle of incident ray
r Angle of refracted ray
f Focal length of lens

From Fig. 1 it can be seen that $r = \arctan\left[\frac{d + f\tan(i)}{f}\right]$

(7) For a negative lens the focal point is located where the emergent rays meet when they are projected backwards.



(8) A ray directed through a negative lens towards its focal point will emerge parallel to the optical axis.

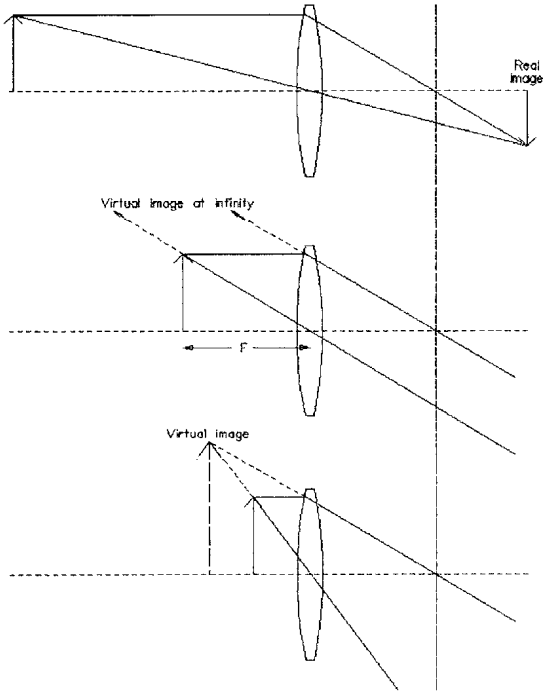


(9) The effect of a lens on an object or real image depends upon the object distance relative to the focal distance :

Object distance > focal distance :
A real image is formed.

Object distance = focal distance :
Virtual image at infinity.

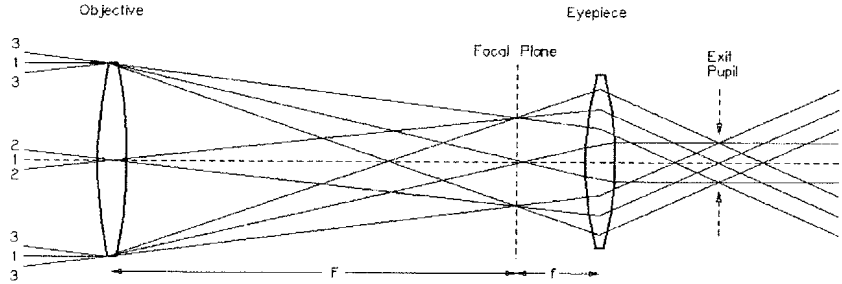
Object distance < focal distance :
Virtual image at finite distance.



In many optical instruments, such as a telescope, the normal position for the eyepiece is at its focal length from the image to be magnified, as a virtual image is required, and if this virtual image is situated at infinity this provides the most comfortable long-term viewing situation for the eye.

Using The Principles To Construct A Ray Diagram Of A Keplerian Telescope

Ray Diagram Of Keplerian Telescope



The Keplerian telescope uses a positive (convex) lens as an eyepiece which has to be placed the other side of the focal plane from the objective. Where the emerging light cone is at its narrowest point defines the exit pupil. As can be seen from the construction, the diameter of the exit pupil equals the diameter of the objective (the entrance pupil) divided by the magnification F / f. Note also that the final image is inverted; the rays that entered the objective from the top, when emerging from the eyepiece, appear to come from the bottom.

We can construct the figure above using the following sequence :

(1) Mark in the focal plane.

(2) Locate the objective at its focal length F from the focal plane and to the left of it.

(3) Locate the eyepiece at its focal length f from the focal plane and to the right of it. (This is the normal position of the eyepiece to provide a virtual image at infinity).

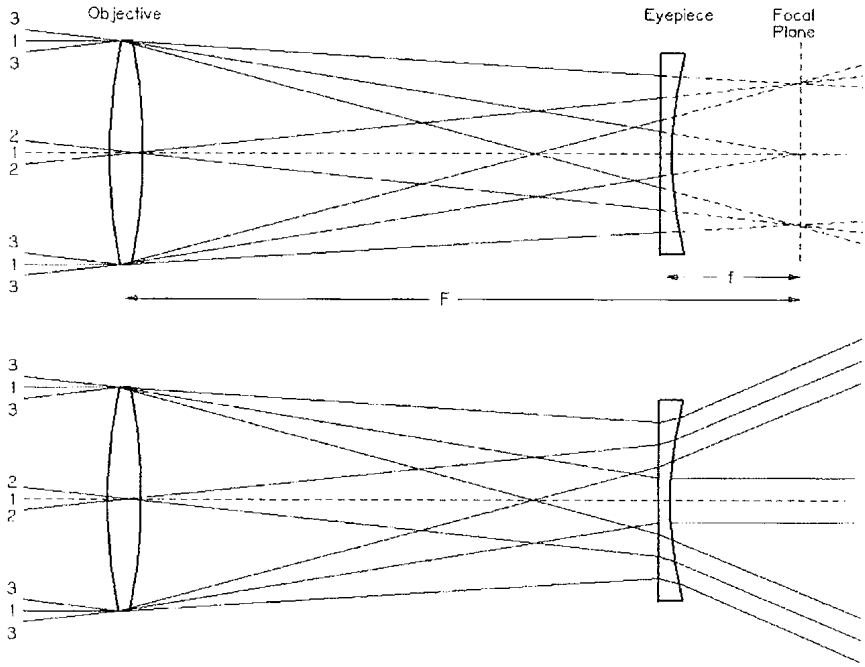
(4) Draw in the three rays marked '1' :
The center one just goes straight along the optical axis.
The other two intersect the optical axis at the focal plane.
Because the eyepiece is also at its focal length f from the focal plane these rays will emerge from the eyepiece parallel to the optical axis.

(5) Draw in the two rays marked '2' :
As these go through the center of the objective, they will be undeviated. They will emerge from the eyepiece at an angle to the optical axis equal to the angle they entered the objective multiplied by the magnification, which is F / f.

(6) Draw in the four rays marked '3' :
These will meet the focal plane at the same points as the rays marked '2'. (This is what a good objective lens is designed to do).
As the eyepiece is also at its focal length f from the focal plane, these rays will emerge from the eyepiece parallel to the rays marked '2'.

Using The Principles To Construct A Ray Diagram Of A Galilean Telescope

Ray Diagram Of Galilean Telescope



The Galilean telescope uses a negative (concave) lens as an eyepiece which has to be placed the same side of the focal plane as the objective. We can construct the figure above using a similar sequence to the Keplerian telescope. The diagram is split into two parts to avoid a confusion of lines : the top diagram shows the construction lines, and the second the light paths.

Construction :

(1) Mark in the focal plane.

(2) Locate the objective at its focal length F from the focal plane and to the left of it.

(3) Locate the eyepiece at its focal length f from the focal plane also to the left of it. (Again, this is the normal position of the eyepiece to provide a virtual image at infinity).

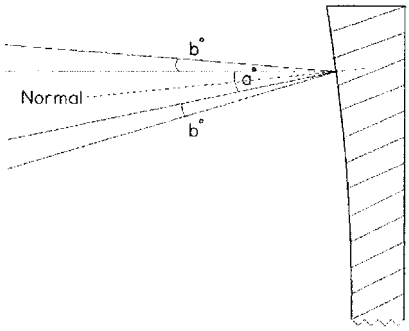
(4) Draw in the three rays marked '1' :
The center one just goes straight along the optical axis.
The other two intersect the optical axis at the focal plane.
Because the eyepiece is also at its focal length f from the focal plane these rays will emerge from the eyepiece parallel to the optical axis.

(5) Draw in the two rays marked '2' :
As these go through the center of the objective, they will be undeviated.
They will emerge from the eyepiece at an angle to the optical axis equal to the angle they entered the objective multiplied by the magnification, which is F / f.

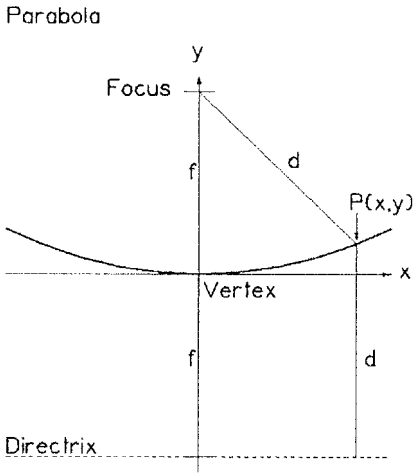
(6) Draw in the four rays marked '3' :
These will meet the focal plane at the same points as the rays marked '2'.
As the eyepiece is also at its focal length f from the focal plane, these rays will emerge from the eyepiece parallel to the rays marked '2'. Unlike the Keplerian, the image is erect; the rays that enter the objective from the top still appear to come from the top when emerging from the eyepiece.

Mirrors

Rays which hit the same point on the surface of the mirror will suffer symmetrical reflection, i.e. the angle 'b' between the reflected rays will be equal to the angle between the incident rays since each pair of rays will be symmetrically reflected about the normal to the tangent of the curvature.



Parabola

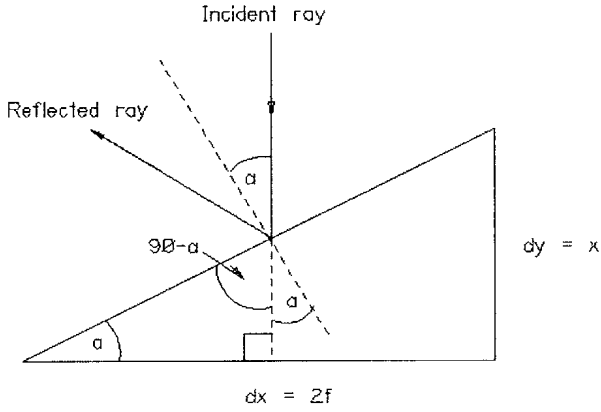


The parabola is the locus of all points where the distance to the focus equals the distance to the directrix. This is the curve that is often approximated by the mirror surface of a reflecting telescope.
For any point P(x,y) :

$$d = \sqrt{x^2 + (f - y)^2} = f + y$$

from which we get $x^2 = 4 f y$ or $y = \frac{x^2}{4 f}$

and the slope of the curve at any point is : $\frac{dy}{dx} = \frac{x}{2 f}$



Angle of incidence $a = \arctan \left[\frac{x}{2 f} \right]$

Angle at reflection $= 2\arctan \left[\frac{x}{2 f} \right]$