IOP | Institute of Physics
London and South East Branch

Online Newsletter **Februrary & March 2013** **Issue no 25**

Professor Celebrates 80th.

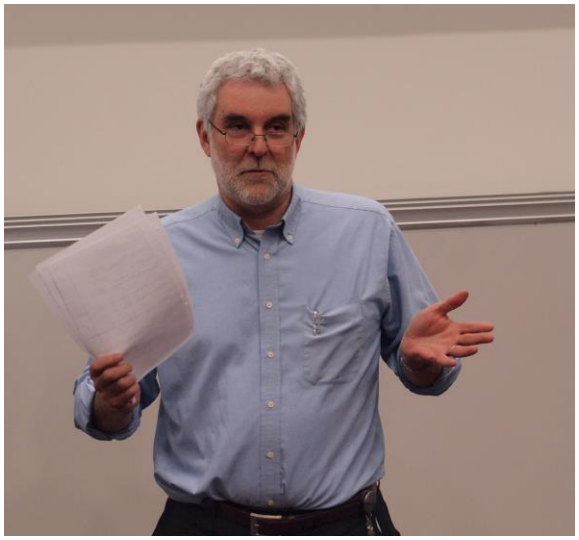
The PPRC held a half day meeting in the afternoon of Wednesday 20th March 2013 to celebrate Peter Kalmus' 80th Birthday. The format of the meeting was a series of talks by Peter's colleagues over the years, followed by a reception and dinner. The talks took place in the G.O.Jones (Physics) Lecture Theatre at Queen Mary University of London.

Above: (Left to Right)
Bob Boutland, Dr Cyril Isenberg (University of Kent), Professor Peter Kalmus, Dr Robert Kirby-Harris (former Chief Executive IOP) and Dr Mike Quinton

Tea and biscuits were provided before the event in the museum area of the G O Jones building. The program being
15.00 - 15.10 Introduction - Steve Lloyd
15.10 - 15.50 The Argonne, Early CERN and UA1 Years - John Dowell (University of Birmingham)
15.50 - 16.10 The Nimrod and K20 Years - Steve Watts (University of Manchester)
16.10 - 16.40 Coffee
16.40 - 17.20 The Nimrod, CERN and HERA Years - Eric Eisenhandler (Queen Mary, University of London)
17.20 - 17.40 The IOP Years - Phillip Diamond (Institute of Physics)
17.40 - 18.00 Wrap-up - Peter Kalmus **continued page 2**

To Join the Retired Members Section (REMS) Contact John Belling

E-mail john.a.belling.secrems@gmail.com



Above Steve Lloyd gave the introduction from Peter's birth in Prague to being a student at UCL, in the USA 1960-64, arriving at Queen Mary College in 1964, Professor 1988, HOD 1992-1997 and an OBE in 2001.

Eric Eisenhandler (Queen Mary, University of London) spoke of his interactions with Peter and his years at Queen Mary

John Dowell spoke of visiting CERN (1961-63) and pioneering the use of optical spark detectors, the pion beam at CERN, The UK taking part in detector design, the hadron calorimeter and trigger processor.

Above Steve Watts spoke of the The Nimrod and K20 Years

Above. Dr Barbara Gabrys and Prof. Kalmus

Above Philip Diamond (IOP) spoke regarding Peter's work with the L&SE Branch Committee and the Rutherford Medal in 1988

National Science and Engineering Competition March 2013

Full List of results: http://www.britishscienceassociation.org/news/national-science-engineering-competition-awards-ceremony

The competition was held at the Excel Exhibition Centre in London. Judging day was 14 March 2013.

Marta Caballero, L&SE Branch, (above left) and Chris Shepherd, IOP Education Department, were the judges for the IOP physics prize. They had plenty to visit and were busy most of the day. After deliberation they decided that Edward Duckworth of The Thomas Hardye School with his project Tidal waves: An investigation into the tidal effect on spectrogram background noise was the IOP winner.

Professor Peter Kalmus was a judge in the science and maths senior stream and Bob Boutland in the intermediate stream. Alison McLure (IOP National Officer for Scotland) was paired with Bob Boutland for a tour of Cloud formation on Earth and Mars, Film Interferometry, Dark Matter & Energy, Mobile Phones, Playing music through foil in a magnetic field, Cracking and Backyard Science.

Above: The IOP Physics Stand

The Science Museum's Communication Prize went to Tolani Oyediran, Amirah De Bourg of La Sainte Union Catholic Secondary School with their project How strong is Velcro? They were the winners of the branch physics prize in the London region event. (See the July 2012 newsletter page 4.)

The Sustainables (above) had a visit from the Prime Minister and also won the The UKFT Textile Edge Prize. (The team were Klara Prela, Swetha Thayalasamy, Fionnuala Greensmith, Celine Ababio, Kelly Bocarro, & Shannon Taylor from the Ursuline Academy Ilford with 'What makes the best insulation & mud as a building material?')

The National Science + Engineering Competition - Intermediate Science & Maths Winner were Moiz Ali, Zak Andrabi, Zain Anwar, Hamza Sardar of Stretford Grammar School with 'Making clouds in a bottle: A study and analysis of cloud formation on Earth and Mars'

Lisa Patterson, Aimee Russell of the Ballyclare High School and their project 'Playing music through foil in a magnetic field' was one of the National Science + Engineering Competition - Intermediate Science & Maths Highly Commended projects.

National Science + Engineering Competition - Senior Science & Maths Runners Up included Claudia Fryer of Upton Hall School FCJ with 'My summer with Archimedes: Measurement of compact porosity using a volume displacement method.'

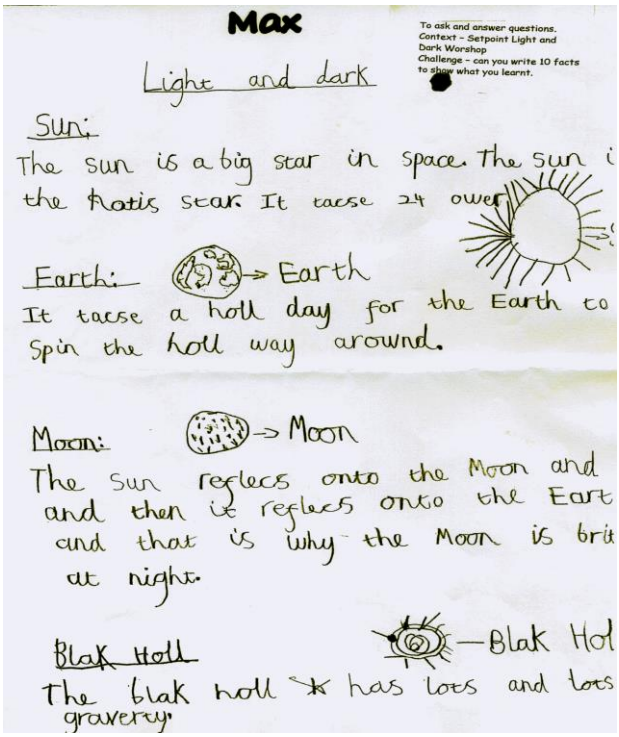
UK Young Scientist of the Year was Emily O'Regan, Newcastle College with 'An investigation into the courtship, mating systems and time budgeting of a captive flock of Chilean Flamingos (Phoenicopterus chilensis) with respect to breeding success.'

To Join the Retired Members Section (REMS) Contact John Belling
E-mail john.a.belling.secrems@gmail.com

Light & Dark at Redbourn Infant

Hertfordshire SETPOINT provided the above workshop for Redbourn Infant School with the support of J B Allen, a school governor (pictured below), Bob Boutland, branch treasurer, and other helpers.

The workshop included demonstrating night and day using a globe and a torch, why the moon is bright at night and ideas of reflection. Pupils also explored reflection with mirrors using torches. Periscopes were also available as were shadow puppets. In one of the cupboards where it could be totally dark the idea of how we see and various light toys, eg optic fibre, were explored.



Max

To ask and answer questions.
Context - Setpoint Light and Dark Worshop
Challenge - can you write 10 facts to show what you learnt.

Light and dark

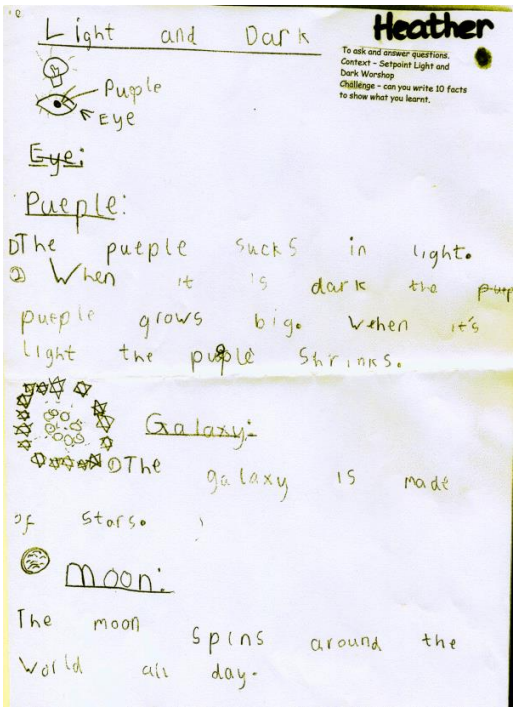
Sun:
The sun is a big star in space. The sun i
the Natis star. It tacse 24 ower

Earth: → Earth
It tacse a holl day for the Earth to
Spin the holl way around.

Moon: → Moon
The Sun reflecs onto the Moon and
and then it reflecs onto the Eart
and that is why the Moon is bri
at night.

Blak Holl — Blak Hol
The blak holl has lots and lots
gravery.

With a little help each pupil was able to construct a small kaleidoscope to use in class lesson and to take home later. (Above: The kaleidoscope in use.)



Heather

To ask and answer questions.
Context - Setpoint Light and Dark Worshop
Challenge - can you write 10 facts to show what you learnt.

Light and Dark

Pupple
Eye

Eye:

Pueple:
The pueple sucks in light.
When it is dark the pup
pueple grows big. When it's
light the pupple shrinks.

Galaxy:
The galaxy is made
of stars.

Moon:
The moon spins around the
world all day.

After the workshop Bob Boutland (left) was invited into the classroom to answer pupil questions.

Some very interesting and difficult to answer questions were asked about gravity and the Universe.

String Theory: Ideology or Tool Box?

Dr David Berman, Queen Mary University London
IOP London 6 February 2013

Above Dr David Berman (left) and Professor Peter Kalmus

Dr Berman clearly and succinctly tackled the concept of String Theory, its implications and its utility. String Theory is a versatile theory which is currently aiming at providing explanation to many natural phenomena; but as a with any scientific theory, there are instances in which String Theory is less able to do so.

The basic concept stems from the fact that the fundamental constituents of Nature aren't point-like structures. They have extension. These 'ultra microscopical filamentous' particles vibrate. The different forces and particles observed are associated to the string's internal degrees of freedom being different. In conclusion, there aren't different particles or forces, they are the same phenomena which are simply vibrating differently. All matter are forces - including gravity- are strings. String Theory can thus be conceptualised as a Unifying Theory. But there are some constraints with this idea. It requires supersymmetry and the existence of 10 dimensions. Additional symmetries between forces and matter have not yet been found. We don't have supersymmetry and we only have 4 dimensions.
It appears to be the case that the extra dimensions are small, hidden à la Kaluza-Klein theory (1921) and that supersymmetry (SUSY) is broken.

Nevertheless, String theory has been successful:1- in Gravity, where Einstein's equations emerge and are quantised efficiently and 2- in Quantum Mechanics, this attesting to its credibility. String theory also works well in properties of duality. Duality in Physics is when two seemingly different physical systems can communicate with each other by means of interchanging either components and/or magnitudes. For example, swapping the electric and magnetic fields and invert the charge. So, by virtue of this duality, we can infer the meaning of system “A” by knowing system “B” and vice versa. Having the right duality frame can make calculations easier and String Theory provides this 'dictionary.'

There are closed and open strings, and both can simultaneously be the same, but also be different. The world sheet of a closed string is a cylinder. The world sheet of an open string at one loop is also a cylinder. But whereas closed strings are simple and straightforward -with particles propagating regularly-, open strings are far more complex. The open strings split into two, then recombine and eventually annihilate each other. Particles are created and then destroyed. But both properties of openness and closeness simultaneously and inherently exist. Their characteristics differ depending on the observer's point of view. Furthermore, closed strings relate to gravity and open strings to gauge theory. Having the duality in mind will help us 'translate' between the two. Gauge theory interactions are ubiquitous in nature and have helped explain and understand convoluted and mathematically cumbersome challenges. For example: Gauge Theory Thermodynamics such as in the RHIC (Relativistic Heavy Ion Collider), and Black Holes. String Theory has provided the best theoretical fit so far.

String theory has applications in condensed matter, superconductors and Hydrodynamics. It is also useful in mathematics, where practically every area is connected to String Theory.

Unfortunately, String Theory allows an excessive amount of possibilities, is formulated as a perturbation theory and is not unique, creating problems and lacunae in knowledge. M-Theory seems to avoid there problems. M-Theory is unique, strings aren't presents, only membranes and fivebranes. It has no dimensionless parameters, is non-perturbative and is effective at solving quantum field theories at low energies (all loops and instantons) although the branes' interaction modelling is still in its embryonic phase.

It all looks very promising and further refinements (such as string field theory) are underway. Hopefully, these theories will be instrumental in assisting our existing physical models of understanding.

Dr N M Calvo

To Join the Retired Members Section (REMS) Contact John Belling
E-mail john.a.belling.secrems@gmail.com

The Higgs Boson and Beyond

At the University of Kent on 5th March John Ellis put the Higgs boson in its context, as a key element in the standard model of particle physics.

He concluded his educational and entertaining lecture with the valuable pieces of information: that, with a very high degree of confidence, the particle found at CERN last July has spin 0, is elementary and not composite, and couples to other particles proportionately to their masses, all of which are demanded by the Standard Model, in order that this particle really is the Higgs.

In the photo Professor John Ellis, CERN and King's College London, is second from the left. The other people, all from the University of Kent, are, left to right, Dr Lewis Ryder, Professor Roy Chisholm and Dr Cyril Isenberg.

Smoke signals from the distant universe

On the 19 March 2013 Professor Seb Oliver gave his lecture, "Smoke signals from the distant universe," to an interested audience at the University of Kent.

Dermot Stuart, Dr Cyril Isenberg, Professor Seb Oliver, Professor Michael Smith, Prof Oliver's student Pete.

A smoke – like dust obscures the view of the most distant galaxies by optical telescopes. However infrared telescopes can penetrate these dust clouds. This enables us to learn about star formation in the early universe.

This was a Joint meeting with the South East Kent Astronomical Society.

The Last Word Went to: - (See Also: Pages 1 & 2)

Pictures above & page 2 courtesy of Mike Quinton

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

**The Institute of Physics,
76 Portland Place, London
W1B 1NT, UK.
Tel 020 7470 4800.
Fax 020 7470 4848**