

Alzheimer's Disease and Yoghurt – a Physicist's Exploration of Proteins



Above: - (left) Branch Chair Dr B Gabrys & Professor Dame Athene Donald

On 30th March Professor Dame Athene Donald DBE FRS explained that the link between yogurt and Alzheimer's disease was that both depend on protein aggregation. In the food industry changes in proteins are often caused by a temperature change, for example boiling an egg or in yoghurt proteins are denatured so they can stick together in different way.



Above: - Dr Mike Quinton (left) and Professor Dame Athene Donald

Amyloid plaques found outside neurons in the brain are mainly made up of beta amyloid protein and stick together in a way that disrupts brain function and indicative of Alzheimer's disease. In the cases of yoghurt and amyloid protein the sticking together to form aggregates is a similar process.

Continued on page 2.

Branch committee

Dr Barbara J Gabrys CPhys FInstP, Chair
E-mail barbara.gabrys@materials.ox.ac.uk

Leonard Lewell CPhys MInstP, Secretary
E-mail londonsoutheast@physics.org

Dr Mark Telling CPhys MInstP, Treasurer
E-mail mark.telling@stfc.ac.uk

David Parkes (co-opted)
Berkshire Centre representative
Email ; davidparkes@physics.org

Stephen Elsmere (co-opted)
Berkshire Centre representative
Stephen.Elsmere@awe.co.uk

Prof. R Mackintosh CPhys MInstP
Milton Keynes Centre representative
E-mail r.mackintosh@open.ac.uk

Dr Diane Crann MInstP
Hertfordshire Centre representative
E-mail d.crann@herts.ac.uk

Callum McAndrew (co-opted)
Student representative
E-mail cfm09@imperial.ac.uk

Maureen Willis (co-opted)
Student representative
E-mail m.willis@qmul.ac.uk

Bob Boutland CPhys MInstP
Education representative
and e-newsletter editor
E-mail rh.boutland@physics.org

Laura Thomas AMInstP
Outreach representative
E-mail l.f.thomas@qmul.ac.uk

Michelle Supper MInstP
Media representative
E-mail amagich@hotmail.com

J A Belling MInstP REMS visit secretary
E-mail john.a.belling.secrems@gmail.com

Prof. P I P Kalmus OBE CPhys Hon.FInstP
E-mail p.i.p.kalmus@qmul.ac.uk

Michael Hammond CPhys MInstP
E-mail jmhammond@physics.org

Lee Crouch
Regional officer
E-mail lee.crouch@iop.org

Non-Committee
Dr C Isenberg
Kent Centre Representative
E-mail c.isenberg@kent.ac.uk

Branch Welcomes New Regional Officer



My name is Lee Crouch and I am the Institute of Physics' new regional officer for the South East. I work with the London and South East branch as well as the South Central branch. My role involves participating in public events, recruiting members, working with schools, engaging public servants, collaborating with other science organisations and being the link between the branches and the central IOP.

Before coming to the IOP I worked in parliament for an MP, where I was responsible for the day-to-day running of a busy Westminster office. I hope to use my experience of parliament to help me promote physics in the South East.

I will be attending many of the London and South East branch talks in the future so if you see me please do not hesitate to raise any IOP issues. I can also be contacted by email at lee.crouch@iop.org

Continued from page 1.

In the cases of yoghurt and amyloid protein the sticking together to form aggregates is a similar process. Haemoglobin for example has a specific shape for an intended function, as do other proteins. If the proteins unfold from the usual shape they resemble synthetic polymers.

Proteins in the unfolded state can produce BSE/vCJD as well as Alzheimers. Haemoglobin for example has a specific shape for an intended function, as do other proteins. If the appropriate proteins unfold from their usual shape they can be responsible for BSE/vCJD as well as Alzheimers.

Beta-lactoglobulin is a small globular protein in whey and often used as a gelling agent and is readily available for study. Below a pH of 4 there is a fine stranded structure as there is above a pH of 6, in-between there is a globular structure. All proteins behave similarly if allowed to denature around their iso-electric point and microscope and other studies show that proteins behave in an apparently universal way. Unfolded proteins can link chain structures together forming spherulites resembling synthetic polymers.

Professor Donald had recently been invited to Andrew Marr's Start the Week radio program to explain the link between yoghurt and Alzheimers.

Volunteering Opportunities

Volunteers are required to support Physics Communicator Group members in re-writing the Institute of Physics 'Visions' papers to make them suitable for schools and the general public.

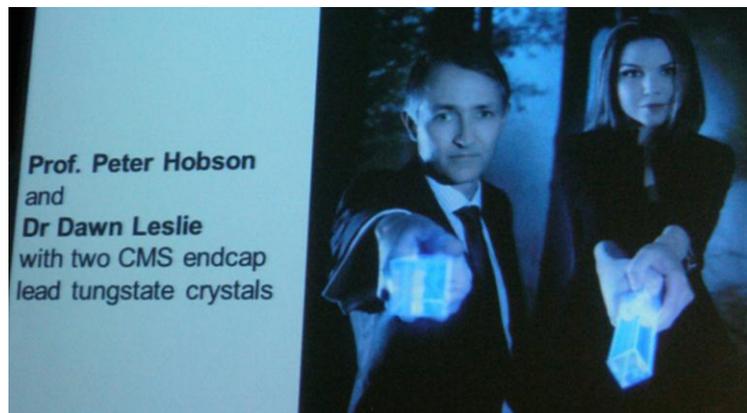
Contact Phil Furneaux on p.furneaux@lancaster.ac.uk

Volunteers are required to attend careers events on behalf of the Institute of Physics.

Contact Caitlin Watson Caitlin.watson@iop.org

Out with the Old? In with New?

Professor Peter Hobson of Brunel University intrigued his audience on 16 March by starting his lecture with what appeared to be fashion shots.



Professionally lit elegant models, male and female, sported books on one side of the screen and e-books on the other. This was followed by a sequence of pictures of redundant bits of equipment: a very large bubble chamber at CERN; a triode radio valve and some old household items: a curvaceous Bakelite radio; an equally rounded television with a cathode ray tube (CRT) screen; a telephone with a dial and a heavy cut-glass decanter. What had these to do with the Large Hadron Collider (LHC) and all its electronic and solid state gadgetry?

The answer was the return of some particle detectors thought to have been superseded, like the bubble chamber, which made its re-entry in 2010, thanks to the discovery the acoustic signals triggered by particles passing through are characteristic of each type, so that an α -particle “sounds” different from any other.

The Compact Muon Solenoid Detector (CMS) of the LHC contains 100 tons of lead tungstate crystals placed around the collision site to measure the energy of particles emerging from collisions.

Scintillations of light created within each of the hundreds of crystals are detected at the far end by a vacuum phototriode,



Above: Professor Hobson is holding up one of the crystals with Barbara Gabrys, Chair of the London and South East Branch looking on.

looking rather like that radio valve, except that the cathode is photovoltaic not thermionic. Interestingly, lead tungstate was rejected as a phosphor for CRTs in televisions, because its efficiency is very low, but that does not matter at the high collision energies in the LHC and it is not prone to radiation damage.

Professor Hobson pointed out that, while the lead glass of the decanter has been essential for the Cherenkov detectors in previous experiments at CERN, it would blacken under intense radiation in the LHC and so could not serve as windows to allowing viewing. However, large glass scintillators may come back as detectors of the heavier hadrons.

The oldest and cheapest plastic of the radio case and the telephone, Bakelite, has made a come back in the form of large scale resistive plate counters (RPC), which we could see in another picture radiating out from the ends of the axis of the CMS Detector.



The meeting ended with some lively discussions of other older technologies: cloud chambers and photographic nuclear emulsions and then another round of applause and agreement that the older technologies should not be forgotten, because they may be useful, perhaps in another guise.

Afterwards, members of the audience crowded round to see and handle some of the materials seen in the lecture.

Mike Quinton

Cows, Crossrail, Carthusians, Chartists, Churches and Clowns – A Walk in Clerkenwell



24 retired members (REMS) and friends assembled near Farringdon Station on 3 March to explore quite a small surrounding area, which is nevertheless full of interest. It was a dry day, unlike Kate and Mike Quinton's first venture with REMS in the area in 2005. There were other hitches though. The first was having to move the start slightly because of the workings for Crossrail.

There was still a lot of traffic around Smithfield Market, but we managed to negotiate Charterhouse Street, (above), where Kate and Mike Quinton are facing the REMS party, to see the frontages of the older cold stores, as well as the General Market and its cast iron columns. On reaching Grand Avenue we noticed a plaque of a wild boar high up on No 1, St John's Street, a sign of the many animals that have come this way.

Then we looked down on the cobbled spiral ramp, up which animals used to come from the Metropolitan Line and where Max Perutz worked during the Second World War to make landing and refuelling strips of ice and wood pulp for aircraft patrolling the Atlantic.



After investigating Charterhouse Square we returned along Cowcross Street (there were plenty of evocative names on this walk), where Kate and Mike (above left) were horrified to find that the designated lunch place had closed, despite having served them only 2 weeks before and taken on board that 20 plus hungry people would arrive on the day.

The Sir John Oldcastle pub nearby served just as well. In the picture below George Freeman and Mike are standing outside it.



In the afternoon, we sat for a moment. John Belling, REMS Secretary, is trying out one of the unusual seats in St John's Gardens. (see end of the last column right hand picture)



Having had a look at Clerkenwell Green and absorbed some of the associated history including that of the local water supply, we found ourselves round the back of St James's Church, where we were allowed in, against the high wall (see picture above left) of the House of Detention, built to take the overflow from Bridewell and Newgate. Stanley Melinek said he had been into the underground cells some time ago. Finsbury and its grade 1 listed Health Centre (picture below) was next, after leaving the medieval street pattern behind.



Then there was Exmouth Market and Spa Fields, where Margaret Stedman (above right) took it easier than the fist fighting and bear baiting that she might have enjoyed in the 17th century.

There was a lot more than I have space for in this brief account and we thank my wife, Kate, for all the research she put into the walk.

Mike Quinton, photographs by John Temple & George Freeman

Communicators Group Summer Meeting & AGM

The Psychology of Communicating Science

Wednesday 8th June 13.00 – 17.00 (lunch from 12.00)
At IOP 76, Portland Place, London

Is communicating science just a matter of putting together a good talk with effective slides and, perhaps a few exciting demonstrations? Or is it more complicated?

Should we be looking at the psychology behind communication and understanding the psychology of our audiences?

Cost (Including Lunch)

Members of Institute of Physics £15

Concessions/Students £10

Non-members £40 Student non-members £20

Booking essential: via IOP Conferences : Lisa Cornwell

E-mail: lisa.cornwell@iop.org Tel: +44 (0)20 7470 4800

This year's programme: -

12:00 Lunch

13.00 Welcome and Opening

13.10 Key Note Lecture Jack Klaff (actor and science communicator) – Stop Visualising!

13.50 Key Note Lecture Liz Kalaugher (editor of environmentalresearchweb) – The Psychology of Communicating Climate Change

14.30 Speed Networking – a great chance to meet others from your region who share your enthusiasm for communication and to spot opportunities.

15.15 – Afternoon tea

15.45 **Launch of Very Early Career Physics**

Communicators' Award with prize money of £250 and the opportunity to showcase your work in the Group Newsletter. Nominations deadline Sept 15th 2011.

16.00 What do You Want – What do you Really Really

Want? – discussion to see how the Physics Communicators' Group should move forward.

17.00 **Annual General Meeting** – report of the year's activity and election of new committee members and Chair

18.00 **London & SE Branch** Tea & Biscuits stay for

18.30 "The Genius of Michael Faraday" by

Sir John Meurig Thomas FRS

(to help with catering if you intend to remain for the L&SE lecture please confirm by calling 020 8845 2295 or e-mailing londonsoutheast@physics.org)

Upcoming L&SE Events

5 May. **REMS Visit** Cavendish Labs Details: <http://www.ihonabelling.webspace.virginmedia.com/>

10 May. Milton Keynes Centre.
The cold atom toolbox: physics and applications. Details: - http://www.iop.org/activity/branches/south_east/lse/calendar/index.html#/?i=2

11 May. 76 Portland Place, London
The GAIA Mission: Design and Test of a Spacecraft Attitude Control System
Details: - http://www.iop.org/activity/branches/south_east/lse/calendar/index.html#/?i=2

12 May. **REMS Visit:** Harwich and Buoy Yard, Trinity House. Details: - <http://www.ihonabelling.webspace.virginmedia.com/>

19 May **REMS Visit** Oxford River Cruise and Walk. Details: - <http://www.ihonabelling.webspace.virginmedia.com/>

17 May Kent Centre.
Studying materials with neutrons. Details: http://www.iop.org/activity/branches/south_east/lse/calendar/index.html#/?i=1

25 May. 76 Portland Place, London
Geoengineering the Climate: an Overview and Update. Details: - http://www.iop.org/activity/branches/south_east/lse/calendar/index.html#/?i=1

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The contents 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.

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REMS around the Cabinet Table



On 8th April our REMS group assembled outside the famous gates, basking in the unseasonably warm weather. After security, we filed through the number 10 front door, full of anticipation. Our excellent guide for the visit, Ollie, firstly showed us that the letter box is actually false, then led us upstairs, past pictures/photos of every Prime Minister (except David Cameron - the convention is that his picture will go up when he leaves office), to the first of the three State Drawing Rooms, The White Room where the Prime Minister receives important guests. Unlike most stately homes, we were free to sit down, and were told that Obama, and Hilary Clinton had occupied these chairs just a short time ago. The adjoining room was the Terracotta Room, lavishly decorated to a design by Margaret Thatcher. It contained William Pitt's writing desk – remarkably small. We were then led to the next room, the Pillared Room – the pillars are 'false'. Computer buffs were able to admire the portrait of Ada Byron, Countess of Lovelace, painted by Margaret Carpenter.



After that we were taken into the 'small dining room'. This had an interesting split chimney flue which rose either side of the window above the fireplace. We were told that in past times, the window became so hot that the glass would fall out. We were shown some interesting silver objects, including Gladstone's Loving Cup. The visit ended in great style in the cabinet room, where we were invited to take our seats. Richard Hartley found he was the Prime-Minister, and the REMS secretary found himself in Nick Clegg's seat. Strangely, our REMS treasurer discovered that he was sitting in Chancellor George Osborne's seat – a meeting of minds? We were given ample time for iconic photos, group and individual, around the legendary front door. The staff and police were all extremely friendly, and helped to make the visit truly memorable.

Colour Vision



This exceedingly clear lecture-demonstration lecture demonstration by Prof. Mohamed Sobhy was given at our Kent Centre on 19 April.

Prof. Sobhy started from the properties of the cones and rods that make up the fovea centralis in the retina, and indicated how the brain processes the information received. The presentation also included: -

The artist's and photographer's view of colours through the colour wheel, additive and subtractive processes.

The Trichromatic colour model and its development since Maxwell's demonstration in 1861.

The results of Guild and Wright which lead to the CIE colour map.

The application of the CIE colour map in colour mixing, lighting and computers.

The Opponent colour theory and its application.

Cone Fundamentals and the more recent results of Stockman and Sharpe.

Adaptation.

The Discovery of W & Z

The PowerPoint presentation of the excellent talk by Professor Peter Kalmus on Tuesday 12th April 2011 at the Open University can be viewed at:

<http://physics.open.ac.uk/~rmackint/WZDiscovery.ppt>

THE DEADLINE FAST APPROACHING for the IOP Teacher AWARDS

If you know a teacher who deserves recognition, please nominate them for an award. We are looking for teachers who inspire in their pupils and colleagues a love of physics or science in the primary context. It is not a competition, but rather a wish to spotlight and celebrate the work of teachers in the classroom.

For more details and nomination forms, go to:

http://www.iop.org/education/teacher/support/awards/page_41533.html

Deadline for nominations
is 31 May 2011

For any enquiries about nominations contact

Lara Ogunbawo

tel 020 7470 4903

e-mail: lara.ogunbawo@iop.org

**The Shell and Institute of Physics
Award for the
Very Early Career
Woman Physicist of the Year
Award presentation, 4th May 2010**

**2 p.m. – 5 p.m.
Franklin Lecture Theatre,
76 Portland Place
London W1B 1NT**

James Smith, Shell UK Country Chair, will present the 5th Very Early Career Woman Physicist award on the 4th May 2010, at the Institute of Physics Headquarters in London.

Each of the short listed candidates will speak on their work in physics and their outreach activities, before the 2011 winner is announced and the prize of £1000 presented.

Our Guest speaker, Prof. Amanda Cooper Sarkar, has worked in several of the world's major international laboratories (CERN in Switzerland, KEK in Japan, RAL in the UK), and is an internationally recognised expert in the deep structure of the proton. She is a fellow of St Hilda's College Oxford and an inspiration to young people.

This meeting is open to all: an informative celebration of the achievements of female Physicists at a very early stage in their careers. The event will be an opportunity to meet previous winners and the 2011 winner of the IET Young Engineer Award.

Students and school pupils are very welcome and encouraged to attend.

Tea/coffee will be served from 1.30pm

It is not essential to register for this event but, for catering purposes, it would be helpful if you would inform the **WIPG Hon Secretary, Amy Preece** amypreece@gmail.com if you plan to attend.