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EXOPLANETS AND HOW TO FIND THEM

**Dr Andrew Norton, Open University
Institute of Physics, London 14/03/2012**



Above Dr Barbara Gabrys and Dr Andrew Norton

The possibility of the existence of non-solar system planets was known for a long time. Lucretius, the Epicurean poet and philosopher commented on the possible worlds phenomenon. At that time, it was known that planets orbited stars. These insights were followed by eminent philosopher-scientists such as Albertus Magnus in the Middle Ages, Giordano Bruno in the Renaissance and Huygens in the 17th century. It was not until 1995 when advances in technology and computing allowed a steadfast progress in this area by detecting and visualizing these planets. In October 1995, Mayor and Queloz announced the discovery of an exoplanet orbiting the star 51 Pegasi. The planet was named 51 Pegasi b. It orbits very close to the star, is nearly half the mass of Jupiter but with a temperature of 1200°C (hence the name hot Jupiter). Today, nearly 800 planets have been detected and their number is increasing rapidly.

The lecture then progressed with a discussion of four detection methods for exoplanets: -

1-Detection by Direct Imaging, which can be difficult because of the light emitted by the star, (easier to do in the infrared spectrum). 29 planets have been detected by this method.

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Page 2 Communicators Group Call for Participants. **Page 3** Dr Isenberg at The 2012 IOP SW Branch Festival of Physics. **Page 4** The Contributions of Photography to Art and Society. Alan Turin lecture at City University 17 April. Communicators Group Summer Meeting 29 June 2012 **Page 5:** Rems Walk along the Regents Canal. **Pages 6 & 7:** A Collaboration based on Red Sprites **Page 7** AWE meeting change of date. **Pages 8 & 9:** The Woofyt at St Mary at Finchley.

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Exoplanets continued from page 1

2- Detection by Doppler Shifts: When an object moves, the light reflecting or emanating from it is shifted in wavelength. This is the Doppler Shift. If an object is moving away from a detector, its light is shifted towards shorter, redder wavelengths; if an object is moving towards a detector, its light is shifted towards longer, bluer wavelengths. When a planet orbits a star, it orbits the centre of mass of the system. Whilst the planet does the bulk of the moving, the star wobbles. By carefully observing a star and measuring the shift in the colour of light, we can determine how quickly the star is moving. From the size of the Doppler Shift we can estimate the mass of the planet and the time it takes to orbit around the stars well as other properties. As the technique gets more refined more and smaller planets have been detected.

3-Detection by Microlensing: The pattern of the light will appear to bend as it goes past a massive object like the sun (as predicted by Einstein and later on tested by Eddington).

Finally 4- Detection by Transits: Observing the extrasolar planet when passing in front of its parent star. On doing this the planet will block part of the light from the star. More than 200 planets have been detected by this method. The method allows calculations for: mass, radius, density, temperature and shape of the planetary orbit. On other occasions, instead of a planet, the transiting object could be a binary star companion. A good example of this method is the WASP (Wide Angle Search for Planets), detecting 70 planets. It can also detect biospheres in the transiting exoplanets. The main purpose of the WASP technique is to detect Earth-like planets, planets that lie in the habitable zone (or Goldilocks zone) and with a similar size. So far, we know of WASP 18b, WASP 17b, planet D, Corot 7 and the Kepler mission which in December 2011 confirmed Sun-like star (Kepler 20) and two Earth-sized candidates, Kepler-20e and Kepler-20f in the constellation of Cygnus. Kepler's only instrument is a photometer that continually monitors the brightness of 145,000 main sequence stars in a fixed field of view.

The future is promising and exciting. Perhaps in a not-so-distant future we could talk of Science-fact instead of Science Fiction!

Dr Nuria M Calvo

Communicators Group

Call for participants – Simon Singh Radio Workshop

**Venue: Institute of Physics, 76 Portland
Place, London, W1B 1NT.
11:00 am -12:30pm on 29th June 2012
(The workshop will take place just prior to the
Physics Communicators Group Summer
Meeting)**

This is a small workshop limited to just 10 participants to discuss how to get more physics on the radio, both local and national. It will be run by Simon Singh, who has appeared on both sides of the microphone, as an interviewer and being interviewed. Due to the limited number of participants, Simon is looking for members who already have some radio experience (i.e., participants should have appeared on local radio at least once). If you would like to participate, then please contact the group Secretary David Smith at

david.smith@brunel.ac.uk

detailing your radio experience, listing date, radio station, approximate duration and topic.

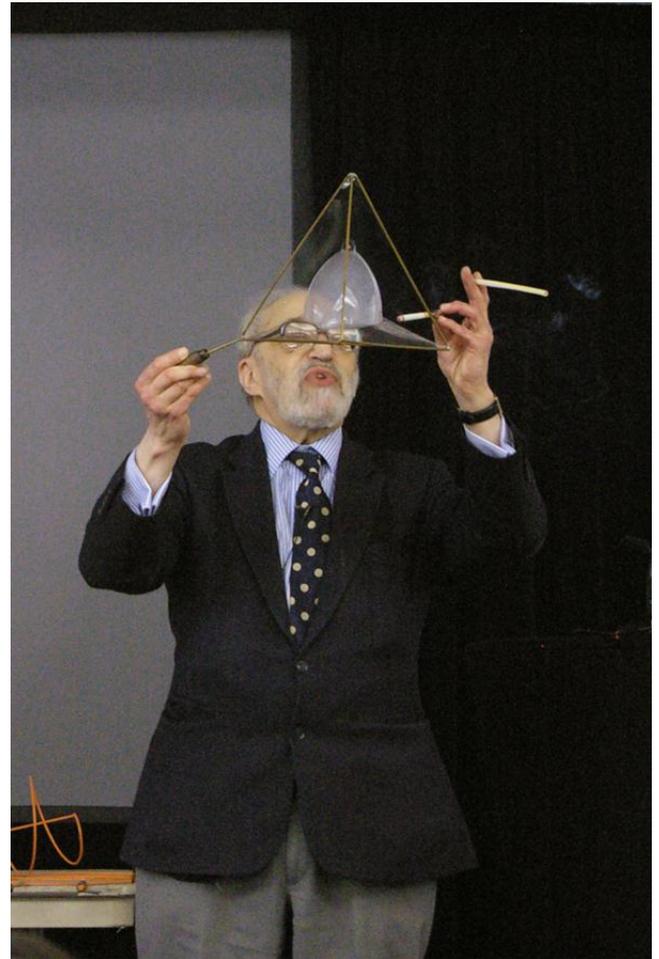
Applications should be submitted no later than
25th May 2012

Topics to be covered in the workshop will be determined by the needs of the participants, but it is envisioned that it will include discussions on how best to raise the personal profiles of individuals so that they are frequently contacted by the broadcaster companies. Participants are also expected to share thoughts on techniques for capturing the imagination of the listening/viewing public, and how to be adequately knowledgeable about handling hot scientific topics such as LHC results, magnetic storms and faster than light observations.

The branch newsfeed and calendar are at <http://london.iop.org>

**The 2012 IOP SW Branch
Festival of Physics
Saturday, 3 March 2012**

Dr C Isenberg gave his famous Bubble Lecture
at 10.30am.



Dr Isenberg will be giving this lecture at the IOP,
76 Portland Place on 5th December at
6.30pm. Book at: -
londonsoutheast@physics.org



**This online newsletter has been
produced
by
The London & South East Branch
IOP**

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The Contributions of Photography to Art and Society.

Professor Mohamed Sobhy, School of Engineering and Digital Arts, University of Kent, spoke about this topic at our Kent Centre on 20 March 2012.



Above:
Left to Right: Professor Mohamed Sobhy & Dr C Isenberg.

Professor Sobhy reviewed the impact of photography on art and society, beginning from the camera obscura, that pre-dates Christ, and was used to draw authentic pictures.

He discussed the impact of photography from the earliest applications to the current digital images using world examples from war years, social revolutions, artists' creations and scientific applications.

Some photographers had adopted pictorialism, emulating painting and etching, while others wanted to stress the aesthetic qualities of photographs stemming from photographic techniques. No other media was able to achieve the results like those of photographers such as Erich Salomon, Dorothea Lange and Henri Cartier – Bresson.

This was an impressive tour de force from a scientist with a deep appreciation of art and social change.

Dr C Isenberg



**CITY UNIVERSITY
LONDON**

The University for business and the professions



Breaking Enigma and the legacy of Alan Turing in code breaking.

Edwards Lecture 2012 in conjunction with the Worshipful Company of Scientific Instrument Makers.

Tuesday 17 April 2012 18:00

Please register in advance

Oliver Thompson Lecture Theatre City University London Northampton Square EC1V 0HB	18:00 Registration 18:30 Lecture starts 19:30 Bowl food supper
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Dear ,

You are cordially invited to the Edwards Lecture 2012 at City University London

The 40th Edwards Lecture with the Worshipful Company of Scientific Instrument Makers celebrates the opening of the new Centre of Excellence for Cyber Security Sciences at City University London with a lecture by Professor David Stupples. The Lecture will present an overview to how the U-Boat code was broken and Turing's Impact on today's Internet security.

David Stupples is Professor of Systems and Cryptography at City University London and for many years he was employed on intelligence work.

Register at: -

<http://www.city.ac.uk/events/2012/april/breaking-enigma-and-the-legacy-of-alan-turing-in-code-breaking.-celebrating-the-alan-turing-centenary-in-2012>

The Medium and the Message: Broadcasting, podcasting, YouTube and other ways of communicating physics
29 June 2012, Institute of Physics,
Organised by the IOP Physics Communicators Group

The Physics Communicators Group Summer meeting will investigate the wide array of different media that can be used to communicate physics. Speakers are expected to include Deborah Cohen, Editor of the BBC Radio Science Unit & Alessio Bernadelli.

For more information & registration please visit the website
<http://www.iop.org/conferences>

REMS Walk along the Towpath of the Regent's Canal Wednesday 21st March 2012

The walk started at Mile End, and proceeded towards Limehouse, southwards along the canal. There was a pleasant park on the left and we continued to Johnson's lock. In the central island between the two locks is, according to a 1990 book about the canal, a post carrying a rack and pinion which can be used to operate the paddle between the two locks so as to control the flow between them. Almost opposite Johnson's Lock used to be a gas works with associated wharves to accept deliveries from the canal. Nearby was the Ragged School, previously used by Dr Barnardo, now a museum. The museum was opened in 1990 in three canal side warehouses in Copperfield Road.



Above: The Ragged School

We passed beneath a railway bridge carrying the Docklands Light railway, this line was originally that of the London to Blackwall Railway and was the second railway line to open in London, in 1840. Originally the line was cable operated, which provided the bonus of safe-guarding from the sparks and cinders emitted by steam locomotives. The railway line concerned was closed to passengers in 1926, one of the legacies of the 1926 National strike, but was reopened as the first part of the DLR in 1987.

The Limehouse Basin, extensively redeveloped since 1983, is now used to moor millionaire's yachts, instead of barges and lighters. Around the basin, which was



Lunch
at
the
Grapes

formerly named Regent's Canal Dock, were notices about the history and the wildlife of the area. Under our feet was the Limehouse Link, a road tunnel built to link the new developments in Docklands with the A13. Skirting the eastern side of the Basin we crossed a bridge over the Limehouse Cut, which leads to the River Lea. Then we followed signs stating "Riverside Pubs" to the Grapes Public house, where we ordered lunch. During lunch we observed a tall ship sailing past.



After lunch at the Grapes we walked alongside the Thames all the way to Wapping. Here we admired the elegant pictures on the walls of the station illustrating the East London Railway in the 1960s (steam and electric). We rode the one stop to Rotherhithe through the world's first tunnel under a river - built by Marc and Isambard Brunel. Alighting at Rotherhithe station it was a short walk to the Brunel Museum to be shown around by Robert Hulst, the curator.



Tea and cake was the order of the day before making our way home.

Ron Gee and
Mike Quinton

Photographs
Mike Quinton

Left:
The Brunel
Museum

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A COLLABORATION BASED ON RED SPRITES

**by Peter McLeish, artist
Institute of Physics, London 28/03/2012**



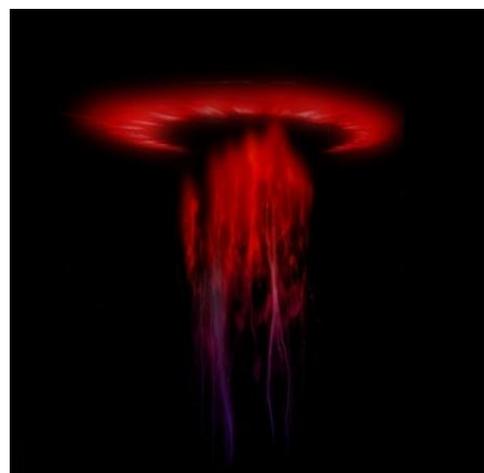
Above: Left to Right. Dr Barbara Gabrys Peter McLeish and Bob Boutland.

For over a century, there have been reports of strange lights in the night sky during thunderstorms. Initially mistaken and dismissed by airline pilots as UFO's, red sprites are known today to be upper atmospheric optical phenomena associated by thunderstorms. Red sprites are short-lived events lasting 10 milliseconds, whereas the blink of an eye lasts 250 milliseconds. Despite nearly a century of anecdotal reports, many scientists did not believe in sprites until the first images were obtained in 1989 on a low-light camera videotape and subsequently by the space shuttle from 1990 to 1994.

Since 2001, Peter McLeish has been involved in a collaboration based on red sprites with American scientist Walter A Lyons, who received a United States National Science Foundation Grant for this work. Peter created the artwork for Lyons' film "The Hundred Year Hunt for Red Sprites" as well as the accompanying 6 minute film, "Lightning's Angels".

These films have been presented at major international science conferences and festivals worldwide. Peter has also collaborated with Dr Colin Price from the Department of Geophysics and Planetary Science at the Tel Aviv University.

Sprites appear as luminous reddish-orange flashes in the upper regions with bluish hanging tendrils underneath and can be preceded by a sprite halo. *Continued page 7*



The branch newsfeed and calendar are at <http://london.iop.org>

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They often occur in clusters within the altitude range 40-90 Km above the Earth's surface following strong positive to ground discharges from large thunderclouds and may be up to 40 km in length. In contrast to lightning, sprites are cold plasma events without the hot channel temperatures of tropospheric lightning. They are clusters of small ionization balls. It is now currently believed that they may be caused by the ignition of atmospheric nitrogen.



Above: Peter McLeish describes a Red Sprite

Allusions to transient optical phenomena above thunderclouds date as early as the 18th century. In 1925 the Nobel laureate CTR Wilson postulated that electrical breakdown could occur in the upper atmosphere. Thundercloud tops are typically positively charged; when cloud to ground lightning quickly removes this positive charge a large electrostatic field above the cloud is briefly left which leads to the heating of ambient electrons and the production of ionisation charges and the visible sprites.

Wilson witnessed a sprite in 1956. The name originates after the mischievous character puck in Shakespeare's Midsummer Night's Dream



Above Left: Simon Anderson, Public Programmes Officer, Political Affairs & Public Diplomacy Division, High Commission of Canada attended the talk.

Above Right: Bob Boutland, Branch Newsletter Editor

Despite their initial dismissal as UFO's, military exercises or hallucinatory experiences afflicting airline pilots, nowadays sprites are a focus of interest as both as natural phenomenal and also because they can negatively affect and damage spacecraft.

An enjoyable evening, where the symbiotic partnership of art and science permeated the lecture.

Dr Nuria M Calvo

Photographs Mike Quinton.

Red Sprite picture on page 6 courtesy of Peter McLeish.

Designing the Best 3D Display

NEW DATE
Monday 11 JUNE 2012

William Penney Theatre, AWE,
Aldermaston, Reading, RG7 4PR

Tea/Coffee and Biscuits will be served
from 7pm. The lecture is open to all,
including non-members. Lecture 7.30pm

Details email: IOP.lectures@awe.co.uk

WOOFYT & Manorside School visit St Mary at Finchley



A selection of quotes from Year 6: -

"It was interesting to see the WOOFYT and learn the basics, it was great fun. Jeremy is a very good teacher and I liked the Twinkle Star music we had to do. I learned about sound and molecules travelling to make an echo. I also learned that to make a sound you are pushing air molecules. Non return valves are more important than I thought and I especially liked the way Jeremy showed us on a piece of cardboard how a non-return valve works. I especially liked playing the WOOFYT, some played and some pumped. It was interesting to see the WOOFYT and learn the basics

I thought the visit was absolutely brilliant and we even got to play the organ. I really enjoyed the trip to the church because I experienced how to play the organ. Never knew you could play the organ with your hands and your feet. Also I learned the organ is a wind instrument. The pipes in the front do not make a sound they are only there for show. This was the first time I played an organ."

Urvi, Hannah Jasmine, Jared, Rhys, Rebecca, Shabab, Frankie, Faizan, Lijun and other year 6 pupils..



The Woofyt by Ben & Bella: -

The needs to be 19 people to play, there is 13 people playing the valves, 4 people using the air bags and two people using the air pump by moving it up and down.



Two people need to pump the airpump until the bag is full of air. Some people need to play the pipes by pushing in the lever and a sound is released. You will not hear a sound unless someone is pushing the airbag. Once you know how to play you can play a tune.



Pupils also had the St Mary at Finchley organ demonstrated by Hannah Parry-Ridout and were allowed to try and play it themselves.

Playing an Organ

My fingers slip down as I play a song,
My feet feel confident playing along,
The sound from the pipes fill the air
With all the care I need to sing along.

Did you know some pipes are bigger than a human.

By Rachel.

Poems about organs

The front pipes are just for show,
The back pipes are there to blow,
Some pipes are tall,
Some pipes are small,
You can play the organ with your feet,
Oh, how unique!

By Preena



"A pipe organ is a musical instrument producing sound by a vibration created in an organ pipe which is controlled by a musician from a keyboard. If there was no air you would not be able to play the organ. There are different kinds of pipes there could be a metal one or a wooden one and the bigger the pipes are the lower the sound and if shorter the higher it is.

In the organ there are numbers 5 to 1. 5 is the loudest and 1 the quietest out of them all."

I learnt that the pipes at the organ front of the organ don't make a sound, they're there for show. Also I learnt that a non-return valve only lets air in, not out. It was great how you showed it with a piece of cardboard. Jeremy explained things very well.

Jinal



I really enjoyed the workshop. I especially liked playing the organ. It was excellent. The pipes were really massive. How did you learn to play the organ? The woofyt was absolutely great! It was really good and we also know now how a non returnable valve works!

Hrithik

Unfortunately some pupils did not put their name on their work and so have not been credited for their efforts. Our REMS secretary attended part of the workshop which was supported by the branch.

I loved the part when we played twinkie twinkie little star as a group to see if we could play in tune and some played or pumped. But when playing the organs was fantastic when Hannah played she played it beautifully the trip was so fantastic I wish we could go again!

Jasmine

Dianne Cohen writes: - "On behalf of the staff and children of Manorside School may I please say a big thank you to you and the other members of the IOP who made the Woofyt workshop possible.

Jeremy was fantastic and his workshops were such fun and enjoyed by both staff and children. What a wonderful way to introduce these young children to physics."

The branch is supporting the WOOFYT at St John's Church Boxmoor, Hemel Hempstead on 28 May.