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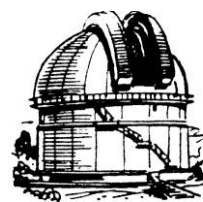
# Journal

of the

Nottingham Astronomical Society

December 2015

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Thursday, 3<sup>rd</sup> December

British Geological Survey

Nicker Hill, Keyworth

8 pm (doors open at 7.30pm)

Tonight we welcome

**Dr Chris Arridge**

*Royal Society Research Fellow,*

*University of Lancaster*

who will be speaking on

**“New Horizons: Pluto and the Kuiper Belt Objects”**



## **Comet C/2013 US<sub>10</sub> (Catalina) is heading northwards into our sky**

C/2013 US<sub>10</sub> was discovered on the Catalina Sky Survey in October 2013, as a magnitude 18 object over 8 AU from the Sun. Originally thought to be an asteroid, it was rapidly re-identified as a comet. It reached perihelion on November 16<sup>th</sup> this year, after spending all its time since discovery in the southern hemisphere. But the comet is now heading into our skies, and should be visible (initially very low down in the morning sky) from the first week in December in the constellation of Virgo. It is hoped that the comet will brighten to magnitude 5, so should (just) be visible to the naked eye from a very dark site under a clear sky. Climbing much higher, it will cross the border into the constellation of Bootes on Christmas Eve (but the Moon will be almost Full at this time!) and on New Year's Day will pass very close to **Arcturus**. Continuing on its northward track, the comet will move into Canes Venatici on January 7<sup>th</sup>, and pass **Alkaid** in the Plough on January 15<sup>th</sup>. Late in January it will pass close to **Polaris**, but by then will probably have faded below 6<sup>th</sup> magnitude.

Realistically you will need binoculars to find this comet, but it could make a great target for astrophotographers. So, fellow Society members with suitable cameras, let's give it our best shot!

# Sky Notes

## December 2015

Compiled by Roy Gretton



*All times given below are in Greenwich Mean Time (GMT)*

The **Winter Solstice**, when the Sun reaches its most southerly declination of 2015, occurs at 4:48 am on December 21<sup>st</sup>.

### PHASES OF THE MOON

<i>Phase</i>	<i>Date and time</i>	<i>Moonrise</i>	<i>Moonset</i>
Last Quarter	7:40 am on December 3 <sup>rd</sup>	---	12:35 pm
New Moon	10:29 am on the 11 <sup>th</sup>	7:30 am	4:30 pm
First Quarter	3:14 pm on the 18 <sup>th</sup>	12:05 pm	---
Full Moon	11:11 am on the 25 <sup>th</sup>	4:30 pm	7:30 am

This month the Moon is closest to the Earth on the 21<sup>st</sup> and furthest on the 5<sup>th</sup>.

### Occultation of Aldebaran

The waxing gibbous Moon will pass in front of the bright star Aldebaran (magnitude +0.9) on the evening of December 23<sup>rd</sup>. The Moon will rise at approximately 2:50 pm. Aldebaran will disappear behind the Moon at about 6:10 pm and reappear about an hour later.

### THE PLANETS

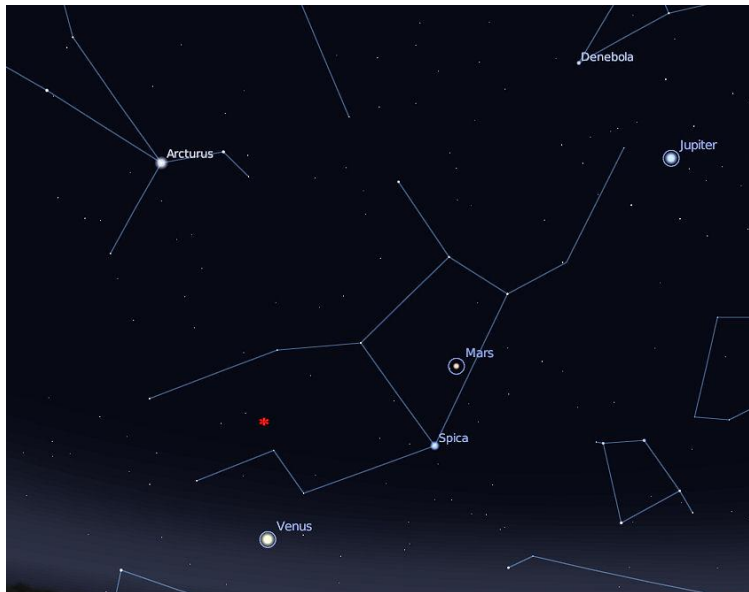
**Mercury** is unobservable as December begins, being only 7 degrees east of the Sun, but the separation increases until the 29<sup>th</sup>, when the planet will be at greatest elongation (20 degrees). Even then it will be a very challenging target, being only 7 degrees above the southwestern horizon at sunset.

**Venus**, in the process of moving from Virgo into Libra, begins December as a brilliant magnitude  $-4.2$  object in the pre-dawn sky, through a telescope exhibiting a gibbous phase. As the month wears on, Venus will be moving back toward the Sun and fading slightly, but even at the end of the year it will still be rising three hours before sunrise, and be shining at magnitude  $-4.1$ .

**Mars**, an unspectacular object in the morning sky, rising 5 hours before the Sun as the month begins, will be very slowly increasing in brightness, reaching magnitude +1.3 by the close of December. Even then it will continue to present a very small disk, a little over 5 arcseconds across, so it is unlikely to show any detail through a telescope.

**Jupiter**, in the constellation of Leo, rises due east half an hour after midnight at the start of December, and by the close of the month will be visible from the very late evening. By then it will have brightened to magnitude  $-2.1$  and will have an apparent equatorial diameter of 39 arcseconds.

**Saturn**, in the constellation of Ophiuchus, is practically unobservable this month, as it passed through conjunction with the Sun on November 30<sup>th</sup>.



### Three planets and a comet

Looking southeast  
at 5 am on  
December 13<sup>th</sup>

*(The red marker  
indicates the  
approximate position  
of Comet Catalina)*

**Uranus** is an evening object, visible for much of the night about seven degrees north of the celestial equator in the constellation of Pisces. It shines at magnitude 5.7, and has an angular diameter of 3.7 arcseconds.

**Neptune** is an evening object in the constellation of Aquarius, due south at 6 pm at the beginning of December, shining at magnitude 7.8, and having an angular diameter of 2.4 arcseconds.

## METEORS

### Welcome the Geminids!

When I became interested in astronomy (in the 1950s) my first astronomy textbook listed the Geminids as an annual meteor shower, but *not* a particularly spectacular one. Since those days, the orbit of the swarm has evolved in such a way as to bring it into closer and closer contact with the Earth, with the result that the Geminids today are unrivalled as the most abundant meteor shower of the year, producing over 100 events per hour under ideal conditions. Furthermore, the radiant of the shower, close to the star Castor, is above the horizon for the whole night in December, so Geminids may be seen at any time after darkness falls (although the radiant doesn't reach its highest point until after 1 am, so a midnight vigil should yield greater rewards).

This year conditions are extremely favourable, with New Moon falling on December 11<sup>th</sup>, and maximum meteor activity expected on the night of the **13<sup>th</sup>-14<sup>th</sup>**... although Geminids may be seen on any night between December 8<sup>th</sup> and 17<sup>th</sup>.

Geminid meteors can be very bright. In 2011, with less-than-favourable conditions (a gibbous Moon in the neighbouring constellation of Cancer), I remember seeing a brilliant Geminid at about 10 pm as I drove home under the lights of West Bridgford.

Of course there is the small matter of the weather! December nights can be **cloudy** (for which we have no remedy) and if clear may be **cold** (the remedy for which is to wear sufficient layers of warm clothes as you relax in your recliner and gaze skywards).

Enjoy!

### COMET Catalina (C/2013 US<sub>10</sub>)

A magnitude 5 comet will be moving northwards throughout the month, beginning in Virgo and reaching Boötes by the close of the year. See the panel on Page 1 for more details.

## DIARY DATES 2015-16

### Monthly Meetings of the Nottingham Astronomical Society

Our programme for this year is shown below. Check our website: [www.nottinghamastro.org.uk](http://www.nottinghamastro.org.uk) for the latest information about the Society's meetings and for further information about the talks and speakers.

Our meetings are held on the **FIRST THURSDAY** of the month, at the British Geological Survey, Keyworth, Notts, NG12 5GG

(except **August**, when we meet at our observatory site, between Cotgrave and Cropwell Bishop)

Doors open at 7:30pm for 8pm start.

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
December 3 <sup>rd</sup>	New Horizons : Pluto and the Kuiper Belt Objects	Dr Chris Arridge, <i>University of Lancaster</i>
January 7 <sup>th</sup>	Open Evening <i>including a New Year Quiz</i>	
February 4 <sup>th</sup>	The Formation of the Solar System	Dr Richard Alexander <i>University of Leicester</i>
March 3 <sup>rd</sup>	Rosetta: Anatomy of a Comet	Dr Colin Snodgrass <i>The Open University</i>
April 7 <sup>th</sup>	Is There Anyone Out There?	Prof Ian Morison <i>University of Manchester</i>
May 5 <sup>th</sup>	Gamma Ray Bursts	Prof Nial Tanvir <i>University of Leicester</i>
June 2 <sup>nd</sup>	Gaia: A Billion Pixel Survey of a Billion Stars	Dr Elme Breedt <i>University of Warwick</i>
July 7 <sup>th</sup>	The Antikythera Mechanism: an Ancient Astronomical Computer	Prof Mike Edmunds <i>University of Cardiff</i>
August 6 <sup>th</sup> (Saturday)	Society BBQ at the Observatory	
September 1 <sup>st</sup>	Images of the Universe - 2	Paul Money
October 6 <sup>th</sup>	Open Evening <i>including a Telescope Surgery</i>	
November 3 <sup>rd</sup>	Annual General Meeting 2016	
December 1 <sup>st</sup>	Galactic Monsters: Seyfert Galaxies, Radio Galaxies and Quasars	Dr Marek Kukula <i>Greenwich Observatory</i>

## **SPECIAL FEATURE: Video Meteor Detection**

I suspect many people have seen a shooting star, a transient streak of light across the night sky. The majority of these will be [meteors](#), bits of debris floating around the solar system which hit the Earth's atmosphere and burn up releasing light. Most meteors are the size of a grain of sand (though not as dense) and are thought to originate from comets and sometimes from asteroids. Larger fragments occasionally penetrate through the atmosphere and material lands on Earth as a [meteorite](#), the most notable in recent times being the [Chelyabinsk meteor](#) which was estimated to be 20m in diameter and weighing more than the Eiffel Tower and appeared over Russia in 2013.

Meteors are classified as either sporadic or part of an annual meteor shower. Sporadic meteors are largely unpredictable, though between about 6-10 an hour can be observed under a dark sky most nights. Shower meteors are the remains of a larger body which currently, or previously, orbited the Sun, and they interact with the Earth's atmosphere at specific times of the year when the Earth crosses the orbit of the parent body. These are the meteors which fall into the category of an annual meteor shower, such as the [Perseids](#) which peak on about the 12th August each year and are debris from [Comet Swift-Tuttle](#).

Some amateurs are visual observers of meteors, others use long exposures with wide-field lenses to detect them. A growing number of people are using video systems to capture meteors which can be left unattended all night (allowing the operator to go to bed), but more importantly to accurately record direction of travel, speed and time of capture. I now belong to the [NEMETODE network](#), which has 28 members and 46 cameras in the UK, Ireland and Northern France. The work of the NEMETODE network feeds in to other UK and international collaborations.

My detection system (right) consists of a Watec camera and 3.8mm f/0.8 lens inside a CCTV housing attached to the side of the house; this points up at about 45 degrees in a south easterly direction. Leads run from the camera to a dedicated PC which controls the camera and records the data. The CCTV housing has a heated block to prevent the window from misting up and an electronic iris in the lens closes during the daytime to prevent sunlight from damaging the sensitive sensor inside the camera. The whole set up of camera, wiring and a refurbished PC with monitor was just over £300; the capture software is called [UFOCapture](#) and a life-time subscription costs about £100. UFOCapture operates continually as a motion-detection system, checking for any movement in the field of view.



If it detects any flash/movement it writes the video clip to the computer's hard disk. Over the course of the night many clips will be recorded and it is the job of the operator in the morning to look through the clips to delete any false captures from bats, aircraft, fireworks, cosmic rays, and to sift out those clips with likely meteor events.

Within the loop of video containing the meteor trail, the background stars are also visible alongside the precise time the clip was taken. Free analysis software ([UFOAnalyzer](#)) then overlays where the background stars should sit given the direction the camera is pointing and the time and date, and the operator adjusts to precisely overlay the predicted star positions with their actual positions on the video footage; this only needs to be undertaken once as long as the camera isn't moved. The analysis software then looks at the meteor trail and calculates the path the meteor has taken through the Earth's atmosphere. From a single camera this analysis is weak, but if a second camera from another location detects the same meteor this will allow a much more accurate triangulation of the path of the meteor to be calculated. If numerous cameras detect a meteor then the triangulation is even better. The analysis software determines many features of the meteor, including its altitude and speed of

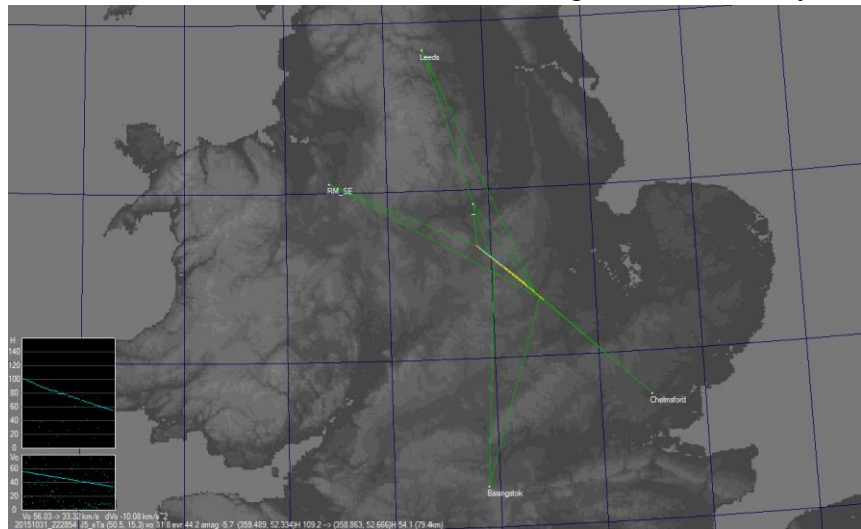
descent, its ground map (the land over which the meteor was travelling), and can determine if this was a sporadic meteor or one of a known annual meteor shower.

On the night of 31<sup>st</sup> October 2015 at 22:28 my camera detected a particularly bright meteor (right); the bright object to the bottom left is the rising moon. My initial analysis identified it as a Southern Taurid meteor, part of an annual meteor shower. On sharing this bright meteor with other members of the NEMETODE network several others declared they had detected it too. The meteor was seen in five cameras in all: from Nottingham, near Chester, Leeds, Chelmsford and Basingstoke.



Analysis of the group data confirmed it to be a bright meteor from the annual shower called the [Southern Taurids](#) which can be observed from mid-September to late-November and which appear to originate from the constellation of Taurus. Analysis also revealed this meteor was first captured at an altitude of 109km whilst travelling at a speed of 56km/s; when the trail vanished at an altitude of 54km it had slowed to 33km/s. The ground map for this meteor and the locations of the cameras which detected it is shown (right). Further analysis

has predicted a likely orbit of the parent body in the solar system, which suggests the orbit extended out past Mars into the asteroid belt. The parent body of the Taurid meteor shower is thought to have been broken up thousands of years ago and may also have given rise to [Comet Encke](#) which orbits the sun about once every 3 years.



By better characterising meteor trails and analysing their velocities, trajectories and brightness (a partial surrogate of the meteors mass), the aims of meteor detection is to look for other possible annual meteor showers amongst the background of sporadic events, to identify likely orbits of the parent bodies (whether they still exist or not), and to better understand the orbits, particle sizes and composition (using spectroscopy) of these particle streams in an attempt to help understand the origins and evolution of our solar system.

*James Dawson*



### **NAS Helpdesk**

The long winter nights are now truly upon us. Are you managing to get to use your equipment to your full satisfaction, or are there problems with setting it up or understanding how it works which is hindering your enjoyment? If so, come and see us at the Helpdesk or email us and we will try and help. We may be able to arrange a visit if you are unable to attend the coming meeting or if the equipment is too large to bring along. No problem is too small or too large for us to try and help with.

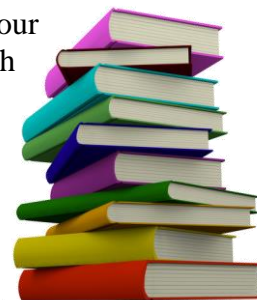


We still have a few copies left of the 2015/2016 Federation of Astronomical Societies' Astrocalendar for sale at £2 each; £1 goes to Nottingham Astronomical Society, and £1 pays for the calendar. These will be on the Helpdesk at the December meeting.

*James Dawson and Bob Richardson* [NAShelpdesk@hotmail.com](mailto:NAShelpdesk@hotmail.com)

### **NAS Library**

Christmas draws near - have you included any astronomy books on your Christmas list? We'd love to hear what books you long for and which ones you receive. [Patrick Moore's Yearbook of Astronomy](#) is a firm favourite for many - in fact the series has been running since 1962. Alongside monthly descriptions of what is happening in the night sky throughout 2016, the latest yearbook also includes various essays, including one by Allan Chapman on John Herschel which make very interesting reading. We have a copy of the 2016 edition so get in touch if you want to borrow it. We also have access to every copy since 1962 so if there is a specific edition you want to look at, get in touch.



The full list of books in our lending collection can be found here: [NAS Library Collection](#).

*Lorraine* [NASlibrarian@hotmail.com](mailto:NASlibrarian@hotmail.com)

### **NAS Facebook update and a blast from the past**

The [NAS Facebook](#) account continues to attract followers from the Nottingham area and from much further afield; the latest count shows that we have 250 followers. Most posts to the Facebook page advertise NAS events, but also advertise other astronomy-related events in the locality, together with national and international astronomy news items. We often get images uploaded by our followers and I'm hoping these long nights will encourage those who image or sketch or just write down their observing sessions to start submitting items to the page again.



A recent comment was received from Tony Elliott who many may remember was chairman of NAS in the 1990s. Tony lives in Eastwood but will soon be moving to France and is still a keen amateur astronomer with an interest in astrophotography. Tony sends his regards to those who remember him, and anyone who would like to contact Tony can do so via the Facebook page (where he is listed as Anthony Elliott), else email me using the Helpdesk email address and I can forward your email address on to him. If you do not have a Facebook account but would like to, or just want to talk about it, speak to a member of the committee or catch me at the Helpdesk. Our Facebook page can be found here: <https://www.facebook.com/nas.org.uk>

*James Dawson*, NAS Facebook administrator, [NAShelpdesk@hotmail.com](mailto:NAShelpdesk@hotmail.com)

## **Society for the History of Astronomy Autumn Conference and AGM 2015**

**Saturday 31 October, Birmingham and Midland Institute, Birmingham**

<http://www.shastro.org.uk/>

The Society for the History of Astronomy was founded at Wadham College, Oxford in June 2002. It regularly holds meetings relating to the history of astronomy at the local and regional level. There are 2 main meetings in spring and autumn and a summer picnic which in recent years has included a visit to Greenwich Maritime Museum and the Mill Hill Observatory. Next spring the conference will be joint with the William Herschel Society and will be held in Bath on 2 April 2016, where several guest speakers will be present.

James Dawson and myself attended the October meeting and we enjoyed a variety of fascinating talks including topics on Derbyshire Astronomers, Neville Maskelyne's life and role as Astronomer Royal and a talk on the Chance Brothers and their contribution to astronomy. The latter founded an early Birmingham glass factory that manufactured the worlds finest quality optical crown and flint glass from which many famous refractor telescopes were made. The final talk was given by Professor Alan Chapman on the life of John Herschel (son of William Herschel) who mapped the southern skies from Cape Town.

I recommend this society to anyone interested in the early history of astronomy and developments in astronomy that we all now take for granted. The society has an online database of historical observatories in Britain arranged on a County basis. A well stocked library of historical material is also available housed at the Birmingham and Midland Institute. James Dawson has recently been appointed as their new librarian.

*Barrie Chacksfield*

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### **The Nottingham Astronomical Society: E - SERVICES**

Whether or not you are a NAS member, you can keep up to date with details of the Society's meetings and other events by visiting the NAS website: [www.nottinghamastro.org.uk](http://www.nottinghamastro.org.uk)

#### **NAS on Facebook**

You are welcome to connect with other members and friends of the NAS on Facebook by going to: <http://www.facebook.com/nas.org.uk>

#### **NAS on Twitter**

The Society now has a Twitter account at <https://twitter.com/NottinghamAstro>

#### **NAS Journal e-mailing list**

To register for your monthly e-mailed copy of the NAS Journal, just e-mail [secretary@nottinghamastro.org.uk](mailto:secretary@nottinghamastro.org.uk)

You don't have to be a Society member to take advantage of this service.



## Advertisement

### FOR SALE

Brightstar manual filter wheel (holds up to five 1¼-inch filters)	£30
Set of four 1¼-inch coloured filters (red, yellow, green, blue)	£20
Mars filter 1¼-inch	£10
Moon filter 1¼-inch (25% transmission)	£10
Filter case (holds up to four 1¼-inch filters)	£2
Celestron lens pen	£2
Micro-fibre cleaning cloth	£2

**Sam Boote [s.boote@bcs.org](mailto:s.boote@bcs.org) or at Society meetings**

# Nottingham Astronomical Society

Affiliated to the British Astronomical Association  
Member of the Federation of Astronomical Societies  
Member of the Society for Popular Astronomy  
Supporters of the Campaign for Dark Skies  
Registered Charity No: 1066645

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**(vacant post)**

email: [observatory@nottinghamastro.org.uk](mailto:observatory@nottinghamastro.org.uk)

**Observatory line: 07726 940700 (line open during observing sessions)**

## **ORDINARY COMMITTEE MEMBERS:**

**Sam Boote**

**Barrie Chacksfield**

**James Dawson**

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## **Meetings**

Our meetings, often with an illustrated talk by a guest speaker, are held on the first Thursday of each month (except in August) at:

**The British Geological Survey  
Nicker Hill  
Keyworth  
Nottingham NG12 5GG**

Doors open                    7.30pm  
**Meetings start                8.00pm**  
Meetings end                10.00pm

Meetings are open to the public, and visitors are welcome to attend.

## **Annual subscriptions 2016**

Full	£30
Joint rate for partners living at the same address	£45
Under-18s and full-time students	£5

Subscriptions become due on 1<sup>st</sup> January. Half-price subscription is charged if joining after 30<sup>th</sup> June (minimum subscription £5).

Please make cheques payable to:  
*Nottingham Astronomical Society.*

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If you would like more information about the **Nottingham Astronomical Society**, or would like to become a member, please contact the Secretary [secretary@nottinghamastro.org.uk](mailto:secretary@nottinghamastro.org.uk) or speak to any NAS committee member at one of the regular monthly meetings. A membership application form is inside this issue of the Journal.

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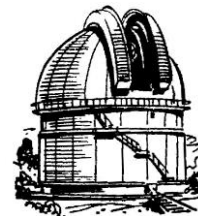
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# NOTTINGHAM ASTRONOMICAL SOCIETY

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## Membership application and Gift Aid declaration

**Title:**

**Full name:**

**Full home address:**

**Postcode:**

**Telephone:**

**e-mail address:**

<b>Subscription rate:</b>	Full	£30.00	(year)	£15.00	(half year)
	Partnership	£45.00	(year)	£22.50	(half year)
	Under-18 and full-time students	£5			

Partnership = two members living together as a couple at the same address

I wish my subscriptions to be eligible for Gift Aid **Yes / No**

## Gift Aid declaration

**(HMRC reference XR32048)**

I want Nottingham Astronomical Society to treat all subscriptions and donations that I make from the date of this declaration as Gift Aid donations, until I notify you otherwise.

I pay an amount of UK Income Tax and/or Capital Gains Tax at least equal to the tax that Nottingham Astronomical Society reclaims on my donations in the appropriate tax year.

**Signature:**

**Date:**