

LANBRIA

The newsletter of the Lancashire & Cumbria branch of the Institute of Physics

Issue 14 April 2005

Principal committee members

Chris Bowdery

Chair and newsletter editor
19 Dumbarton Road
Lancaster LA1 3BX
Tel: 01524 61678
E-mail: chris.bowdery@physics.org

Steven Bailey

Honorary secretary
Department of Physics
Lancaster University
Lancaster LA1 4YB
Tel: 01524 592 844
Fax: 01524 844 037
E-mail: s.bailey@lancaster.ac.uk

Dick Collins

Honorary treasurer
E-mail: r.collins@lancaster.ac.uk

Chris Walton

Vice-chair
E-mail: CWalton@preston.ac.uk

Peter Bates

Paperclip Physics organizer
E-mail: pabates@uclan.ac.uk

Anne Small

Galactic Gig roadshow organizer
E-mail: a.watson1@lancaster.ac.uk

Other committee members

Alan Christy
Ian Ferguson
Michael Holmes
Brian Jones
David Mehers
Tim Mercer
Rich Haley
Tony Guénault
David Manning
Mark Hetherington

North-west branches support officer

John Bradshaw

E-mail: john.bradshaw@iop.org

See <http://lancashire.iop.org> for details of committee members, events and how to join the Lancashire & Cumbria branch.

Chris Walton takes over as vice-chair of branch

On 1 January 2005, Ian Ferguson (who recently served as a Paperclip Physics judge; see photo on p2) stepped down as branch vice-chair after many years of service. Chris Walton has kindly agreed to take his place, and has already attended a meeting of branch chairs at the Institute's headquarters at Portland Place, London.

Regular readers of LANBRIA will know that Chris has been the organizer of the STEEL(Physics) Eureka! competition, and he will continue to fulfil this role for the

foreseeable future. However, it is expected that 2005 will see the competition transferred to the branch and the physics section of the long-defunct STEEL organization closed down. (SETPOINT Lancashire may be considered the successor to STEEL.)

In a future issue we will be looking back at Ian Ferguson's long term of office for the branch, at the story of the physics section of STEEL, and at SETPOINT/SETNET in Lancashire and Cumbria.



New vice-chair Chris Walton.

The editor's lines on the leaves

In this issue we have good news about the regional Paperclip Physics competition final, the opening of the Spaced Out Saturn site at the Lancaster Girls' Grammar School, the Physics and Music Galactic Gig roadshow, and more. The Saturn project is especially important for the branch, as we have paid for the sphere that has been created to represent the planet.

The slate model of Saturn made by Andrew Loudon (see story p4) is funded by money from our regular branch budget. The Galactic Gig roadshow, on the other hand, has a special budget of £2000 that has been

provided by an Einstein Year branch grant from the Institute.

While I was preparing this issue of the newsletter, I heard the sad news that Hans Bethe had just passed away aged 98. I once heard him give a seminar on the physics of supernovae while I was working at the DESY laboratory in Hamburg, Germany, in the mid-1980s.

I remember being surprised at Bethe's conclusion that there were still big gaps in our understanding of supernovae. (Later in 1987, I was again surprised when astrophysicists were delighted to find out how well they had understood supernovae following the observations of SN1987A.)

I have been finding out about Bethe on the Internet and it

appears that he was briefly a lecturer at the University of Manchester in 1933/34. This made me wonder whether he visited Lancashire or Cumbria during that time. If you know the answer, why not write in and share the story with everyone?

Finally, our Web-based schools' competition has now been closed down. Very few teenagers were entering, so it did not seem worthwhile to keep it running. However, we still have some money in the coffers, so if anyone writes in with a new idea for a better Web-based competition, we will award a substantial prize to show our gratitude. ("The branch bank balance must have gone to his head!", I hear you cry...)

Chris Bowdery, **Chair and editor**

Visit the branch website at <http://lancashire.iop.org>

Moore work is needed on blue plaque initiative

It is disappointing to report that there has been no progress on the Sir James Jeans plaque. The owner of the house in Birkdale has not replied to either of two letters sent seeking permission to erect a plaque. However, Chris Walton, branch vice-chair, is looking into the alternative possibility of erecting a plaque to Sir Jonas Moore, who was born at Higher Whitelee, Lancashire, on 8 February 1617.

In early life Moore was a clerk under Dr Burghill, Chancellor of Durham University. He later had a remarkable career, becoming a practical mathematician, teacher, author, surveyor, cartographer, ordnance officer, courtier and patron of astronomy. Moore was one of the first people to make a substantial fortune from mathematical practice.

He received a knighthood, membership of the Royal Society, and favour at the court of Charles II; as Surveyor-General of the Ordnance, he became a patron of the then new Royal Observatory at Greenwich.

Moore died on 25 August 1679 at the age of 62.

BRANCH EVENTS

Sunday 19 June

Physics Fun Day

A day of fun and physics for branch members and the public, the centrepiece of which will be a performance of Galactic Gig. 2.00 p.m., George Fox Building, Lancaster University

Lab in a Lorry

Venues to be announced. For more details, visit our website.

Wednesday 20 April

Penrith Meeting

Dr Nigel Marshall: "Spaced Out and news from Saturn" 7.00 p.m., Newton Rigg campus

Date to be announced

Lancaster Meeting (University)

Prof. Barbara Maher, Chree Medal winner (afternoon colloquium)

Westholme School team heads

Westholme School was judged to have put forward the best team in the Lancashire and Cumbria branch regional final of the 2005 Paperclip Physics competition.

The event took place at the University of Central Lancashire, Preston, on 23 February. The team's triumph took them southwards to the Thinktank, Birmingham, for the national final which was held on 16 March, but sadly they lost out there to a Manchester branch team from Altrincham.

The all-girl Westholme A-team chose Sound as their theme and started with the old conundrum of whether or not an acorn falling in an empty forest makes a sound. Apparently, the answer depends on your definition of sound – does it include the process of hearing? Along the way, the team covered audible sounds and ultrasounds, as well as vibrations in solids and gases. All in all, it was a very entertaining presentation.

Well done to the Westholme School team and their teacher, Mrs Christine Mayson. And our commiserations to the other teams that also gave memorable performances. Arnold School's entrants demonstrated fission in uranium and showed off their knowledge of chemistry with atoms of fluorine (F), iodine (I), sulphur (S), silicon (Si), oxygen (O) and nitrogen (N) – managing to prove their spelling skills at the same time.

St Wilfrid's threw some balls around to illustrate Newton's Second Law, while the two teams from Lancaster Girls' Grammar School also tackled Sound and Newton's Laws.

The judges were Dr Ian Ferguson (retired chemist with BNFL Springfields), Dr Steve McCann (Preston College) and Ms Pam Culley (UC Lancs).



The St Wilfrid's team, shown here with their teacher Jonathan Wilson, gave a demonstration of Newton's Second Law.



The Arnold School team, shown here with their teacher Ward, had fun speaking about Newton's Laws.



Regional champions: the winning team from Westholme School gave an entertaining presentation on the subject of Sound. They are shown with their teacher, Christine Mayson.



The judges: Ian Ferguson, Pam Culley and Steve McCann.



Lancaster Girls' Grammar School team.

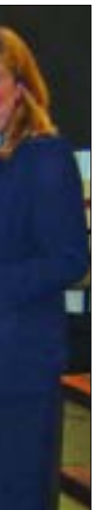
Please check your e-mail address in your Institution's Web to ensure that you receive the e-mails that

www.iop.org

ads south! A sticky problem: the truth about the vacuum



's team, shown here with their teacher Ken ...
lling out the nature of fission.



g
Mayson.



The B-team from Lancaster Girls'
Grammar School.



Grammar School A-team with teacher Jo Dale.

ute details on the
we send you

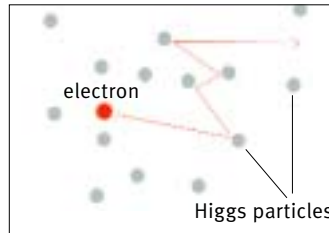
In an earlier LANBRIA article (December 2004 p3), we looked at the origin of mass for protons and neutrons and found it in the bizarre "femtoworld" of quarks and gluons – femto because we are dealing with femtometres (10^{-15} m). In this issue, we will now look at the origin of mass for electrons, and for the quarks inside protons.

If quarks and electrons were composite particles – i.e. if they were themselves made up of even smaller particles – we could assign their mass to the forces that hold them together. However, our current understanding is that they are actually fundamental point-like entities (or perhaps tiny little superstrings), making such an explanation untenable. We need to look elsewhere.

In 1964, Peter Higgs at the University of Edinburgh proposed a mechanism for "mass generation" that involved the existence of an all-pervading "sea" of some kind throughout the universe.

At first sight, this idea looks alarmingly like the old "aether" which 19th-century physicists imagined was the medium through which light propagated. However, the Higgs field, as it became known, is consistent with Einstein's theories of relativity and has no paradoxical properties, unlike aether.

The Higgs mechanism passed



Electron interaction with Higgs.

its first test a few years later, when the W and Z bosons were discovered at the CERN laboratory in Geneva in 1983. These were force-carrying particles of the so-called weak force and their masses were just what was expected from other measurements of the weak force in action. This was a triumph for theorists and experimentalists.

The Higgs field gives the vacuum a non-zero energy value which is the same everywhere. The result is that the W and Z bosons, when travelling through space, can be considered to interact with the Higgs field and no longer have equal amounts of energy and momentum. That is, they acquire mass, since mass is just the name we give to an energy-momentum imbalance.

Returning to the quarks and electrons, it was apparent that the Higgs field could interact with them too, causing their energy-momentum imbalances. The only problem was that each type of quark would need a different interaction strength

("stickiness" parameter) with the Higgs field in order to have a different mass. The same problem arises for the leptons – the family of particles that includes the electron, as well as the muon, tauon and their neutrino partners.

Today we know of six quarks and six leptons, which means 12 uncalculable numbers for 12 interaction strengths, which is a rather ugly feature. (Back in the mid-1960s only two numbers were definitely needed, so it did not look so bad then.)

Most physicists are happy to live with this situation – for now – while waiting for a deeper understanding to arise. But it is worth remembering that we have simply swapped our ignorance of the origin of quark and lepton masses for ignorance of the stickiness of these particles as they move through the Higgs field.

Clearly, the way forward is to test whether the Higgs field really exists, and then measure its interaction with W and Z bosons, quarks and leptons. This question has been high on the agenda of experimental particle physicists for at least two decades, and CERN's Large Hadron Collider (LHC) is confidently expected to deliver the answers. See http://lhc.web.cern.ch/lhc/general/gen_info.htm for information on this project.

Physics and Music show dubbed 'Galactic Gig'

Einstein Year may be one-quarter over, but the branch's special activities are still to come! The centrepiece of these will be the £2000 Physics and Music schools' roadshow, which will tour primary schools in Lancashire and Cumbria during the week 13–17 June.

After much discussion, we have now decided on a proper

name for the event: Galactic Gig. An explanatory poster can be found elsewhere in this newsletter. If you know of a primary school that would be interested in hosting Galactic Gig, please contact Anne Small or Steve Bailey.

Visit the branch website at lancashire.iop.org for the latest information about Galactic Gig.

LETTER TO THE EDITOR

Dear editor,
Having edited various local publications over the years, I appreciate that it can be a thankless task. So thank you for your all efforts and for producing an excellent newsletter. I suspect that everyone feels the same; it's just that no-one ever thinks of saying so!
David Abbott, BNFL Sellafield

Branch sponsors project to bring Saturn to Lancaster

On Tuesday 15 March, during the 2005 Science Week, Spaced Out unveiled the Saturn site in the grounds of the Lancaster Girls' Grammar School.

Regular readers of LANBRIA will know that Spaced Out is constructing a model of the solar system across the UK, with the Sun based at Jodrell Bank and the scale set by Saturn's location. This has allowed Uranus to be sited at the William Herschel Museum in Bath. For further information about sites, see box (below) or visit the Spaced Out website at www.spacedout-uk.com.

When it became known that the model representing Saturn was to be sited in Lancaster, the branch committee approved a plan to become a major sponsor. To that end, the branch has paid approximately £350 for the materials that have been used by artist Andrew Loudon to create a 1 m diameter slate sphere symbolizing the planet.

The Saturn model is located in the centre of a planting area created by Ann Picot. The black grasses surrounding Saturn represent the blackness of space. The path encircling the sphere and grasses represents Saturn's rings, and was designed by Andrew with help from Year 9 girls at the school.

The afternoon ceremony began at 2.30 p.m. with a presentation by Dr Nigel Marshall (project director) about the Spaced Out project. This was followed by the unveiling of the model of Saturn by Lord Taylor of Blackburn and Hannah Wilson (a Year 11 pupil who won the Spaced Out competition at the branch's Physics Fun Day last year).

Philip Oglethorpe, chair of the school governors, rounded up the formal proceedings by thanking Lord Taylor for travelling up from London to perform the unveiling.

After some food and drink, Einstein Year was briefly introduced by myself, and some



Above left: the Saturn site in the grounds of the Lancaster Girls' Grammar School. Above right: project director Nigel Marshall with the Saturn model. Below left: The 1 m diameter sphere, with its layers of slate clearly visible. Below right: Hannah Wilson, who unveiled Saturn with Lord Taylor of Blackburn.



SPACED OUT SITES

Major objects

Sun: Jodrell Bank, Cheshire

Mercury: Holmes Chapel

Venus: Alderley Edge

Earth: Macclesfield

Mars: Northwich

Jupiter: Techniquet, Wrexham

Saturn: LGGS, Lancaster

Uranus: William Herschel Museum, Bath

Neptune: Planetarium, Armagh

Pluto: Aberdeen

Lesser objects

Halley's Comet: London

Ceres: Furness Vale, Derbyshire

Gaspra: Manchester

Pholus: Birmingham

Absolus: Spaceguard Centre, Knighton

Chiron: National Space Centre, Leicester

Varuna: Camborne, Cornwall

TL66: Whalsay, Shetland Isles

branch prizes (tiny FM radios) were given away for the best answers to the question, "What 20th-century inventions had strong physics connections?"

Saturn is not the only Spaced Out site that has been opened. March also saw the completion of the Sun site, represented by striking yellow perspex sheets; Mercury, which has a steel centre and a surface constructed from different-sized crater rings; and six other installations. More sites will open shortly. Chris Bowdery, **Chair**

Lab in a Lorry makes its first visit to Cumbria

The first definite booking in our region of one of the three Labs in a Lorry (LIALs) has been made. A LIAL will be available at Sellafield, Cumbria, from 27 June until 1 July 2005. This booking has been made by Lisa Moore of SETPOINT Cumbria. The LIAL will be coming from Northern Ireland via Stranraer.

Watch out for more news in the LANBRIA newsletter and on our website about other LIAL bookings in the region.

The deadline for your contributions to the May 2005 issue of this newsletter is:

**Friday
8 April
2005**

**Please e-mail your materials to
chris.bowdery
@physics.org**

PHYSICS AND MUSIC ROADSHOW



Galactic Gig

Monday 13 – Friday 17 June

Join Einstein and friends on an interplanetary voyage of music and sound.

A fun-packed hour of drama and demonstrations coming to a school near you.

Supports QCA units 5E – Earth, Sun and Moon and 5F – Changing Sounds.

Refreshments and supplementary teaching materials will be provided.

To register your school's interest, to obtain further information, or if you would like to be a local host on any of the above dates, please contact:

Anne Small
e-mail: a.watson1@lancaster.ac.uk, or

Steve Bailey
e-mail: s.bailey@lancaster.ac.uk

at the Lancashire and Cumbria branch of the
Institute of Physics.

Lancashire and Cumbria branch hits 40th birthday

In 2006, the branch will be 40 years old. Back in 1966, the Lancaster sub-branch of the Manchester branch was formed when the physics department of the University of Lancaster was founded. Tony Guénault was the first secretary, and the head of the physics department was the first chairman.

Since then we have had a name change and, of course, we have expanded our boundaries. Next year the branch will be holding various celebrations and LANBRIA will be carrying articles about our history. If you have any memories, documents or ideas pertaining to the celebration of our first 40 years, please let me know.
Chris Bowdery, **Chair**

COMMITTEE NEWS

We are delighted to learn that Dr David Manning has been promoted to Professor of Medical Imaging. He works at St Martin's College in Lancaster and was, until recently, our branch media representative. He gave a presentation to the branch on 9 February this year about his work on decision-making from medical images. You can see his slides (PDF file) on our website at lancashire.iop.org.

The branch newsletters are published by Institute of Physics Publishing, Dirac House, Temple Back, Bristol BS1 6BE, UK.

©2005 Lancashire & Cumbria Branch of the Institute of Physics

Printed by Warners (Midlands) plc, Bourne, Lincolnshire, UK.

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

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

einstein™
year

Explore, Discover, Invent - Physics

EINSTEIN and other marks are trademark (HJ), represented by the Roger Richman Agency Inc., www.albert-einstein.net



**BE
INSPIRED
BY
PHYSICS
IN 2005**

www.einsteinyear.org

email: einsteinyear@iop.org