Institute *of* **Physics**

LONDON AND SOUTH EASTERN BRANCH REMS SECTION

AT HOME

THURSDAY 10 JULY 2008

This meeting has been organized by George Freeman

This At Home is being held in the Rutherford Room on the ground floor of IoP at 76 Portland Place, London, W1B 1NT. Refreshments and lunch are on the floor below.

Chairman Dr David Pick

PROGRAMME

	SPEAKER	TOPIC
10.30	Registration and coffee	
11.00	Welcome and notices	
11.05	Dan Daly Lein Applied Diagnostics	Non-invasive blood glucose measurements
11.30	Dr John Stanley Oxford University	Dietary fats and human health
12.00	Phil Renton Thames Water	The Thames Catchment Area and the supply of water
13.00	LUNCH	
14.00	Dr Barrie Juniper Oxford University	The Story of the Apple
15.00	Dr Ellen Norman RSSL	A review of some techniques used in Food Analysis**.**
15.45	Dr George Freeman REMS	Forgotten Work on Dietary Trace Elements
16.05	Tea and disperse	

The cost is £23. Students not requiring lunch £5. Non members should contact Reinalt Vaughan-Williams on reinalt@physics.org or 020 – 8946 3399.

Abstracts and biographical details

Non-invasive blood glucose measurements

Dan Daly, Director, Lein Applied Diagnostics Ltd., Reading Enterprise Hub, The University of Reading, Earley Gate, Whiteknights Road, Reading, RG6 6AU
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Abstract:
Lein is developing an innovative non-invasive platform technology to exploit the diagnostic properties of the eye. The primary product will be a non-invasive glucose meter for people with diabetes that will have the look and feel of a mobile phone. The user will simply look into it to measure their glucose level. This meter will eliminate the need for the more painful traditional 'finger stick' solutions that are widely disliked by people with diabetes.

Brief CV:
Dan Daly spent a number of years at NPL working on the development of novel micro-optical devices and associated measurement systems. He then spent 2 years in Switzerland with Leister Process Technologies helping to build-up a MEMS manufacturing facility. After the downturn in the optical telecommunications industry in 2003 he left PerkinElmer and co-founded Lein with the intention of exploiting the optical advances made during the telecoms boom in the medical device industry.

Dietary fats and human health

Dr John Stanley, Oxford University
Trinity College and St Hugh's College, Oxford and Lincoln Edge Nutrition
john.stanley@trinity.ox.ac.uk

Abstract:
All governments recommend a reduction in the intake of saturated fat in an attempt to improve the health of their country's populations. Cardiovascular disease remains the main cause of mortality and morbidity in most countries of the world. There are numerous risk factors which contribute to the development of cardiovascular disease but the one that has received the most attention is a high concentration of cholesterol in the blood. It is well established that a lower intake of saturated fat results in a lower concentration of cholesterol in the blood. Hence, a lower intake of saturated fat should result in a lower risk of cardiovascular disease and this is the reason for the dietary recommendation.
This presentation will critically examine the experimental evidence for the saturated fat dietary recommendation. This will involve a close look at the different fractions of cholesterol in the blood, some of which increase risk namely low density lipoprotein (LDL) cholesterol and others which decrease risk namely high density lipoprotein (HDL) cholesterol. In addition, the different types of fat found in the diet, including saturated, monounsaturated, polyunsaturated and trans, which have different effects on the blood cholesterol level will be reviewed. This presentation will highlight the somewhat surprising conclusion that marine oils which are rich in n-3 polyunsaturated fat have the greatest effect on the risk of cardiovascular disease despite the fact that they have no effect on the blood cholesterol level.

Brief CV:
After periods of time working as a nutritionist in government, industry and academia I now divide my time between teaching and consultancy. I was appointed Lecturer in Biochemistry at Trinity College, Oxford in October 1995 and to a second Lectureship in Biochemistry at St Hugh's College, Oxford in October 2006. Both posts involve teaching metabolism, a basic part of both courses, to biochemistry and medical students. My consultancy, Lincoln Edge Nutrition, provides nutrition advice to government and industry. Since January, 1999 I have been a regular contributor to the journal *Lipid Technology* and publish an article on a subject of current interest to the fats and

oils industry in human nutrition every two months. I am adviser to the Food Standards Agency for their research programme on Diet and Cardiovascular Health and also have contracts with the Coffee Industry and the Cereal Industry

The Thames Catchment Area and the supply of water

Phil Renton, MSC, CIWEM, Thames Water: Scientific Consultant, Water Quality, Water Operations, Walton AWT, Hurst Rd, Walton on Thames, KT12 2EG
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Abstract:
Thames Water Utilities Limited is the UK's largest regulated water and wastewater services company, based on number of properties served. We have over 8 million clean water and over 13 million sewerage customers, which is nearly a quarter of the total population of England and Wales. The region within which we provide regulated water and sewerage services occupies about 13,750 square kilometres and encompasses more than nine percent of the total area of England and Wales. Our regulated business area reaches as far as Cirencester in the west, Dartford in the east, Banbury in the north and Haslemere in the south. We also serve London, the UK's largest and most densely populated city, with very high concentrations of traffic and economic activity around the clock.
The supply of water to our customers involves abstracting water, treating it to strict drinking water quality standards, distributing it to customers' premises through our network of pipes, or mains. Water is abstracted from surface sources, such as rivers or via reservoirs, or from underground sources like aquifers, via wells and boreholes.
We use reservoirs to store untreated raw water and underground service reservoirs for treated water, to maintain the continuity of supply.
Providing sewerage services involves the collection, treatment and disposal of sewage, which includes domestic sewage, trade effluent from other businesses and surface water. Sewage is collected through our network of sewers and moved, by pumping, to sewage treatment works, where it is treated.
Sewage sludge resulting from the treatment process may be recycled, used for power generation, reused on land or disposed of by a variety of methods.
We bill and collect payment from our millions of customers, both domestic and non-domestic and manage calls and correspondence from them. To give an idea of the scale of this, we deliver around nine million items of post every year, including 6.7 million bills.
NB: The presentation will focus on the abstraction and treatment of potable water primarily on those systems serving London.

Brief CV:
32yrs in the water industry, primary focus - potable water production, monitoring and control, London and Thames Valley
Managed DW process science and monitoring teams.
Member of the historic Thames Water International, commissioning and training team in Izmit, Turkey.
Team member - due diligence in Puerto Rico and Madrid.
Currently a member of the consultancy team working on the production of Drinking Water Safety Plans.

The Story of the Apple

Dr. Barrie Juniper, Reader Emeritus, Department of Plant Sciences, University of Oxford, and Fellow Emeritus of St. Catherine's College, Oxford. OX1 3RB
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Abstract:
What we can call the 'sweet' apple (as opposed to crab apples) of the western world appears, from the DNA evidence, to have evolved, over a period of some twelve million years, in the Tien Shan, a range of mountains that runs, politically now, from extreme western China, through Kazakhstan to Uzbekistan in the west and south through Kirgistan to Tajikistan. This huge area, through the great warm reservoir of the Indian Ocean, has never been glaciated in recent geological time and has remained, albeit geologically disturbed, a haven for plant and animal evolution virtually unique on the planet.

Into this haven, probably from the east, came a small-fruited, bird-distributed, eo-apple something like the Siberian crab (*Malus baccata).* Over enormous geological time and through constant geological disturbance causing a rapid turnover of individual trees, and through the agency, primarily of bears, this tiny, to us almost inedible apple, was converted directly to the apple of our supermarkets. There does not, surprisingly, seem to have been any hybridisation, and apples can still be found in the fragmentary FRUIT FOREST of the mountains that would pass muster on any fruit stall in the west.

The apple moved west (but not east because the deserts had already closed off this route) principally in the bellies of the newly-domesticated horse. The horses' sharp hooves pushed the resistant seeds into the soft soil of the oases. Orchards of random seedlings emerged and from these open pollinations came, selected, the sweet large fruits of the western world. These elite seedlings could, it was soon found, be preserved for eternity as clones, by the newly invented (probably about 3000 years ago) device of grafting, somewhere in the Babylonian empires.

This new crop was entering into established agricultural communities and was found, empirically, to be a valuable addition to the diet, not only because it could be picked and eaten straight off the tree, and was an excellent source of vitamins and minerals, but could, with care and little energy input, be stored virtually until apples came again.

Brief CV:

I have spent most of my academic life working in what is now the Plant Sciences Department of the University of Oxford. For much of that time I was in charge of the electron microscope unit, but also lectured on a range of subjects including the origin of crops. In 1974 I was elected a Fellow of St. Catherine's College, Oxford. *Inter alia* I spent sabbaticals and working stints in Berkeley and Santa Barbara (California) and the University of Arizona at Tucson. On retirement I was awarded a post-retirement Leverhulme Professorship (a.k.a. a Geriatric Professorship) and spent the next ten years, much of it in Central Asia, trying to work out the origin of the apple. The result was THE STORY OF THE APPLE (Timber Press 2006). I am now working on the origin of the mulberries, also from China and Central Asia, and the TRADESCANT ORCHARD collection in the Bodelian Library.

A review of some techniques used in Food Analysis.

Ellen Norman, Technical Manager – Analytical Chemistry and metals, Reading Scientific Services Ltd., Whiteknights Road, Reading, RG6 6BZ
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Abstract:
Food analysts today have a bewildering array of techniques to choose from, from the simplest colourimetric analysis to analyses which require instruments worth hundreds of thousands of pounds.
The talk will review some of the application of some of these techniques and the limitations of these analyses. The labelling of food is becoming evermore complex and this review will look at how we measure some of these key parameters found in the food we eat daily.
Some of the main areas explored will be the ways of measuring minerals and metals; sulphites; and antioxidants.

Brief CV:
Ellen Norman holds a degree and doctorate in Chemistry from the University of Birmingham. She joined the Brewing Research International Analysis team in 1997 and she was the Head of Analytical Development when she left in 2007 to join RSSL (Reading Scientific Services Limited), where she is the Technical Manager of Analytical Chemistry and Metals. Ellen and her team provide analysis for both food and pharmaceutical industries and many in between. They have extensive experience in problem-solving using a combination of traditional chemistry and more advanced analytical techniques. Ellen is a member the Royal Society of Chemistry.

Forgotten Work on Dietary Trace Elements

Dr George Freeman, Retired
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Abstract:
In the late 1950s, Klaus Schwartz and Walter Mertz were studying glucose intolerance (mild diabetes) in rats, and after a thorough search found the cause was a deficiency of chromium. Addition of chromium to the food cured and prevented the disorder. They isolated a chromium compound which they named glucose tolerance factor (GTF).
Later, Mertz showed that chromium was necessary for insulin to work properly in glucose metabolism and in the synthesis of fats.
H A Schroeder studied life-long exposure to low levels of 14 elements, and confirmed the findings of Schwartz and Mertz. He also discovered the connection between cadmium and high blood pressure.
Isobel Tipton's analyses of tissue samples showed widespread deficiencies of chromium and zinc in Americans. Analysis of food shows that refining removes much of the chromium and zinc as well as other metals and vitamins.
There are many papers on trace elements and I will talk about a few of them. This work is important to all of us and deserves to be better known.

Brief CV:
Dr G H C Freeman graduated at Reading University in VUV Spectrophotometry. At NPL he worked on various aspects of optical standards in the far IR to the VUV building reference instruments and calibrating national standards.