



# The Newsletter

of the  
**Orwell Astronomical Society (Ipswich)**



Registered charity No 271313  
www.oasi.org.uk

2009 April

No 440

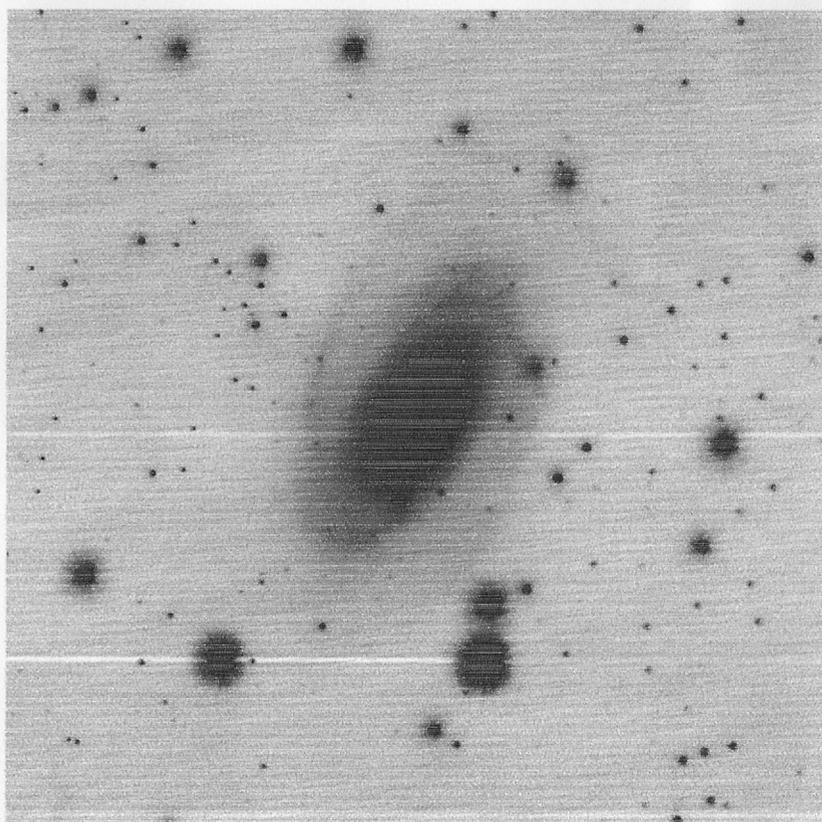


Image taken with 6 inch Schmidt camera working at F/2.8 using a Starlight Xpress H16 CCD camera. Twenty eight exposures of 30 seconds each were stacked together using IRIS software. The image was taken on 20<sup>th</sup> March at 21.00UT. Xpress is spelt like that!!!!  
Mike Harlow

## Society News (Roy Gooding)

### 1 Committee Meeting Sunday 19<sup>th</sup> April 2009 at 7:30pm

All members are invited to attend the next Committee meeting, on Sunday 1<sup>st</sup> February at 15:00 at Nacton Village Hall **Please note date, time and venue**

### 2 Observatory Keys

A new set of observatory key costs the society £18. If you have a set of keys that you no longer need please return them to Roy Gooding

### 3 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

### 4 Welcome to New Members

Mr. Chris Davies                      Mr. Richard Startin  
Mr. Stephen Blackhouse            Prof. Alan Mcguire

### 5 Lecture Meeting Venue

Our town lecture venue is now at the Methodist Church Halls, in Blackhorse Lane. The Church has a car park, which can take about 30 cars. Black Horse Lane has only one entrance, which is from Elm Street. This is just past the Police Station, if you are arriving from Civic Drive. The church car park is on the right, just past the Black Horse pub.

Meetings start at 20:00 doors open at 19:30

## Spring Open Weekend

The Open Weekend this year will be held on Saturday 4<sup>th</sup> and Sunday 5<sup>th</sup> April. Doors open for the public at 19:30

As usual as much help, as possible is required to make the Spring Open Weekend a success.

If you are only available to help for a short time your presence will still be appreciated.

## 6 Events for International Year of Astronomy 2009 (IYA 2009)

Spring Meetings	Venue	Date
Sidewalk Astronomy ( Night Observing)	The Ship Levington	Thursday 2 <sup>nd</sup> April 19:30
Spring Open Weekend	Orwell Park Observatory	Saturday & Sunday 4 <sup>th</sup> & 5 <sup>th</sup> April 19:30 to 22:00
Astronomy in the Park Solar observing	The Visitors Centre Christchurch Park ( Bolton Lane entrance)	Saturday & Sunday 30 <sup>th</sup> & 31 <sup>st</sup> May 11:00 to 16:00
Autumn Meetings	Venue	Date
Autumn Open Weekend		Saturday & Sunday 24 <sup>th</sup> & 25 <sup>th</sup> October 19:30 to 22:00
Talk and Telescope Evening	Nacton Village hall	Monday 26 <sup>th</sup> October 19:30
Talk and Telescope Evening	Nacton Village hall	Tuesday 27 <sup>th</sup> October 19:30
Sidewalk Astronomy ( Night Observing)	The Ship Levington	Thursday 29 <sup>th</sup> October 19:30
Astronomy in the Park Solar observing	The Visitors Centre Christchurch Park ( Bolton Lane entrance)	Saturday & Sunday 31 <sup>st</sup> October & 1 <sup>st</sup> November 11:00 to 15:00

The success of our contribution to IYA 2009 is dependent on the enthusiasm of our members. Please come along to as many events as you can.

Telescopes are needed for events at, The Ship, and Astronomy in the Park (preferably solar ones if available)

For more information please contact Paul Whiting or Roy Gooding

## 7 Other Society Events

Meeting	Venue	Date
Astronomy Workshop Laurence Newell talking on <i>Radio Astronomy</i>	Nacton Village hall	11 March 2009 19:45
Astronomy Workshop Second Beginners' Workshop	Nacton Village hall	08 April 2009 19:45
Summer Barbecue	Newbourne Village Hall	June TBA
Perseid meteor	The Dip" Felixstowe"	Saturday 15 <sup>th</sup> August 20:30
Geminid Meteor watch	The "Dip" Felixstowe	TBA
Christmas Meal	TBA	Wednesday 16 <sup>th</sup> December

## Night Sky (April)

All times GMT

### Moon

1 <sup>st</sup> Quarter	Full Moon	3 <sup>rd</sup> Quarter	New Moon
2 <sup>nd</sup>	9 <sup>th</sup>	17 <sup>th</sup>	25 <sup>th</sup>

Object	Date	Times		Mag.	Notes
		Rise	Set		
Sun	1	05:39	18:39		
	30	04:37	19:28		
Mercury	1	05:49	18:44	0.0	Mercury returns to the evening sky. This is the best evening apparition of the year
	30	05:04	21:32		
Venus	1	04:41	18:16	-4.5	Venus is back in the early morning sky this month.
	30	03:21	15:51		
Mars	1	05:02	15:51	1.2	Mars is the morning sky, but will be difficult to see as it is near the sun
	30	03:45	16:06		
Jupiter	1	04:13	13:32	-2.1	Jupiter is also visible in the morning sky
	30	02:29	12:04		
Saturn	1	15:56	05:22	0.5	Saturn remains well placed to observe all night.
	30	03:25	13:54		
Uranus	1	05:16	16:49	5.7	Uranus is in the morning twilight sky and will not be observable
	30	03:25	15:04		
Neptune	1	04:25	14:10	7.8	Neptune is also in the early morning twilight sky
	30	02:32	12:19		

### Meteor Showers (BAA Handbook)

Shower	Maximum	Limits	ZHR
Lyrids	April 24 <sup>th</sup>	April 19 <sup>th</sup> to 25 <sup>th</sup>	10

## OCCULTATIONS DURING APRIL

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
01 Apr	23:14:12	D	0.42+	-32	22	7.3	ZC 949
08 Apr	22:52:27	D	0.99+	-29	28	5.5	21 Vir
29 Apr	22:33:46	D	0.28+	-21	17	7.2	Hip 33757

James Appleton

## Google Street View comes to OASI.

Recently I was contacted by Google on whether it was possible for them to take a series of photographs of the entrance to the observatory progressing from the road and ascending the spiral staircase to the Tomline telescope.

Discussions have progressed well and a photographer will be visiting at the beginning of April to carry out the survey.

When the work is finally put onto Google Earth you will be able to virtually access the Observatory building with the intention that you will be able to view through the eye piece of the Tomline which will take you into Google Sky.

Members wishing to be present when the photographs are taken, and have their faceless images imbedded into Google should contact me via the website for a date and time.

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Martin Cook

## Shooting Stars with Ipswich Parks Department

Paul Whiting

This is how the park rangers billed the event that they asked us to put on for them at Orwell Country Park, on the banks of the Orwell between the Observatory and the Orwell Bridge. About a dozen members turned out with assorted telescopes and binoculars, meeting at the car park at 6.30pm. The weather was actually doing its bit – it was forecast to be clear until about midnight, when a front was due to cross over from the east. However as darkness fell a murky mistiness rose obscuring anything below about 40 degrees above the horizon all round.

Not to be put off we all duly loaded our kit in the back of a 4x4 pickup truck, which zoomed off into the distance leaving us to walk the several hundred metres down to the shore.

When we arrived the parkies were having some trouble with local bikers and they had to summon the local constabulary, but they had gone when the police arrived.

We were expecting the masses around 7 to 7.30 – we had even prepared for them an Iridium flare and a spectacular pass of the International Space Station plus support shuttle at around 7.20. However there was no sign of them. We appreciated the ISS pass (I didn't actually see the flare) and the time crept on. At 7.45 it was confirmed there were 45 or so punters who were currently paying to see us, but it was another 10 minutes or so before they actually arrived down the slope. After I welcomed them and briefed them about not using torches they were duly split up amongst the observers who had set their wares up at various places along the shore.

Green lasers blazed and, according to feedback, a good time was had by all. The biscuits were good but I didn't notice any hot drinks (or cold come to that). We saw all the old seasonal favourites, that the bad seeing would allow – Saturn, M42, M45, Alcor/Mizar, the bright spring stars and constellations. There were a few intelligent questions like if the universe is expanding and all galaxies are receding from each other, why are the Milky Way and Andromeda galaxies colliding? and a few inane questions about horoscopes!

The last keenies went home at about 9.45 and we wended our way up the hill and set off home at 10.

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# OASI Committee Contacts & Responsibilities

Neil Morley	Chairman	☎	
Roy Gooding	Secretary	☎	<b>MAIN POINT OF SOCIETY CONTACT</b> Press Publicity with Chairman. Observatory Decoration. Visits by potential new members.
Paul Whiting FRAS	Treasurer	☎	<b>Finance.</b> 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 APRIL

<b>Monday</b> 6 <sup>th</sup> & 20 <sup>th</sup>	<b><u>SMALL TELESCOPES</u></b> <b><u>OBSERVING NIGHTS</u></b>  Main Observational targets: Saturn Leo Vergo & close Messier objects. These will be the meetings till October.  ☎ Paddy O'Sullivan [redacted] ☎ Gerry Pilling [redacted]
<b>Wednesdays</b> From 8PM	<b><u>MAIN OBSERVATORY CLUB</u></b> <b><u>NIGHTS</u></b> Primary Observational targets: Nebulae and faint objects. ☎ Martin Cook [redacted] (mobile) ☎ Roy Gooding [redacted] (mobile)
<b>Wednesday</b>  8 <sup>th</sup> From 7.45PM <b>NACTON VILLAGE HALL</b>	<b><u>OASI WORKSHOP</u></b> <b>Beginners Night – Part 2</b> After Part 1 in February, Paul will go more deeply into the solar system and different types of stars and their fates. Hopefully we'll have one or more telescopes present again for you to poke and p[ro]d. ☎ Mike Whybray [redacted]
<b>Thursday</b>  9 <sup>th</sup> @ 8.00pm  23 <sup>rd</sup> @ 8.00pm	<b><u>OBSERVATORY VISITS BY LOCAL COMMUNITY GROUP</u></b>  Felixstowe Boys Brigade visit  <b><u>Taster evening</u></b>  ☎ Paul Whiting FRAS [redacted]
<b>Saturday</b> 19 <sup>th</sup> 7.30pm	<b><u>COMMITTEE MEETING</u></b> <b>Nacton Village Hall</b>

### Society Primary Contacts

Chairman: Neil Morley ☎ [redacted]  
Secretary: Roy Gooding ☎ [redacted] (daytime) [redacted] (evenings)  
E-Mail queries: [lpswich@ast.cam.ac.uk](mailto:lpswich@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

Meeting nights only

### Observatory Telephone Number

# John Isaac Plummer, Colonel Tomline's Astronomer

## Part 12

### A1 Micrometers

Plummer reported using four types of micrometer during his astronomical work:

- parallel wire,
- dark bar,
- ring,
- Airy double image.

In 1875, in Plummer's first report [1875a] on cometary observations from Orwell Park, he noted that the Observatory *is now supplied with more complete micrometrical arrangements*. He did not specify what the micrometrical arrangements were, but his later observing reports from Orwell Park indicated that it was equipped with all four kinds of micrometer.

References [1955a, 1979a] provide an overview of micrometers, including the four types used by Plummer. Figure 26 illustrates an idealised version of the view through the eyepiece for each of the four types.

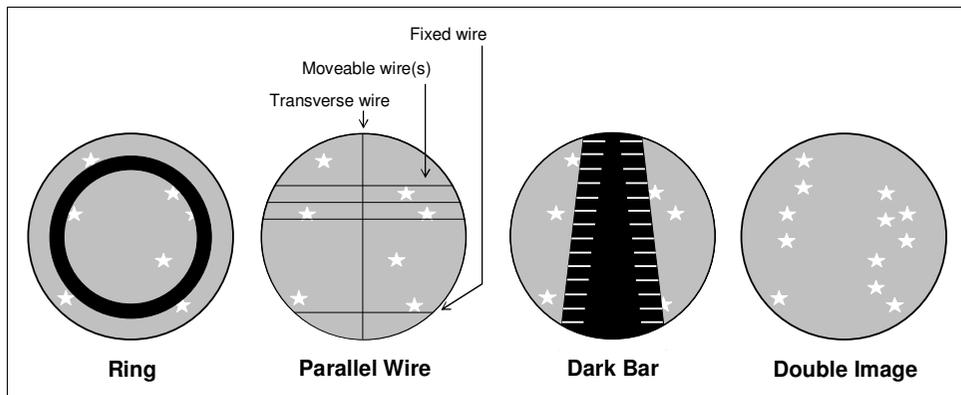


Figure 1. View through micrometer eyepieces (idealised).

For the purposes of exposition below, suppose that the astronomer is measuring the angular separation between a comet and a comparison star.

#### Ring Micrometer

The ring micrometer consists of a narrow, flat, opaque ring mounted at the focus of the objective glass. The advantages of the ring micrometer are that it is simple to construct, no field illumination is required and it works with any form of telescope mounting. The disadvantages are that it requires preliminary calibration prior to use and a relatively complicated reduction of results.

The ring micrometer operates with the telescope undriven. The observer positions the telescope ahead of the reference star and the comet and records the times at which both objects transit the ring of the micrometer. For greatest accuracy, he records times of transiting both the inner and outer edges of the ring. Subsequent reduction of the transit times, which is relatively complicated [1979a], yields the difference in position between the comet and the reference star.

Plummer used ring micrometers with a variety of diameters: 806".26, 932".500, 1234".136, 1878".4 plus several unspecified ring micrometers. When he specified the diameter of the ring micrometer, he specified only one measurement, implying that he used only the one diameter (either inner or outer) of the ring and eschewed the potentially improved accuracy that he could have obtained by using both the inner and outer diameters.

#### Parallel Wire Micrometer

This consists of several parallel wires, one fixed and one or more adjustable, placed at the focus of the objective glass. (The number of adjustable wires is always odd.) Many instruments also have a transverse wire, perpendicular to the parallel wires. A calibrated screw determines the position of the adjustable wire(s). The entire micrometer may be rotated about the optical axis, its orientation being indicated by an engraved position circle. Some variants provide a second set of parallel wires, one or more of which is adjustable, at right angles to the first set. Advantages of the parallel wire micrometer are its accuracy; its main disadvantage is cost.

The parallel wire micrometer operates with the telescope tracking the comparison star. To use the micrometer, the observer adjusts the position of the telescope such that the comparison star lies on the fixed wire. He then adjusts the moveable wire(s) so as to centre it/them on the comet and reads off the displacement from the calibrated screw.

### Dark Bar Micrometer

This consists of a wedge-shaped, graduated bar mounted at the focus of the objective glass. The observer first calibrates the bar by measuring the time taken by a star to transit the bar, at various elevations above the base of the bar, with the telescope undriven.

The dark bar micrometer operates with the telescope tracking the objects concerned. To use the micrometer, the observer moves the bar until its width spans the gap between the comparison star and the comet. The observer reads from the graduations the width of the bar and the corresponding distance between the two objects.

### Airy Double-Image Micrometer

The Airy double-image micrometer [1845a] uses a divided lens to produce two images of the field of view. The observer can rotate a threaded screw to move the components of the divided lens relative to one another - this has the effect of moving the two images relative to one another. Let S and C be the images of the comparison star and comet respectively produced by one half of the divided lens and let S' and C' be the corresponding images produced by the other half. To estimate the angular separation between the two objects, the observer rotates the micrometer such that the line separating S and C is aligned with the line separating S' and C' and then rotates the threaded screw until C and S' overlap; the separation can then be read from graduations on the threaded screw.

The Airy double-image micrometer has the advantage over the parallel wire micrometer that there are no wires to be illuminated or to cause diffraction effects. However, even if the segments of the divided lens are cut with great care, there is always some roughness around the edges which causes diffraction effects and makes it impossible to combine the images perfectly. The division in the lens also causes diffraction effects. Despite these problems, the double-image micrometer produces marginally more accurate measures of separation than the parallel wire micrometer.

## A2 Modern Calculation Of The Circumstances Of Astronomical Phenomena

In reviewing Plummer's work, it is instructive in some cases to compare his description of a phenomenon with a modern calculation of the circumstances of the phenomenon. In this booklet, calculations of the circumstances of astronomical events are based on the following reference material:

- Positions and motions of bodies in the solar system: the NASA JPL ephemeris DE-405<sup>1</sup> [1997a]. This is a high precision reference ephemeris (at the time of writing the most accurate ephemeris readily available).
- Positions and proper motions of stars: the ESA<sup>2</sup> Hipparcos catalogue [1997b]. This is a high precision reference catalogue providing positional data accurate to sub-milliarcsecond (mas) levels to magnitude 9.0 and to 25 mas for fainter stars. The median astrometric accuracy is around 1 mas.
- Lunar limb profile (for calculation of the times of lunar occultations): IOTA<sup>3</sup> electronic limb data. This is an electronic version of limb profiles published by Watts [1963a]. Note that Watt's data is of variable quality and is known to have several significant deficiencies: its uneven quality currently represents the biggest obstacle to producing accurate predictions of occultation events.
- Astronomical constants or values are taken where possible from [1989a] or [1992a] or from other sources specified.

In relating reports of astronomical phenomena in Plummer's era to modern predictions of the same phenomena, it is necessary to specify the value of the quantity  $\Delta T$ , defined (informally) as the difference between Ephemeris Time (ET) and Universal Time (UT):  $\Delta T = ET - UT$ . In Plummer's time  $\Delta T$  was typically of the order of a few seconds. In the calculations supporting the analysis in this booklet, values of  $\Delta T$  are estimated by interpolation in the table of historical values listed by Meeus [1991a], and reports of phenomena expressed in GMAT are converted to GMT, which is then simply equated to UT.

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<sup>1</sup> National Aeronautics and Space Administration, Jet Propulsion Laboratory Dynamic Ephemeris #405.

<sup>2</sup> European Space Agency.

<sup>3</sup> International Occultation Timing Association.

## A3 Plummer's Astronomer Relatives

### A3.1 William Edward Plummer, FRAS

John Isaac Plummer's younger brother was William Edward Plummer FRAS (1849-1928) [1929a]. William was born in Deptford like his elder brother, but unlike John, William had to start from the very bottom of the - then - astronomical career ladder by obtaining at the age of 15 a position as a supernumerary computer at the nearby ROG. William's talents were such that he was given training on Airy's Transit Instrument and qualified for occasional observing duties. In 1868 William left the ROG to become an assistant at Mr Bishop's private observatory at Twickenham.

At the time John Russell Hind was superintendent of Bishop's Observatory and in company in later years William would often say that any observing skills he possessed were due to the tutelage of Hind. Plummer's work at Twickenham included cometary observations and orbit prediction and the charting of stars down to the 11<sup>th</sup> magnitude within three degrees north and south of the ecliptic.

In late summer 1874 (almost the same date that John Isaac took up his post at Orwell Park) William was appointed First Assistant at the Oxford University Observatory. Working under Professor Pritchard, William's work at Oxford included the observation of satellites of Saturn, double stars, comets, photometric determination of the magnitude of stars visible to the naked eye, photographic measurement of the stellar parallax and photographic investigation of the motion of the companion star to Sirius (Sirius B - *The Pup*). In 1889 William received an Honorary MA from Oxford University. William did much work on international cooperation for the Photographic Astrographic Chart & Catalogue (*Carte Du Ciel*) and represented Professor Pritchard at the 1891 conference in Paris when Pritchard's ill health prevented him from attending.

In 1892, William was appointed to the Directorship of the Liverpool Observatory at Bidston. He remained in this post until his death in 1928. William's main duties at Bidston were the maintenance of a time service, rating and issue of chronometers and meteorological observations. He also utilised the Observatory's 200mm (8 inch) refractor for cometary work and the transit instrument for the determination of circumpolar star positions.



**Figure 2. An image thought, but not confirmed, to be that of William Edward Plummer FRAS and his wife.**

### A3.2 Henry Crozier Keating Plummer, FRS, FRAS

William Edward Plummer's son (John Isaac Plummer's nephew) was Henry Crozier Keating Plummer, FRS, FRAS (1875-1946) [1947a]. Henry was born at Oxford and educated at St Edward's School and Hertford College, where he excelled in mathematics. He studied physics and was then appointed Lecturer in Mathematics at Owen's College, Manchester. In 1900 he was appointed Assistant at the Oxford University Observatory (where his father had served with distinction) where he stayed for the next 12 years, with one year out as a Research Fellow at Lick Observatory in the USA. His research interest was the rapidly expanding discipline of spectroscopy and developments of the science at American observatories. At Oxford he utilised his mathematical abilities in the study of planetary theory.

Like his father before him, Henry worked on the Astrographic Catalogue. He also turned his mathematical attention to occultations, binary star orbits, cometary orbits, instrumentation and the accuracy of naked eye observations of meteors. Throughout his career he wrote many important papers.

In 1912 Henry was appointed Royal Astronomer for Ireland and Andrews Professor of Astronomy at Trinity College, Dublin. Working at the Dunsink Observatory with the 380mm (15") reflector he began a long programme of photometric observations of short-period variable stars and analysis of their light curves. In 1918 his book *An Introduction to Dynamical Astronomy* was published; it remains a standard work on the subject. Henry's papers published while at Dunsink included work on radial pulsations of Cepheid stars, work that would later be built upon by Harlow Shapley and Sir Arthur Eddington.

However, all was not well in Southern Ireland, and against the background of the Irish struggle for independence Henry retreated into an almost hermit-like existence at the observatory.

In 1921 he obtained a Mathematics Professorship at the Military College of Science at Woolwich. He remained there until his retirement in 1940. In a more congenial atmosphere suited to his quiet manner, Henry went on to publish further mathematical books and papers. He was also well known for his study of the history of science and he worked on the Committee of the Royal Society formed to publish Newton's papers. He also researched Edmund Halley and presented the Halley Lecture in Oxford in 1942. He was elected a Fellow of the Royal Society in 1920 and served as President of the RAS from 1939 to 1940.



**Figure 3. RAS Presidential portrait of Henry Crozier Keating Plummer, FRS, FRAS<sup>4</sup>**

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<sup>4</sup> Image reproduced by kind permission of the Royal Astronomical Society.

## **A4 Visit By Plummer's Great-Grandson To Orwell Park Observatory**

In late 2004, Richard Bellamy-Brown, great-grandson of John Isaac Plummer, while researching his family history on the Internet, discovered the OASI web site and the Society's interest in Plummer. On 18 September 2004 he contacted OASI. On 20 December 2004, Richard visited Orwell Park Observatory, where Ken Goward, Garry Coleman and Paul Whiting took great delight in showing him the Observatory and explaining his family ties to it. Richard kindly posed at the eyepiece of the equatorial refractor (nowadays known as the Tomline Refractor) and the transit instrument, thereby recreating scenes from more than a century previously. Luckily, the sky was clear and Richard was impressed with an *ad hoc* solar projection using the Tomline Refractor, which revealed a large sunspot group on the Sun's disk. Following a brief meeting with Andrew Auster, Orwell Park Headmaster, and a photo-stop at *Orwell Dene* (the house built by Colonel Tomline for J I Plummer), the party retired to the Shepherd & Dog Carvery for lunch after which Richard took his leave.

At the OASI AGM on 15 January 2005, Richard was elected an honorary member of OASI. We look forward to a long and happy association with the descendants of J I Plummer.



**Figure 4. John Isaac Plummer's great-grandson, Richard Bellamy-Brown, at the eyepiece of the Tomline Refractor, 20 December 2004.**

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A much expanded and revised version of this article can be found on the OASI website ([www.oasi.org.uk](http://www.oasi.org.uk)) and it will shortly be available for sale as a booklet.