
Contents

1.	Contents	
2.	Editorial	
3.	Education News and Views	
9.	Resources	
10.	TY Science Resources	
11.	School lab horror stories	Ciara McGrath
12.	Creating a 'Dream Chemistry team' and what makes an effective Chemistry teacher	Jane Essex
18.	How does it work? #2 Why is ethyne, C_2H_2 , bubbled through copper(II) sulphate solution to purify it?	
19.	CheMiscellany	
21.	Elementary Chemistry	
23.	Laboratory gas generators for CO_2 , H_2 and O_2	Declan Finlayson
24.	Notes on the Preparation of Oxygen	Declan Finlayson
25.	2010 Anniversaries	
27.	The Element Makers: 9 Smithson Tennant	Adrian Ryder
31.	Climate Change: Geoengineering	
33.	Biochar: a new name for charcoal	
34.	Diary 2010-2012	
35.	Classical Chemical Quotes #4 Justus von Liebig	
	Conference Reports	
36.	4 th . Chemistry Demonstration Workshop	Peter Childs and Sarah Hayes
40.	10 th . ECRICE - Krakow, Poland	Vicki Hennessy and Aine Regan
42.	21 st . BCCE, Denton, Texas, USA	Anne O'Dwyer and Maria Sheehan
45.	Chemical & Mining News	Marie Walsh
45.	Environment, Energy and health News	Marie Walsh
54.	Information Page	

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Contributions on any matter of interest to second-level chemistry teachers are welcome. Normally the results of research (chemical or educational) are **not** published, except in a general form or as a review. Articles should be submitted electronically (email or disc) to peter.childs@ul.ie together with a printed copy.

For subscription details etc. see inside back cover.

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Cover photo: Goodness, gracious, great balls of fire: Sarah Hayes and Ciara Power give us another take on the methane mamba. (Photo: Press 22/University of Limerick)

Editorial

Good news for chemistry

This hasn't been a good year for encouraging news in Ireland, but there are some rays of light. This year's LC results show an increase in the number doing LC Chemistry (and a widening gap with Physics). However, these students started their LC course in 2008 before the effects of the cutbacks were really seen in school. We still have to see in the 2011 and 2012 cohorts whether the cutbacks have affected uptake in Chemistry and Physics, as the ASTI Report suggested. So far Chemistry is holding its own.

The second bit of good news is that the chemical and pharmaceutical industry in Ireland (pharmachem) is still doing well and has helped keep the Irish economy afloat. A recent article in *Chemical & Engineering News* (19/7/10) gave an overview of the industry. The chemicals & related products sector in Ireland made up 57% of exports and export value continued to grow in 2009. Although there are challenges from the global downturn, company mergers and plant closures, the Irish industry is still healthy. The closures by Pfizer of three plants in Ireland announced in May 2010 with the eventual loss of 785 jobs were a direct result of its merger with Wyeth and the consequent duplication of facilities in Ireland. Closure is not immediate and Pfizer hope that the plants will be sold before the closure date. Since then job losses have been announced by Schering Plough (Brinny) and GlaxoSmithKline in Cork. Ireland is not immune to the cold winds of change blowing through the world economy and the global chemical industry, but losses here have been much less than elsewhere. There is still strong growth potential in biopharmaceuticals and Ireland is well-placed in this area with Wyeth, Pfizer and Eli Lilly all major players. What is amazing about the export figures is that 50.7% of Ireland's exports were produced with a core workforce of just less than 25,000.

The health of the pharmachem industry in Ireland (see Matt Moran's article in *CinA!* #90) should be an encouragement to students to take Chemistry at school, despite some closures and job losses in the industry. The reductions in the pharmachem industry have been much less in Ireland than globally and Ireland has survived the mergers and downsizing in the industry very well. It is a cause for optimism.

The third bit of good news is the government's commitment to research through SFI and PRTL. This means that there are many good research openings for students who take Chemistry at 3rd level. The only problem is that not enough good students are going to study relevant subjects at 3rd level, that will enable them to take up these opportunities. Around 50% of the SFI-funded researchers come from outside Ireland and the national STEM pipeline is just not producing enough good graduates.

We need investment at 2nd level

Investment in 4th level is not enough on its own unless there is significant investment at 3rd and 2nd level. I have often made this point but the message does not seem to have been heard by government or industry. It is no good complaining and wringing one's hands about the shortage of students doing maths and physical science in schools, if the necessary investment is not being made. Apart from Project Maths, the cutbacks in education have worked against greater uptake and better teaching of science in schools. The €14 a head support for students taking LC Chemistry or Physics was withdrawn and then reinstated – but this was already a ludicrously small amount. What can you get for €14? A few test-tubes perhaps, but nothing to put in them! To have any effect on the resource drought in schools the figure should be at least €100. In addition labs need refurbishing and proper long-term resourcing, and teachers need technical assistance to do the job properly. **In many schools we have a third world infrastructure trying to deliver first world objectives.** There will be no smart economy without smart investment in schools and teachers. Science (and maths) teachers need regular CPD to keep up-to-date with teaching content and methodology. Teachers are always the key to success in education, as many studies have shown, and in Ireland we need to train them, resource them and support them properly, and this must continue throughout their careers. Investing in high level research alone will do nothing to promote science in schools or prime the STEM pipeline.

Hon. Editor

Peter E. Childs

Education News and Views

Pupils not well advised

Irish Times 3/5/10

A recent report from Dr Delma Byrne and Dr Emer Smyth of ESRI on Parental Involvement in Post-Primary Education indicated weaknesses in career advice in schools. Parents are satisfied with teachers and schools but think that their children don't get enough life skills and not well prepared for the world of work. Broadly pupils were more reliant on their parents than on the school for advice on subject and career choice. Transition Year won strong approval from parents because it made their children more confident and helped them mature. This study is important as it allows the voice of parents to be heard in Irish education.

Minister supports Maths bonus

The Minister of Education, Mary Coughlan, has come out in favour of bonus points for honours Maths. The University of Limerick has given bonus points for Maths for many years but by early October all the other six universities had come out in favour of bonus points. The details have to be worked out and the scheme should be in operation by 2012.

Big rise in college 'spin-outs'

Irish Times 12/02/10

The number of "spin-out companies" from Irish third-level colleges increased by 250 per cent in 2009, according to new figures from the Irish Universities Association (IUA). The data shows 35 companies were created directly from campus research last year, compared to 10 in 2008. About half of these are in the information technology sector, and half are in the bioscience or food areas. The IUA's figures also show a trebling of licensing activity last year, where new technologies or processes created by campus-based research teams are licensed to outside third parties. There were 102 licensing deals last year, compared with 33 in 2008.

The data covers 10 Irish academic institutions: UCD, UCC, UL, TCD, NUI Galway, NUI Maynooth, DCU, Waterford Institute of Technology, Dublin Institute of Technology and the Royal College of Surgeons in Ireland. Commenting on the report, John Scanlan, director of NUI Maynooth's Office of Commercialisation, said the higher 2009 figure was due to increased work by technology transfer offices based at the

institutes. These groups identify academic research that has commercial potential, and encourage participants to use that intellectual property as the basis for starting a company, or transferring it to industry through licensing.

The offices are funded by Enterprise Ireland's Technology Transfer Strengthening Initiative (TTSI), which runs from 2007 to 2012. According to the IUA, the research funding needed to create a campus spin-out totals about €20 million per company. It claimed this compared favourably with the UK (£30 million) and the US (£50 million).

Mr Scanlan said all of the companies spun out last year have "*outstanding technology and are selling into a market of unmet needs*". Companies spun out last year included the mobile software firm Cauwill Technologies, set up in the University of Limerick, and DIT-backed Trezur, which develops digital music applications for consumers.

During 2009 seven new UCD spin-out companies, commercialising UCD research were established, bringing to 13 the total number of UCD spin-outs incorporated since 2005. One of these new companies, Equinome, recently announced the launch of a breakthrough genetic test that can identify the optimum racing distance for individual thoroughbred horses which has the potential to transform decision-making processes in the global bloodstock industry.

Irish Innovation Praised

Irish Times 16/01/10

Irish research and innovation was praised at the recent Organisation for Economic Co-operation and Development (OECD) forum on green technology. The development of biodegradable plastic, garnering energy from sewage treatment and an ecological computer were among the Irish projects that gained acclaim in Paris. "*The development of a smart and resilient green economy can make a significant contribution to economic recovery and growth*," says Dr Micheál Lehané of the Environment Protection Agency. Download the report, Innovation for a Green Economy, at:

epa.ie/downloads/pubs/research/tech.

Poor standard of maths and science costs €8bn a year

Irish Independent 08/02/10

Ireland could be an average of €8bn a year better off if today's 15-year-olds were world-class students of science and maths. Raising the educational achievement of Irish teenagers to the standard of the world's top performer, Finland, would deliver major benefits to the economy through high-skilled jobs. The room for improvement has been identified in a report from the Paris-based Organisation for Economic Co-operation and Development (OECD).

The report examines, for the first time, the high cost of low educational performance, putting a value on how much it would be worth to a country if its 15-year-olds matched the Finns. A good grasp of maths and science is regarded as an essential foundation for developing the necessary brainpower for high-skilled jobs in a "smart" economy. The report uses new economic techniques to draw a link between educational abilities and economic growth, and puts a new focus on Ireland's "average" rating in maths and science, as well as efforts to boost interest and performance of second-level students in these key subjects.

The report uses educational attainment levels in Finland as a benchmark, as measured by OECD Programme for International Student Assessment (PISA) studies. PISA surveys focus on maths, science and reading scores for 15-year-olds, and they reveal wide differences in the performance of education systems. While Irish students score well on reading, there is concern that they rate only average in maths and slightly above average in science.

The report indicates that relatively small improvements in the skills of a nation's labour force can have very large impacts on future well-being. It traces the potential gain to the economies of 23 countries over 80 years of bringing educational performance up to the level of the Finns. According to its calculations, Ireland stands to reap the equivalent of €635bn by 2090 - an average of €8bn a year and about 5pc of the current value of the economy.

However, the report cautions that there are a lot of uncertainties with such long-term projections, but concludes that building key skills in students brings the most reward to economies in the longer term.

Sean McDonagh, former director of Dundalk Institute of Technology, who also headed up the

Government Skills Initiative, said disappointing PISA results had not received proper attention here, while in Germany there was national uproar over their outcomes. He said as well as concern over the average maths rating, it was very worrying that PISA found that Ireland was below the EU average in the number of high achievers in maths.

"I can't think of any stronger recommendation than to aim to achieve cognitive skills at the level of Finland," he said. "If cognitive skills are instilled in 15-year-olds they will go to upper secondary and third level."

One of the issues raised in relation to the poor maths performance is the fact that not all maths teachers have a qualification in the subject. An Engineers Ireland survey, released today, found that 80pc believed that making a maths qualification compulsory would improve Leaving Cert results. Engineers Ireland Director General John Power said: *"This insight very much confirms the general view that there needs to be drastic change to help students get to grips with this critical subject."*

Another report published in January 2010 found that mathematical knowledge levels varied widely among primary teachers. While primary teachers take courses in maths methods, they are not required to study mathematics during their teacher education programmes, although some do, according to the report authored by Dr Sean Delany, a senior lecturer in Colaiste Mhuire, Marino College of Education. He found that when teachers are offered professional development, the goal is usually to improve their teaching methods rather than their mathematical knowledge.

Dublin science centre in doubt

Sunday Times 20/12/09

The planned Exploration Station interactive science museum for Dublin, which has had more than €1 million of public funding to date, seems unlikely to go ahead as no government funding has been allocated to it for the next year. The idea was first mooted in 2003, with an original cost projection of €10 million. It is now estimated that the project would cost at least double that, and sources have said that the six months to June 2010 will be crucial in determining whether or not the project will be shelved.

Universities in dispute over funding

Irish Times 17/12/09

Divisions among the seven Irish universities have resurfaced as the bidding for some €300 million in research grants intensifies. An international assessment team was in Ireland in December examining the merits of various applications for funding under the Programme for Research in Third-Level Institutions (PRTLTI).

The controversial new Innovation Alliance, established jointly by UCD and Trinity College Dublin, hopes to secure most of the new funding. However, other universities insist all applications for research funding must be evaluated strictly on merit. They say the strong Government backing for the Innovation Alliance must not have any influence in the process. Traditionally, research grants under the PRTLTI programme have been made solely on the basis of assessments by the international team of experts. This is in line with best international practice.

Some university heads criticised the secretive talks which led to the alliance. They also expressed concern that the alliance would lead to the creation of a two-speed university structure, with some colleges marginalised. Essentially, the Government believes the merging of science and technology research functions in the State's two largest universities will give the third-level system the critical mass it has lacked. The hope is this will generate world-class research and innovation – which could be translated into jobs. Both Trinity and UCD are ranked among the world's top 100 universities. The 10-year-old PRTLTI programme has delivered more than €860 million in research funding to Irish colleges. Cycle five of the programme, now under way, will run over five years between 2009 and 2013.

The investment forms part of the Government's Strategy for Science, Technology and Innovation (SSTI) – the blueprint for developing research and technological innovation in the Irish economy

Institutes' research role grows

Irish Times 17/12/09

The first edition of the *Institutes of Technology Research and Innovations Yearbook* has been launched. It shows that the institutes have become a major contributor to Ireland's efforts to deliver a smart economy via research. The 13 IoTs outside Dublin now account for 20% of the State's spend on scientific research.

For copies of the yearbook e-mail
Sandra.cryan@ioti.ie

Gallery experiment proves theory that science can be fun

Irish Times 05/03/10

Trinity College Dublin's Science Gallery has had more than 500,000 visitors since it opened its doors two years ago.

At its opening it was announced that it would be "*the place where ideas meet and opinions collide*", where science and technology would mingle with the arts, culture, society and philosophy (though not always comfortably, and deliberately so). It would have workshops, talks, a book club, exhibitions, press briefings on topical science and even science cabaret. To encourage people to wander in, stick around, chat and return again, the Science Gallery would have a cafe, WiFi, science magazines to peruse and a shop with books and curiosities.

The Science Gallery's original goal of a footfall of 50,000 in its first year proved to be astonishingly modest. More than twice that number paid a visit in its first year: there were 120,000 visitors overall, which works out at an extraordinary 10,000 a month. Two years later, visitor numbers have passed 500,000, signalling that the Science Gallery has found a secure place with locals and is also a growing attraction on the tourist trail. The gallery has achieved something special: it has made science and technology accessible, intriguing, challenging, thought-provoking and popular.

For more information check out the website:

http://sciencegallery.com/this_is_science_gallery

Triple number of science and maths teachers, says report

The Independent 07/07/2010

The Royal Society in the UK has released a report on the state of maths and science education for five to fourteen-year-olds, recommending that each primary school should have a specialist science teacher as well as one in mathematics. The report has been well received, with Professor John Holman, head of the National Science Learning Centre in the UK, saying such measures were "welcome".

Public attitudes to science in Europe

Research Europe

<http://www.researchresearch.com/> 302 8 July 2010 p.5

Máire Geoghegan-Quinn, Europe's research and innovation commissioner, is prioritising public communication following the launch of the European Commission's latest Eurobarometer survey into public attitudes to science. Only 11 per cent of respondents reported feeling well informed about science, indicating that a better public awareness of science is needed for the EU to fulfil its vision of becoming an "innovation union".

Pharmaceutical Ireland reaction to Leaving Certificate results, 2010

www.pharmaceuticalireland.ie 18/08/2010

PharmaChemical Ireland has welcomed the upward trend in the total number of students studying science base subjects at Leaving Certificate level. The group also welcomed the increase of students studying chemistry from 11% to 13% since 2006, but is concerned with the increased failure rate in chemistry from 5.7% in 2006 to 9.1% in 2010.

PharmaChemical Ireland Director Matt Moran said: *"The 2010 results emphasise the need for the promised revision of the science curriculum to be prioritised by Government. There remains a need to dedicate energy and resources to the continuous professional development of teachers to ensure that science subjects are taught as effectively as possible; this will go some way to stop the rising failure rates at higher and ordinary levels."*

"The pharmachem and biopharma sectors in Ireland are always looking for top quality science graduates to maintain the industry as a global leader. It is vital that students get the best science education possible. The strategy document 'Building Ireland's Smart Economy: A Framework for Sustainable Economic Renewal (2008)' recognises that science-based technology is one of the cornerstones of the economy and that using the knowledge, skills and creativity of people is central to developing innovation and

ideas."

In 2009, the pharmaceutical sector exported products to the value of €47.2 billion, which represents over 50% of the total national exports. *"Ireland has secured over €1.5 billion of investments over the last number of years from biopharmaceutical corporations including Pfizer, Allergan, Genzyme, Gilead, Merck, Lilly and Centocor. Most of these investments are in biotech or R&D - the cutting edge of the sector. This bodes very well for the long-term future of the industry in this country."*

NI STEM Report

In September the Department of Education (DE) and Department of Employment and Learning (DEL) in N. Ireland published a *Report on The STEM Review*. STEM stands for Science, Technology, Engineering and Mathematics. The full Report is available online at: http://www.deni.gov.uk/report_of_the_stem_2009_review.pdf

The expert group was convened in Spring 2007 and the Report makes 20 recommendations under 4 major imperatives. These are given below because their findings are of interest to STEM in the Republic of Ireland.

The four imperatives:

1. Business must take the lead in promoting STEM.
2. We must alleviate key constraints in the STEM artery.
3. There needs to be increased flexibility in the provision of STEM education.
4. Government must better coordinate its support for STEM.

1. Business must take the lead in promoting STEM.

Recommendation 1 – Establish a business-led STEM framework

Business should develop and lead a framework of stakeholders which will engage directly with schools, FE colleges, universities and government to focus on growing the STEM artery across the education service and the promotion of STEM within our society.

Recommendation 2 – Develop a clear STEM careers path

Business, in conjunction with the Sector Skills Councils, professional bodies, DEL and DE need to develop and promote clear career paths for STEM students. Linking formally with the Careers Advisory Service, the pathway should identify the benefits of taking up apprenticeships, graduate and postgraduate education and the career opportunities available within the private sector.

Recommendation 3 – Introduce prestigious STEM scholarships

Business, professional bodies and DEL should introduce prestigious scholarships in STEM subjects for students entering FE and HE, targeted at retaining our most able STEM students following graduation.

Recommendation 4 – Address gender bias

Business, in conjunction with Sector Skills Councils, and in partnership with schools, colleges and universities, must address the issue of gender bias, particularly the disparity between the physical sciences and engineering on the one hand and the life sciences on the other.

Recommendation 5 – Develop regional STEM links

The framework to engage business should include mechanisms to join with STEM businesses in neighbouring regions and especially on the island of Ireland, to create a critical mass of larger businesses to promote STEM. In support, links should also be developed with DETI.

2. We must alleviate key constraints in the STEM artery.**Recommendation 6 – Address the disparity in STEM performance amongst schools**

There needs to be action focused on improving the performance of our poorer performing pupils in STEM, particularly in science and mathematics. Improving pupils' mathematical knowledge and the application of their mathematical skills will be a prerequisite.

Recommendation 7 – Support primary school teachers in teaching the area of learning, The World Around Us

As a matter of urgency, there needs to be a programme of support for primary school teachers to ensure they develop the confidence and

enthusiasm to teach science in ways which motivate and engage pupils.

Recommendation 8 – Review developments in mathematics in relation to STEM provision

There is a need to review whether or not current initiatives are adequately addressing the development of mathematical knowledge and the difficulties experienced by many young people in applying their mathematical skills, which hinder their progress in science, engineering and technology. In particular, DE, DEL and CCEA should review how ongoing developments in GCSE mathematics will impinge on the provision being offered by schools, FE colleges and training organisations.

Recommendation 9 – Make STEM learning more enquiry based

Young people's STEM learning in schools, FE colleges and training organisations needs to be much more investigative and enquiry-based than it is now. The relevance of STEM in everyday life should be emphasized by all the key interests.

Recommendation 10 – Improve planning at the Key Stage 2 / Key Stage 3 interface

Post-primary schools and their feeder primary schools need to plan jointly to ensure that there is improved continuity and progression from KS2 to KS3, so that the teaching of STEM builds effectively upon the children's earlier learning.

3. There needs to be increased flexibility in the provision of STEM education.**Recommendation 11 – Increase the focus on the core sciences and mathematics subjects**

STEM teaching resources, scholarships and grant assistance should be focused on the core STEM courses, viz physics, chemistry, biology, and mathematics to provide maximum flexibility and efficiency later in the STEM artery, to meet the changing demands of the economy. In addition, postgraduate subjects such as medicine should consider the implementation of a graduate stream to allow easier transfer from core science courses.

Recommendation 12 – Facilitate easier two-way transfer between FE & HE

Our local universities and FE colleges should introduce mechanisms to permit easier two way transfer, thereby allowing students additional time and space to choose between academic, technician, or apprenticeship style courses and

providing alternative choices in the event of non-continuation; courses must sit within the qualifications and credit frameworks.

Recommendation 13 – Reduce barriers to obtaining support in STEM

Government, in conjunction with FE and HE, should review the financial support for students both full-time and part-time on all STEM courses.

Recommendation 14 – Develop a STEM CPD framework

There needs to be a clear CPD framework related specifically to STEM, which continues to update teachers, lecturers and support staff on STEM developments and issues globally and to promote best practice in respect of curriculum, pedagogy and assessment.

Recommendation 15 – Increase the emphasis on STEM CEIAG

There needs to be more resources allocated by business and government to Careers Education, Information, Advice and Guidance (CEIAG) for STEM. In support, formal links should be created between the business framework and the Careers Advisory Service.

4. Government must better coordinate its support for STEM.

Recommendation 16 – DE and DEL, supported by other relevant Government departments, should develop a clear STEM strategy & vision

Building on the Executive's Programme for Government to create a dynamic, innovative economy, DE and DEL, supported by other relevant departments, should develop a clear strategy for STEM recognizing the critical role of STEM and the skills required for sustained economic growth.

Recommendation 17 – DE and DEL, supported by other relevant Government departments, should introduce cross-departmental structures to help develop

appropriate STEM strategies and policies.

The structures should include a Chief STEM advisor who would carry the educational responsibilities of a Government Chief Scientist and a National STEM Director.

Recommendation 18 – Develop a more proactive approach to managing STEM supply and demand

Government needs to be more proactive in managing the supply and demand of skills in relation to economic need relevant departments should develop appropriate systems to better assess the flow of skills into the workforce at the various qualification levels, including the application of ongoing foresight.

Recommendation 19 – Increase the number of applications for physical sciences and mathematics places in Initial Teacher Education courses

DE, in partnership with Initial Teacher Education institutions, should continue to seek to increase the number of students entering Initial Teacher Education courses in the physical sciences and mathematics. Further research is required into the issue of STEM subjects which are taught by teachers without appropriate specialist qualifications.

Recommendation 20 – Expand the capacity to respond to critical skills shortages as they arise

DEL, in conjunction with business, should continue to develop and build upon its current initiatives to tackle skills shortages. This should include the application of foresight and knowledge of important emerging market opportunities.



Change of name for SLSS

The SLSS has been renamed Professional Development Service for Teachers, PDST, with a new logo. It combines CPD support for both primary and secondary schools into one organisation. www.pdst.ie

From this site you can link to the SLSS website and resources for Chemistry teachers.

“Do not train a child to learn by force or harshness; but direct them to it by what amuses their minds, so that you may be better able to discover with accuracy the peculiar bent of the genius of each”

Plato, Greek Philosopher

Resources

Feynmann thinking aloud

Richard Feynmann was one of the 20th. century's great physicists but he was also a great communicator. You can catch him thinking aloud is a series of 6 short video clips on the BBC archive website. Check out this one to hear him talking about jiggling atoms as he talks about heat and phase changes.

<http://www.bbc.co.uk/archive/feynman/10700.shtml>

ECOWEB: Celebrate Biodiversity

www.cbd.int/2010

This is the official site for the UN International Year of Biodiversity. It gives details of events held throughout the world to celebrate and safeguard the variety of life on Earth.

More smartphone apps about science

Irish Times 28/07/10 and science.ie newsletter

A growing number of apps – mobile phone applications – are a great way of exploring science, from the solar system to sub-atomic particles.

Science teacher Humphrey Jones from St Columba's College in Dublin, who runs the excellent Frogblog.ie website, gave a good round-up of these apps in a recent Irish Times article.

Many of the apps are free or cost just a nominal sum, and here is his "top ten":

1. **Pocket Heart** (iPhone, iPad, Android) – explore the workings of the human heart using 3D animation
2. **The Chemical Touch** (iPhone, iPad) – an interactive periodic table
3. **Mitosis** (iPhone) – learn about cell division
4. **Planets** (iPhone, iPad) – explore the night sky
5. **Science Glossary** (iPhone) – dictionary of science terms with short biographies of famous scientists
6. **Celeste** (Android) – more for astronomy fans
7. **Sciencepal** (Android) – a set of science apps including another interactive periodic table and the Solar System

8. **Touch Physics** (iPhone) – solve puzzles using your knowledge of the laws of physics
9. **Hubble** (iPhone) – photos and more from the Hubble space telescope
10. **Speed Anatomy** (iPhone) – a quick test of your knowledge of the human body

Royal Society of Chemistry Resources

The Royal Society of Chemistry has a number of resources/projects aimed at school science teaching at various levels. Further information can be found at www.rsc.org/education

The RSC also have an online resource for undergraduates/universities called 'Discover Maths for Chemists':

<http://www.rsc.org/Education/DiscoverChemistry/DiscoverMathsforChemists.asp>, which brings together all the best resources to help combine maths and chemistry.

NCE-MSTL Research & Resource Guides Volume 2

A set of the Research & Resource Guides Vol. 2 from the National Centre for Excellence in Mathematics and Science Teaching (NCE-MSTL) at the University of Limerick, together with the Centre's newsletter, will be sent into schools in October. The new Research & Resource Guides and the 14 titles from Volume 1 can also be accessed at www.nce-mstl.ie.

Obituary: Viktor Obendrauf

It was great sadness that I heard that Viktor Obendrauf passed away on 28/8/20 in Graz, Austria. He was well-known internationally for his superlative demonstration lectures – he spoke at two ChemEd-Ireland conferences and he features on the cover of issue #80, Winter 2006. He spent hours preparing for a 45 minute lecture and I heard him speak several times. He was also a gracious and helpful person, always willing to share his expertise with others. Viktor worked at different times in Austria at the University of Graz, Karl-Franzens University, and the Pedagogical Academy of Graz and won several national and international awards. Viktor is survived by his wife, Barbara and his sons: Martin and Michael.

PEC

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TY Science Resources

New TY Science Modules

Two new TY Science modules have been produced by UL 4th year students and a limited number of copies are available for trialling this Autumn. The two new modules are described below. Each consists of 8 units, each taking a week, comprising 1 single, 1 double and an optional single lesson.

Waste not, want not! by Hannah McDonnell. This module looks at the science behind waste in Ireland.

The titles of the units and lessons are given below.

Unit 1: Are We Wasting Away?

Unit 2: Reduce, Reuse, Recycle!

Unit 3: What a Load of Rubbish!

Unit 4: Drastic Plastic!

Unit 5: Composting

Unit 6: Let's Go Metal!

Unit 7: Disposal Proposal!

Unit 8: It's Not Easy Being Green!

Power to the people! The Science of

Energy by Nicholas Ryan. This module looks at the science of energy in Ireland with an emphasis on renewable sources of energy, like water, wind and biomass. The titles of the units and lessons are given below.

Unit 1. You've got the Power!!

Unit 2. Burning up the Past!!

Unit 3. Waste not, Want not!!

Unit 4. Gone with the Wind!!

Unit 5. Water Works!!

Unit 6. A New Tide of Technology!

Unit 7. 'Let there be Light!'

Unit 8. A Vision of Energy!!

If you are interested in trying one of these before Christmas 2010 please email peter.childs@ul.ie. There are some conditions attached to trialling these new modules, in order to provide us with feedback. Feedback from teachers on the draft modules is essential in order to improve and correct them. The revised modules will be made available in September 2011.

Existing TY Science modules

The TY Science modules have been developed mainly by 4th year science education students and modified after testing in schools. However, they are low cost resources and they are not perfect.

The following titles are already available in the TY Science series.

- **Forensic Science**
- **Cosmetic Science**
- **Science and Sport**
- **Environmental Science**
- **Issues in Science**
- **Science and Medicine**
- **Food Science**
- **Science of Survival**
- **Space Science & Technology**

Each module has the same format and consists of a photocopiable Student's Guide (a workbook) and a Teacher's Guide. The modules cover at least 8 week's work, but in most cases individual units (a week's work) can be done on their own. Each module costs €10 plus a postage contribution (unless collected at conferences or from UL).

The nature of the topics covered means that the modules are interdisciplinary i.e. they contain biology, chemistry and physics, depending on the topic – they are not solely biology, chemistry or physics. They have a strong emphasis on Science, Technology and Society (STS) and aim to arouse interest in science and develop the pupil's scientific literacy. The modules are also designed to develop a range of skills – practical, ICT and communication skills.

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Lip prints and Forensic Science

One of the units in the Forensic Science TY Science module looks at the use of lip prints for identification. The page of lip prints does not reproduce well in B/W and you can access a colour version at:

<http://lawrencehallofscience.org/chemmystery/> or <http://www.reocities.com/Athens/Atrium/5924/lipprintsbackground.htm>

For some background on the use of lip prints consult: <http://lifeloom.com/II2Aggrawal.htm>

Resources for TY

Two Research and Resource Guides are available on resources for teaching Transition Year Science from the NCE-MSTL at www.nce-mstl.ie. They have been written by Sarah Hayes.

School Lab Horror Stories

Ciara McGrath

I taught for 28 years in three schools in England and Ireland. When you teach chemistry in a high school you get used to strange questions and donations. Questions like, “How does water divining work?”, or “My Dad says he wants you to give me a recipe for gunpowder for him to make his own fireworks.”

People in industry used to use schools as dumping grounds for broken down machinery or hazardous chemicals. A knowledgeable chemistry teacher would have turned away these “gifts”, but very often they were just left at the school office, in a sealed box.

On one occasion the secretary phoned me and said there were two enormous boxes that had been left by a parent for the Chemistry Department. It turned out to be a spectrophotometer. Now don't get me wrong. A spectrophotometer is an extremely useful piece of equipment, when it works. This one did not work at all.

One of my students came from a very odd scientific family. I spoke to her father and he said to drop it off to his house and he would have a look at it. When the front door opened the hall was 4 feet high with boxes of all shapes and sizes. Our spectrophotometer is still there fifteen years later.

On another occasion a school laboratory technician was tidying a cupboard under a sink. She brought me a polythene bottle labelled HF. HF is hydrofluoric acid, an extremely nasty acid, that dissolves skin and glass, amongst other things. This bottle had been there for at least 25 years, and nobody could remember where it came from. The school would never have bought it because it is totally unsuited for use in a school laboratory.

Looking under a sink in my first teaching job I found 3 enormous sweet jars full of what looked like sticks of rock (candy). There was no label on the jars, so I asked the Head of Chemistry what it was. “Phosphorus”, he says. I argued with him that we would never use 100 g, let alone the 10 kg that we had. “It was free, a parent brought it to parents' evening and gave it to the department, so we cannot throw it away.”

Phosphorus is another very nasty material that is absorbed by the body and incorporated into bones, causing them to lose their rigidity. It is also the prime ingredient of incendiary devices, and we had 10 kg of it stored in an unlocked cupboard!

The same head of department was not knowledgeable about Chemistry, though. On one occasion I heard screams coming from his lab, so I went through the connecting door, to find purple smoke coming from an oven on a side desk. The guy was only drying iodine in an oven. He had gone off for a cigarette, leaving the class in the room. Iodine changes directly from a solid to a gas, and back again when it cools down. It causes respiratory distress and if it crystallizes (sic) on the cornea of the eye can cause blindness.

In the same school, in 1975, we were using asbestos mats and gauzes, and had asbestos fire blankets. The Principal refused to give us money to replace this potentially harmful equipment with safer glass fibre alternatives. The school had enough money to replace 800 bibles and prayer books every year, but would not find the money to replace worn out and unsafe asbestos equipment. Flammable liquids such as ethanol, hexane and ether should, by law, be stored in ventilated and clearly marked cupboards with trays at the bottom to catch any spilled liquid. In my third school, I found a walk in cupboard with 2 litre bottles of each of these highly flammable liquids stored on an open shelf, directly above oxidizing agents that they would react with if spilled. The door to this cupboard was never locked and students were routinely left in the room with no teacher.

About the Author: Ciara McGrath taught Chemistry for 28 years and has set up three labs herself. The stories here are all totally true and recounted without any exaggeration.

Source: www.isnare.com

I came across this while surfing the internet. Ed.

WANTED:

Your science-based school stories, anecdotes or horror stories either as a student or as a teacher. They can be published anonymously if required! Your account of your accidents might prevent someone else having them. The stories above seem to relate to the 1970s – nothing like that happens these days, or does it?

Creating a 'Dream Chemistry team' and what makes an effective Chemistry teacher

Jane Essex

School of Public Policy and Professional Practice, Keele University, Staffordshire, ST5,
j.e.essex@educ.keele.ac.uk

Where have all the Chemistry graduates gone?

England and Wales are currently experiencing a crisis in recruitment of Chemistry (and Physics) specialists to Initial Teacher Education (I.T.E.). There are a number of identifiable factors which appear to have contributed to our current situation, including a fall in the number of graduates and the limited financial appeal of teaching in comparison to other career options open to Chemistry graduates. At the same time the Initial Teacher Education, the Training and Development Agency's modelling of projected needs for specialist chemistry teachers indicated that recruitment will need to see at least 900 teachers entering maintained schools per year from this point in time, rising to 1 100 by the year 2014, which represents a huge increase on current numbers which fluctuate at around 500 entrants per annum. (Department for Education and Skills, quoted in Royal Society, 2007) Recent changes in the curriculum have made this shortage even more problematic for schools. The increased demand is associated with the relatively high numbers of specialist Chemistry teachers who are now close to retirement, and cannot be met by present recruitment patterns which have been broadly static since the late 90s (Royal Society of Chemistry, 2007)

An additional, increasingly significant, pressure on recruitment is the steep decline in the proportion of graduates whose degrees contain the 40% Chemistry component required to train as a specialist teacher in the subject. Changes in degree profiles over the last 25 or so years have seen far more degrees offered with an applied or an interdisciplinary focus, such as Forensic Science, rather than Chemistry. To judge from the degree profiles of non-UK applicants for teaching, this is seems likely to become more prevalent in a

number of countries, as more education systems offer a wider range of degree profiles.

The impact of the shortage

The current initiatives, described in more detail further on, involve increasing the chemistry subject knowledge of graduates in subjects other than chemistry. Diverting non-specialists, either before or after teacher training, may seem like 'trying to make a racehorse out of a pig'. However, the alternative of doing nothing or working to increase undergraduate numbers in Chemistry, is likely to be much worse in the short term both for teachers and their students. To extend the analogy, developing a fast pig seems, on present evidence, to be a great deal better than having no runner in the race at all. Leaving non-specialists to teach chemistry, especially to examination classes, risks giving students a poor and partial version of the subject. This, in turn, impacts on recruitment to chemistry degrees and so recruitment takes a further turn down a negative spiral. Anecdotal evidence from serving teachers gathered at Keele University corroborates previously published evidence (Royal Society, 2007) that schools are using non-specialists, some of whom do not feel able to teach Chemistry well. Non-chemistry teachers report that they do not feel confident that they will be able to answer questions and, in some cases, this fear is leading them to rely on very 'closed' teaching activities, such as working through a text book, where open discussion and exploratory talk is less likely to take place. Avoidance of practical work is another common symptom of their low levels of self-confidence. The problems are exemplified by the following quotation.

'Since starting to deliver the AS (in chemistry) I rely on recalled knowledge when preparing for lessons. I have gaps in my understanding which causes problems when answering student questions. The (chemistry) course will develop my

understanding of higher level chemistry and increase my confidence.'

(Applicant for Chemistry Additional Specialism Project, 2009)

'Turning the tide' of falling recruitment

Although subject knowledge alone does not make an effective teacher, an issue which I consider further on, it is nevertheless an essential component of pedagogical proficiency and is recognised as such by non-specialist teachers, such as the one quoted previously. Yet the level of subject knowledge does not need to be anything like a degree. There is a clear distinction between Chemistry as it is presented at school level, and Chemistry at an undergraduate level and post-graduate/ research level (Kind and Taber, 2005). The content taught at school level confers a high level of redundancy upon the content of a degree. Conversely, as the demands for flexible understanding, and the ability to offer alternative approaches to a topic increases with the level of curricular demand, and there clearly is a need for effective trainee teachers and teachers to be fluent in the 'disciplinary matrix' of Chemistry (Kuhn, 1977). The impact of specialism on quality of teaching is corroborated by Ofsted (1998). In reality, of course there will be many intermediate positions of expertise supporting varying levels of teaching in schools. In response to this situation the Training and Development Agency for schools (T.D.A.) has, in recent years, funded a range of courses, mainly for pre-I.T.E. students but also one introduced three years ago specifically for serving teachers.

These no-fees, bursaried courses run for 2 weeks, 24 weeks or 36 weeks with the purpose of raising participants' subject knowledge so that they can teach confidently up to G.C.S.E. but are not required to address teaching issues; the pedagogy of chemistry is expected to be covered later on, during their I.T.E. The subject content is driven by the teaching demands within school and may, though does not need to, cover material needed for the teaching of the optional, pre-university courses (Advanced Supplementary and Advanced exams, known as AS and A2).

However, the 24 and 36-week Chemistry Subject Knowledge Enhancement (S.K.E.) courses at Keele has gone a step further than the course requirements by 'buying in' the university's

Chemistry lecturers' time, and they teach much of the course. Their expertise means that the material can be pitched somewhere around first year undergraduate levels, giving participants significant knowledge beyond AS and A2. Education staff, with a background in school Chemistry, also teach about a third of the course material.

The course comprises a series of modules, which have been planned in such a way as to develop a rigorous and flexible knowledge of Chemistry. Chemistry lecturers teach modules on Bonding and moles, Organic Chemistry, Maths for Chemistry, Inorganic Chemistry and Physical Chemistry. In addition, the Chemistry staff teach an Applications of Chemistry module looking at practical uses of Chemistry (such as an analysis of alcopops and evaluating sunscreens) and spectroscopy. Education staff have taught lab skills for school ; I.C.T. for chemistry; a module on the History, Philosophy and Ethics of Chemistry and a series of outside visits to a venues including a salt works, a pharmaceutical plant and a chocolate factory. The final Education module requires participants to spend at least 20 hours preparing and delivering chemistry activities to a lay audience, including running days at local museums and running Salters' Institute Chemistry Festivals. Although the list may seem slightly disparate, it appears to have been precisely the diversity of approaches that made the course so successful.

What makes an effective Chemistry Teacher?

A major flaw in the schemes to increase numbers of Chemistry specialists has been a hesitation, until this year when a T.D.A. specification for a longitudinal evaluation specified such data, to ask searching questions about the quality of the specialists rather than their numbers. However the apparent success of non-traditional recruits as Chemistry specialists in school does offer an interesting opportunity not simply to measure impact, but a chance to probe which aspects of competency are most critical for success and which components of the enhancement course appear to have most facilitated participants' subsequent success.

In the framework that follows, the requirements of the T.D.A. are set out and categorised, alongside descriptors from other contemporary sources and the aspects of the course which fulfilled these requirements. In the final column findings, of the

T.D.A. appointed evaluators are quoted, along with data from a follow up survey of former

participants at Keele which was conducted by the author.

Training and Development Agency's requirements of pre-Initial Teacher Education Chemistry S.K.E. course	Other descriptors of effective teachers	Role of SKE in developing and assessing	T.D.A. Evaluators' reported findings and follow up evidence
Subject Knowledge			
Subject knowledge of Chemistry robust enough to support teaching it at key stages 3 and 4 (11- 16 year olds). Some Subject knowledge of Chemistry sufficiently robust to support teaching it to AS/A2		Provision of a systematic coverage of key concepts, combined with regular formative assessment in the 5 Foundations of Chemistry modules.	<p><i>'...enhance significantly participants' knowledge through a six month intensive course, for many to quite a high level....' (T.D.A.)</i></p> <p><i>Mentors all reported favourably on trainees' subject knowledge. Of the eight one had been judged suitable to teach A2 in her first year.' (T.D.A.)</i></p> <p><i>'Their understanding was found to be robust; (T.D.A.).</i></p> <p>Universally former participants that they were as knowledgeable about chemistry at a school level as other chemistry specialists who had come from chemistry degrees. (E.)</p>
Understanding			
An awareness of the distinctive nature of Chemistry as a science		Highlighted by History, Philosophy and Ethics of Chemistry tutorials	
Deep understanding of Chemistry achieved (taken to mean 'concerns central ideas... 'make clear distinctions, develop arguments, solve problems, construct explanations....work with relatively complex understandings.' Wehlage and Newmann (1993) : 9)		Developed through individual investigation, the development of activities for public events; assessed by end-of-course synoptic questions.	
Has considered the role of practical work in understanding and developing new ideas about Chemistry		Weekly laboratory sessions in undergraduate laboratories plus lab skills for school in Education labs.	<p><i>'confident and competent demonstration) experiments'. (T.D.A.)</i></p> <p><i>'They've raised our game. We're doing demos again after years of not bothering.' (E.)</i></p>

Application			
Understanding of Chemistry achieved that enables participant to deal with unfamiliar contexts successfully	An understanding of the limits of Science (H.)	Rehearsed in Applications of Chemistry module; assessed by an individual investigation and end-of-course synoptic assessment	
Understands the ways in which the wider environment provides a context in which Chemistry can be learnt.		Visits give the opportunity to see chemistry deployed in a wide range of settings.	
Analysis			
An awareness of the potential barriers to learning Chemistry and how these may be overcome, both by themselves and others.	Critical reflection on developmental needs and identification of goals (K.T.)	Identification of participants' own development needs; undertaking public Chemistry events	
Synthesis			
Ability to synthesise models and theories from different areas of Chemistry to explain phenomena effectively	Creativity in making subject relevant (R.S.) Imagination (R.S.) Stimulating (R.S.)	Rehearsed in Applications of Chemistry module; assessed by an individual investigation and end-of-course synoptic assessment. Criticality of subject knowledge is developed through peer assessment, during Applications and lab skills	
Able to communicate effectively about Chemistry to both specialist and lay audiences.	Pass on skills (R.S.)	Assessed by presentations during the Applications of Chemistry and lab skills for school modules, plus delivery of chemistry activities at public events.	
Communication skills			
Skills developed to communicate Chemical concepts effectively.	The ability to explain concepts (R.S.)	Rehearsed and assessed by several presentations during the course, also delivery of chemistry activities at public events.	<i>''... the trainees were all able to explain relevant chemical ideas clearly and confidently, using plain language.'</i>
Able to use ICT effectively as a tool to support analysis and communication		I.C.T. module	

Interpersonal skills			
	Pass on knowledge (R.S.) Facilitator of discussion (H.) Individual relationships with pupils (R.S.) Engaging pupils (H.,R.S.) Pass on passion for learning (R.S.)	Supported problem classes; extensive group work including assessed items; regular tutorials.	
Attitudinal characteristics			
A positive attitude to the learning of Chemistry, by both themselves and others	Enthusiasm for subject (R.S.) Dynamism (R.S.) Dedication (R.S.)	Exposure to subject enthusiasts modules, opportunities to enthuse non-specialists at public events.	<i>'...all of the trainees demonstrated a strong interest in chemistry and an enthusiasm for teaching it.'</i>
Professional attributes			
A professional attitude to teaching and learning, including satisfactory attendance.	Class management skills (R.S.) Resource management skills (R.S.) Commitment to ongoing professional development (H., K.T.) ¹	All participants have agreed to undertake additional study prior to undergoing I.T.E.	Participants were found to <i>'prepare thoroughly'</i> for practical work (T.D.A.) Five of eight respondents who described their membership of professional organisations were still members of the R.S.C., a higher proportion than would be expected amongst chemistry teachers generally. (E.). Two thirds of respondents had engaged with substantial further professional development since completing the course.

¹ **References for table:**

E. = Essex (2009)

H = Harlen (2009)

K.T. = Kind and Taber (2005)

R.S. =

Royal Society (2007)

T.D.A. = Teaching and Development Agency Evaluation

What does the analysis tell us about the future supply of teachers of shortage subjects?

The analysis above indicates that there is broad concurrence on the key features that an effective teacher exhibits, and that according to the common criteria Enhancement course participants are found to be effective. The findings of the, admittedly small scale, evaluations of teachers who have come to the classroom by the alternative route of a Chemistry Subject Knowledge Enhancement course are that these teachers can be at least as effective as those coming from a more 'traditional' route. However the evidence is considerably strengthened by corroborating evidence from other studies of enhancement courses in other subjects (Teacher Training Resource Bank website).

Whilst the different sources indicate that good teachers need a combination of subject knowledge, interpersonal and communication skills there is no indication that it matters in which order these attributes are acquired. The evidence also demonstrates that it is feasible to work with some of the many graduates who have excellent personal qualities who are currently unable to take up specialist Chemistry teaching qualification because of insufficient systematic Chemistry study at degree level. Indeed the evidence to date suggests that it may be particularly effective to choose the people for the job first and then supplement their subject knowledge. (In contrast, most of us know of teachers with very sound subject knowledge but who are low in interpersonal skills or professional attributes and who have, in consequence, been ineffectual teachers). One particularly notable gain with the non-traditional entrants is in their enthusiasm about their newly acquired specialism, and their very active engagement with ongoing professional development.

Participants' comments suggest that the different components of effectiveness do not operate in isolation and, through the provision of additional subject knowledge the courses elicit gains in their broader attributes which persist for up to five years after they completed the course. Put crudely, teachers appear to behave more professionally when they know they are secure with the subject they are teaching. This has been particularly evident in serving teachers attending a 40 day Science Additional Specialism Project course, who are aware that a subject knowledge deficiency impacts negatively on their classroom demeanour.

'I have the passion and enthusiasm to inspire Key Stage 4 pupils to extend their chemistry education into A level and beyond, but I am missing the extra subject knowledge to stretch pupils to open their eyes to the satisfaction and wonder of the world of chemistry.'

(S.A.S.P. participant, 2009, Biology specialist)

In terms of identifying the aspects of subject knowledge enhancement courses which have the greatest impact, the analysis above suggests that there is no one specific component that achieves the results that have been described. It is the mixture, of approaches, ideas, content and teaching staff that has driven the gains that have been reported. By building on the strengths of both the Education and Chemistry lecturers, such courses have the potential to maximise both the subject knowledge gain and the personal and professional qualities required for the effectiveness of participants in school.

Conclusion

There is a high level of concurrence in descriptions of effective teachers. Keele's experience of using one such set of descriptors enabled staff to design and implement a course which produced a significant number of additional effective Chemistry teachers. By being able to provide opportunities to develop the requisite skills, knowledge and attitudes, the Chemistry Subject Knowledge Enhancement Course has had a positive impact on its participants, both in the short and medium term. The outcomes of the course to date also have wider implications for teacher education, indicating that it is possible to design courses which, if taught by people with a range of subject expertise, can achieve a dual impact on both subject knowledge and positive professional attributes.

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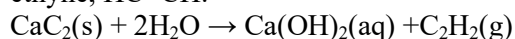
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Jane Essex is a Lecturer in Science Education at Keele University, with a specialism in Chemistry. Prior to that she taught Science in schools across England. Her major role is the supervision of students on the Post- and Professional Graduate Certificate in Education. A key area of interest is the maintenance of the supply of knowledgeable and enthusiastic chemists to go into schools, and she has worked extensively on subject knowledge enhancement courses, which enable a wider range of graduates to train as specialist Chemistry teachers. She also lectures on the Philosophy, History and Ethics of Science.

How does it work? #2

Why is ethyne, C₂H₂, bubbled through copper(II) sulphate solution to purify it?

Ethyne (acetylene) is made in the laboratory by adding water to calcium carbide, CaC₂, which contains the C₂²⁻ ion, the ethynide ion. The ethynide ion is a strong base (C≡C⁻) and in water it is protonated (water acting as an acid) to give ethyne, HC≡CH.



Commercial calcium carbide is impure and when it reacts with water a number of gaseous impurities are produced, which contaminate the ethyne. The solid contains compounds of calcium with sulphur, phosphorus and nitrogen and in water these produce H₂S, PH₃ and NH₃. The preparation of ethyne specifies copper(II) sulphate solution to wash the gas and purify it: the gas is bubbled through the solution before collecting over water. **So how does it work?** It is risky to do things that you don't understand and don't really know why you're doing it – a good student will ask you why and you will look stupid if you don't know. Ammonia is very soluble in water and so it is removed as it passes through the aqueous solution and it also forms a complex with copper(II) ions. The H₂S forms insoluble CuS with copper(II) ions and the PH₃ forms insoluble Cu₃P₂. Thus the impurities are removed by

reaction with copper(II) and the ethyne passes on for collection.

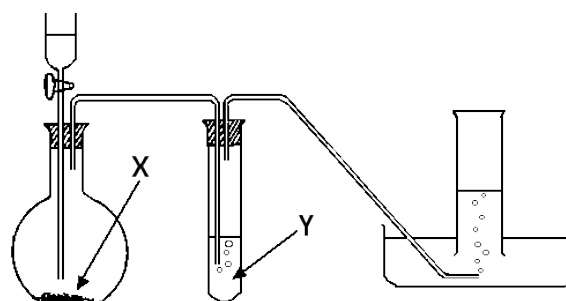


Diagram showing preparation of ethyne. X is calcium carbide and Y is copper(II) sulphate solution.

With copper(I) salts the insoluble and unstable i.e. explosive copper(I) acetylide (ethynide) is formed. This is a red precipitate and is used as a test for ethyne. Silver(I) ethynide is also unstable and explosive and is used as a test for ethyne.

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If you have a query about how some test works or why certain experimental precautions are taken, send me an email. peter.childs@ul.ie

Chemiscellany

Science Fact and Fiction... check out

www.lablit.com

LabLit.com is dedicated to real laboratory culture and to the portrayal and perceptions of that culture – science, scientists and labs – in fiction, the media and across popular culture. The site is intended for non-scientists as well as scientists, and the goal is to inform, entertain and surprise. It is edited by scientist and science writer Dr. Jennifer Rohn, who has several years of research experience in the fields of virology, cell biology, cancer and gene therapy and an incurable addiction to scientist-related literature (or "lab lit", a term she coined in 2001 which is now used widely).

Website launched by UK science teachers

www.howscience.wikidot.com

This will be of interest to anyone concerned about the future of science in schools. The science teachers who have launched this collaborative website have outlined their rationale in trying to redress the failings of science curricula in the UK. Many of their ideas are probably echoed for curricula internationally:

Science teachers rewriting Science education

What makes us different?

- We're teachers. We know, in minute detail, from *daily* experience what is working and what desperately needs fixing. We have a high opinion of the opinion of teachers. (And we want *your* opinion.)
- We passionately believe that the needs of future scientists/doctors/engineers/etc are *radically* different to the needs of future scientifically-literate citizens and that these different needs must be catered for by different courses, not differentiated versions of the same one.
- We believe that providing for these differing needs begins in year 8; year 10 is too late. We are constructing a single-stage, 5-year science curriculum.
- We are following a logical process of bottom-up curriculum design and this collaborative site both documents the progress of and the evidence for consensus ideas.
- We advocate the need for "critical thinking", the importance of appreciating evidence and a proper development of the ideas of what science is and how

science progresses — not the over-simplification that "how science works" has become.

- We value an evidence-based approach to teaching science that rests upon scientifically-valid research. We structure the curriculum to exhibit a logical ordering of concepts that tell coherent 'stories'. Concrete and abstract concepts are recognised and dealt with appropriately.
- We recognise the importance of a properly constructed curriculum in bringing long-term stability to Science education — removing the constant cycle of change that undermines our capacity to teach.

Check out the website for further information and ideas.

Exploding bubble gum kills Ukraine student

Sunday Business Post 10/12/2009

A Ukrainian chemistry student was killed chewing explosive bubble gum that tore off half of his face.

A police spokeswoman said the 25-year-old accidentally dipped the gum into explosives he was using for studies.

She said Vladimir Likhonos mistook the powder for the citric acid he often added to increase the gum's sour taste.

The spokeswoman said Mr Likhonos, from the town of Konotop in north-east Ukraine, blew off his jaw and most of the lower part of his face.

She said on the table where he had been working police found about 100 grammes of the suspected explosive, a powder that resembles citric acid but has yet to be identified.

Picric acid scare in Dublin

Irish Independent 2/10/10

There was a minor bomb scare in Dublin on 1st October when the Army bomb disposal team was called to the Royal College of Surgeons of Ireland's building to deal with an old bottle of picric acid. This chemical is commonly used in biology and medicine for staining. Picric acid can be used as a high explosive but needs a detonator. The bottle was destroyed in a controlled explosion. I wonder how many schools have an old bottle of picric acid lying in a cupboard or on a shelf?

Word-coining in chemistry: the origin of chemical names

#1 Mikhail Tsvet (1872-1919) and colour writing

Mikhail Tsvet first separated pigments from a chlorophyll extract in 1901 on columns packed with calcium carbonate or sucrose, and he found that the pigments separated into coloured bands on the column. He coined the word chromatography in a paper written in 1906.

*"Just like the rays of light in the spectrum, so are the different components of a pigment mixture separated in an orderly way in the calcium carbonate column and thus may be qualitatively and also quantitatively determined in this way. Such a preparation I call a **chromatogram** and the corresponding method, the **chromatographic method**."*

(Ber. Deut. Botan. Ges. 1906, 24, 316)

You may be interested in the series on the origin of chemical names called Chemlingo that I have running in *Education in Chemistry*, which appears in alternate issues. You can access some of these online – google Chemlingo. Here is a link to one of the most recent.

<http://www.rsc.org/Education/EiC/issues/2010Jan/Chemlingo.asp>

PEC

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Updates

Ocean acidification

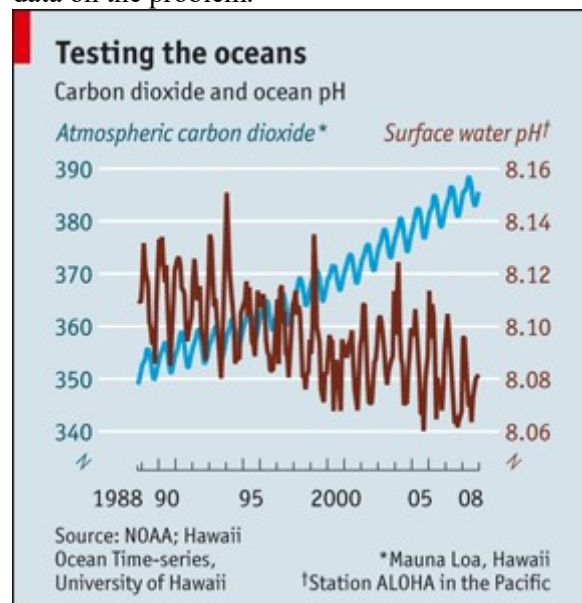
The topic of ocean acidification due to increased levels of CO₂ in the atmosphere was covered in a previous issue. (CinA! #77 Winter 2005, p.9). This is happening irrespective of the debate as to whether increased CO₂ levels are producing climate change. If this was the only effect of increased CO₂ levels then we should do something to reduce them. A recent article in *Scientific American* (August 2010, 303(9), 52-59) looks at this topic with the title 'Threatening ocean life from the inside out'. pH has dropped by 0.12 units since the industrial revolution, an increase of 30% in the ocean's acidity. In the past 20 years it has dropped by 0.04 units (6% increase in acidity) in the Pacific. Lower pH interferes with growth, reproduction, shell formation etc. and has the potential to disrupt marine food chains. The

oceans are the major sink for CO₂ and soak up 30 million tonnes a day!

EPOCA is a 4 year European project to monitor ocean acidification from 2008-2012 and its website provides useful information.

<http://www.epoca-project.eu/>

A recent article in *The Economist*, 'The other carbon dioxide problem', 3/7/10 looks at recent data on the problem.



For more information consult:

<http://www.whoi.edu/OCB-OA/page.do?pid=40276&tid=441&cid=103589&ct=61&article=69327>

The UK's Royal Society published a report on Ocean Acidification in June 2005 and this can be accessed at: <http://royalsociety.org/Ocean-acidification-due-to-increasing-atmospheric-carbon-dioxide/>

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Ireland's pharmachem industry

An encouraging article on the pharmachem industry in Ireland appeared in the 19/7/10 issue of *Chemical & Engineering News*.

The article can be accessed at:

<http://pubs.acs.org/cen/business/88/8829bus1.html>

It also features the Crystallization Cluster industry-education initiative at the University of Limerick.

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Elementary Chemistry



Element 117 made

The last remaining slot in Period 7 of the Periodic Table has been filled with the announcement in April that 6 atoms of element 117 have been made. This was a joint effort between the Oak Ridge National Laboratory in Tennessee, USA, who made a sample of berkelium, and the Joint Institute for Nuclear Research (JINR) in Dubna, Russia who bombarded the berkelium sample with calcium atoms. The Russian laboratory has previously made elements 113, 114, 115, 116 and 118. Element 105, dubnium, was named after their laboratory. The provisional name for the new element is "ununseptium," the Latin word for 117, symbol Uus. Most Periodic Tables are now again out-of-date – see <http://www.ptable.com/> for the latest version. Elements from 113-118 are still awaiting their IUPAC-approved names.

(See

<http://news.sciencemag.org/sciencenow/2010/04/finally-element-117-is-here.html>,

<http://en.wikipedia.org/wiki/Ununseptium>)

Symbol for element 112 is Cn

The name copernicium and the symbol Cn have finally been confirmed in March 2010 for element 112 by IUPAC, chaired by John Corish from TCD. Originally Cp was suggested for the symbol but it has been changed to avoid confusion: Cp is also used for cyclopentadienyl radical and was an old symbol for a lost element.

See the Periodic Table of Videos:

<http://www.youtube.com/watch?v=QHcbQfcwgeY>

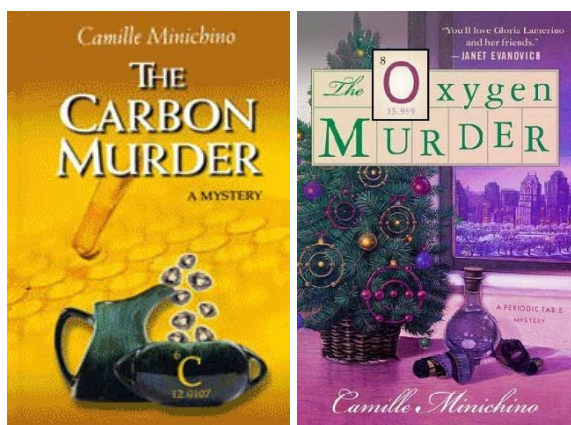
Press release from IUPAC

IUPAC has officially approved the name copernicium, with symbol Cn, for the element of atomic number 112. Priority for the discovery of this element was assigned, in accordance with the agreed criteria, to the Gesellschaft für Schwerionenforschung (GSI) (Center for Heavy Ion Research) in Darmstadt, Germany. The team at GSI proposed the name copernicium which has now been approved by IUPAC. Sigurd Hofmann, leader of the GSI team stated that the intent was to "salute an influential scientist who didn't receive any accolades in his own lifetime, and highlight the link between astronomy and the field of nuclear chemistry."

The name proposed by the Gesellschaft für Schwerionenforschung (GSI) lies within the long tradition of naming elements to honor famous scientists. Nicolaus Copernicus was born on 19 February 1473, in Toruń, Poland and died on 24 May 1543, in Frombork/Frauenburg also in Poland. His work has been of exceptional influence on the philosophical and political thinking of mankind and on the rise of modern science based on experimental results. During his time as a canon of the Cathedral in Frauenburg, Copernicus spent many years developing a conclusive model for complex astronomical observations of the movements of the sun, moon, planets and stars. His work published as "*De revolutionibus orbium coelestium, liber sextus*" in 1543 had very far reaching consequences. Indeed the Copernican model demanded major changes in the view of the world related to astronomy and physical forces and well as having theological and political consequences. The planetary system introduced by Copernicus has been applied to other analogous systems in which objects move under the influence of a force directed towards a common centre. Notably, on a microscopic scale this is the Bohr model of the atom with its nucleus and orbiting electrons.

The Recommendations will be published in the March issue of the IUPAC journal *Pure and Applied Chemistry* and is available online at *Pure Appl. Chem.*, 2010, Vol. 82, No. 3, pp. pp 753-755 (doi: 10.1351/PAC-REC-09-08-20). Priority of claims to the discovery of the element of atomic number 112 was determined by a joint

working party of independent experts drawn from the International Union of Pure and Applied Chemistry (IUPAC) and the International Union of Pure and Applied Physics (IUPAP). The group's report was published in July 2009, *Pure Appl. Chem.*, 2009, Vol. 81, No. 7, pp. 1331-1343 (doi: 10.1351/PAC-REP-08-03-05). The Joint Working Party will issue a second report, dealing with claims for the discovery of elements with atomic numbers in the range 113 to 118, in the near future.



The Periodic Table Mysteries

In this series, Dr. Gloria Lamerino, retired physicist back from California, moves into an apartment above a funeral home in Revere, Massachusetts. When she signs on to help the Police Department in science-related homicides, she doesn't realize she may have 118 cases ahead of her. They only seem to have been published in the USA and are available from amazon.com or from amazon.co.uk from US suppliers. I haven't read any of these so I don't know what they're like, but I like the idea.

Uranium from coal ash

Uranium occurs as a trace metal in coal and ends up in the coal ash, along with other trace elements. An Canadian company Sparton Resources is exploring the idea of using waste ash from some coal-fired power stations near Lincang, in Yunnan province in China, as a source of uranium. The ash is too radioactive to use for other purposes. Although the uranium content of ash is much less (60-300 ppm) than uranium ores currently being mined (1000 ppm), it is much easier to process and the raw material is free. The ash is first leached with acid to extract the metals, purified using charcoal and then the uranium is extracted from solution using ion

exchange resins. The uranium is washed from the resin using ammonium carbonate and precipitated as a mixture of uranium oxides, known as yellow cake. The process should produce uranium at \$77/kg compared to the current price of \$90/kg. The Chinese are interested in the process because it secures a domestic source of uranium, as well as solving an environmental problem. Germanium is another by-product and this is very valuable and will improve the economics of the uranium extraction. The diagram is a schematic from Sparton Resources (see www.spartonres.ca/ for more information).



The renewed growth of the nuclear industry has led to an increased demand for uranium and its price has soared. Other sources of uranium being actively explored include wastes from the fertilizer industry, the tailings from gold and copper mines, and even sea water. The Japanese are considering using seaweed or modified polymer beads to absorb uranium from seawater to concentrate it. The concentration of uranium in seawater is only 3 ppb but the oceans contain 4 billion tonnes, 700 times more than terrestrial resources. Chemists in the USA are trying to develop new ligands that will selectively remove uranium from dilute solutions.

Sources:

See 'Rising from the ashes' *The Economist* 8/4/10

For uranium resources: <http://www.world-nuclear.org/info/inf75.html>

Mara Hvistendahl, 'Coal ash is more radioactive than nuclear waste', *Scientific American*, December 13, 2007

<http://www.scientificamerican.com/article.cfm?id=coal-ash-is-more-radioactive-than-nuclear-waste>

Laboratory gas generators for production of CO₂, H₂ and O₂

Declan Finlayson

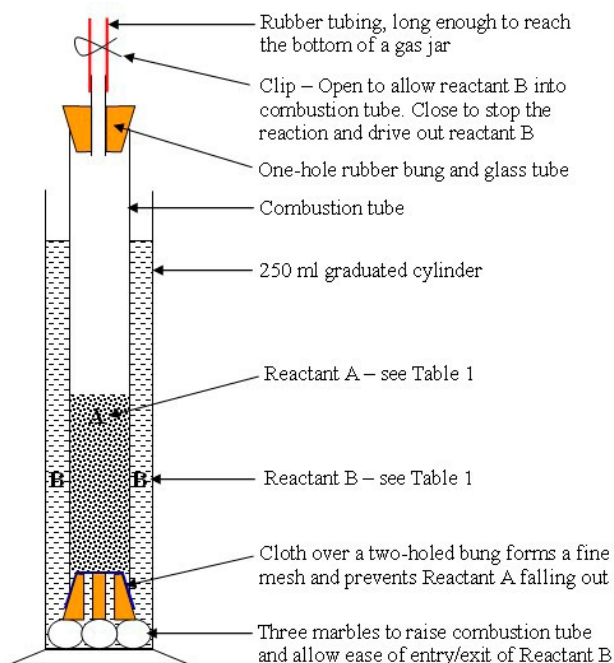
Vocational School, Borris, Co. Carlow djfinlayson@gmail.com

Have you ever needed a sample of oxygen or hydrogen or carbon dioxide in a hurry? Here's a neat way to have these gases always 'on tap' in the laboratory.

It is suitable for reactions that generate a gas by the reaction of a solid with a liquid. It is a variation of Kipp's Apparatus.

The oxygen generator should be protected from light (especially ultra violet) by covering it with black plastic or aluminium foil; this will inhibit the photo-decomposition of hydrogen peroxide.

	Carbon dioxide	Hydrogen	Oxygen
A	Marble Chips	Zinc granules	Immobilised Manganese dioxide*
B	Hydrochloric Acid	Hydrochloric Acid	Hydrogen peroxide



Advantages

- You always have the three gases 'on tap' – ready for immediate use, for teaching or revision
- Very easy to maintain. When Reactant B stops working pour it out and top up with new reactant
- Pure gas is collected immediately
- No waste of resources – can be used to collect a little or a lot of gas
- Students have no difficulty in understanding how it works as they can see Reactant B being pushed out of the combustion tube and the reaction stopping
- Very easy diagram to draw compared to the 'conventional' one.
- A second set might be made up for student use.
- If the apparatus is set up for permanent use then it should be stored in the fume cupboard.

How it Works

1. Open the clip. This allows Reactant B into the combustion tube.
2. Reactants A and B mix and react producing the gas.
3. The gas is emitted through the rubber tube and collected in the appropriate manner.
4. Close the clip when sufficient gas has been collected.
5. Gas pressure builds up in the combustion tube and forces reactant B down and out of the tube. The reaction stops.

Declan Finlayson teaches in Vocational School, Borris, Co. Carlow.

*See the following article for notes on Oxygen preparation.

□

Notes on the Preparation of Oxygen

Declan Finlayson

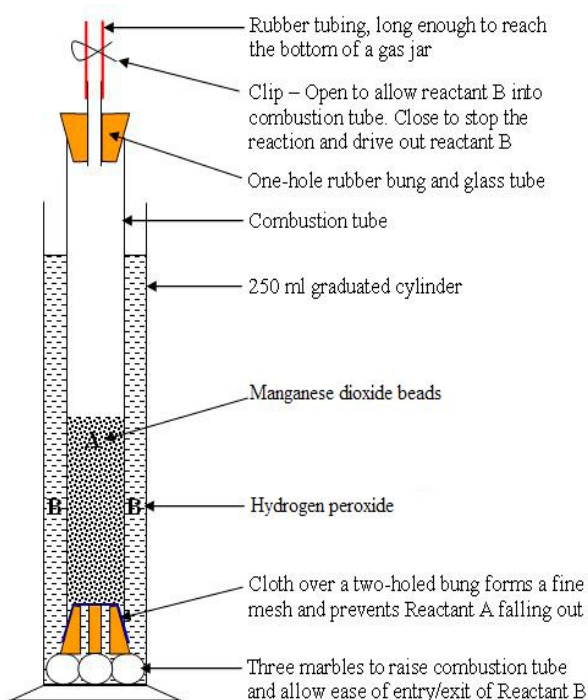
Vocational School, Borris, Co. Carlow djfinlayson@gmail.com]

The method we use to teach the preparation of oxygen works. It is messy. The glassware used is difficult to clean. Conical and Buchner flasks used previously can be very obvious.

We teach that MnO_2 is a catalyst and
(a) does not get used up in the reaction and
(b) it can be reused.

Our traditional method of teaching does not allow us to show either of the above. With the method outlined below it is possible to weigh the MnO_2 at the start of the experiment and again the following day when it has dried. It is also possible to reuse the MnO_2 frequently.

The method involves trapping MnO_2 in beads of gel so that it will react with, but not mix with, the hydrogen peroxide. This makes it easy to recover the MnO_2 at the end of the experiment and it is reusable.



Preparation of the immobilised Manganese dioxide

1. Add 0.4 g of sodium alginate to 10 ml of deionised water in a 100 ml beaker. Mix thoroughly.
2. Mix 2 g of MnO_2 in 10 ml of deionised water in a second 100 ml beaker.
3. Prepare 100 ml of a 1.4 % calcium chloride solution in a 500 ml beaker.
4. Add the MnO_2 suspension to the sodium alginate solution and mix thoroughly with a glass rod.
5. Draw all of the mixture into a 20 ml syringe.
6. Clamp the syringe onto a retort stand at a height of 10 cm above the calcium chloride solution.
7. Remove the plunger. The syringe contents will slowly drip into the calcium chloride solution forming perfect beads.
8. Leave the beads to harden for at least 10 minutes.
9. Filter the beads through a sieve and flush with copious amounts of water.
10. You should have sufficient beads for at least one Gas Generator.

The immobilised beads of MnO_2 may be used in the traditional preparation apparatus or can be used in the Gas Generator.

The Gas Generator setup works well as you can control the amount of Oxygen gas given off – a little or a lot. It can be left set up in the fume cupboard.

Note: Only add the H_2O_2 when it is needed as it will deteriorate on exposure to light.

□

2010 Anniversaries

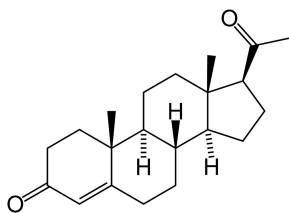
The Contraceptive Pill at 50



The birth control pill was approved in the USA in the Food and Drug Administration (FDA) on 9th May 1960 (see Time, 3/5/10, Nancy Gibbs, 'Love, Sex, Freedom and the Paradox of the Pill', available at:

<http://www.time.com/time/health/article/0,8599,1983712,00.html>)

The Economist in 1999 named 'The Pill' as the most important scientific advance of the century, as it gave for the first time women reliable control over their fertility. The active ingredient, a synthetic progesterone (progestin norethindrone) – a sex hormone, was first synthesised from wild yams at a laboratory in Mexico in 1951 by a team of chemists led by Carl Djerassi. The hormone blocks ovulation and if taken regularly prevents pregnancy as also menstruation.

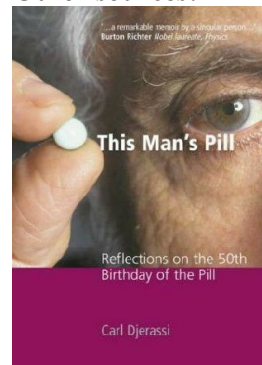


Progesterone

'The Pill' was first tested in Puerto Rico in 1956 and in 1959 the US company G.D. Searle applied to the FDA for approval to market 'The Pill' as Enovid. It was approved on 9th May 1960 and the rest is history. 100 million currently take some form of the Pill every month and as well as preventing millions of pregnancies over the past 50 years it has also almost certainly prevented hundreds of thousands of abortions. The early version of Enovid caused many side effects due to the high concentrations of hormones – the current

version contains 25-35 µg compared to 150 µg in the first pills.

Other sources:

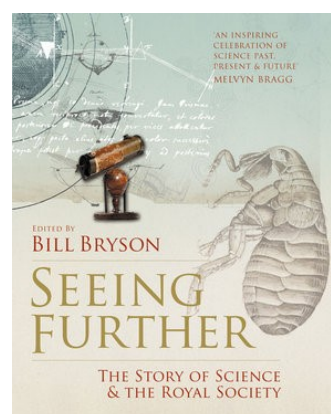


Carl Djerassi, *One man's pill*, OUP 2001

<http://www.irishtimes.com/newspaper/weekend/2010/0501/1224269451339.html>

Royal Society turns 350

"On November 30th 1660 a dozen men gathered to hear the young Christopher Wren give a lecture on astronomy. In the discussion that followed they decided to form a society for the study of the new and still controversial Experimental Philosophy. Two years later Charles II made it his Royal Society and in the 350 years since it was founded, its Fellows have given us gravity, evolution, the electron, the double helix, the internet and a large part of the modern world. In 2010 we celebrate 350 years of scientific brilliance and fearless doubt." <http://350.royalsociety.org/>



Bill Bryson has edited a book 'Seeing Further' to celebrate the 350th anniversary of the Royal Society.



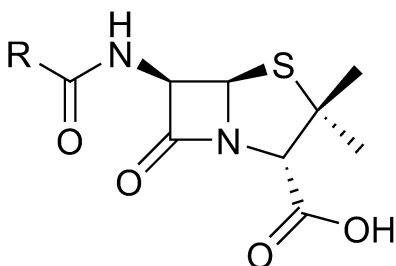
The Royal Mail issued a set of ten first class stamps on 25th. February 2010 to mark the anniversary, featuring amongst others Robert Boyle.



2010 is the 20th. anniversary of the Hubble Telescope and the 10th. anniversary of the human genome (see Francis Collins' blog at <http://www.scientificamerican.com/blog/post.cfm?id=a-genome-story-10th-anniversary-com-2010-06-25>), and the 50th. anniversary of the laser.

It is the 100th anniversary of the birth of Nobel laureate Dorothy Hodgkin, also featured on the Royal Mail set of stamps above. (http://en.wikipedia.org/wiki/Dorothy_Hodgkin)

Discovery of penicillin



Structure of penicillin

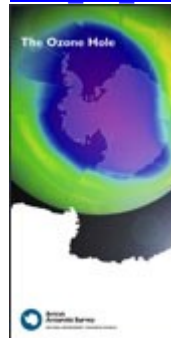
2010 is the 70th. anniversary of the discovery of penicillin by Sir Alexander Fleming (Nobel Prize

1945).http://en.wikipedia.org/wiki/Alexander_Fleming

The ozone hole

This year marks the 25th. anniversary of the discovery of the ozone hole over Antarctica by scientists from the British Antarctic Survey (http://www.antarctica.ac.uk/press/press_releases/press_release.php?id=1192). They have produced a new booklet on the The Ozone Hole.

http://www.antarctica.ac.uk/about_bas/publications/bas_the_ozone_hole.pdf

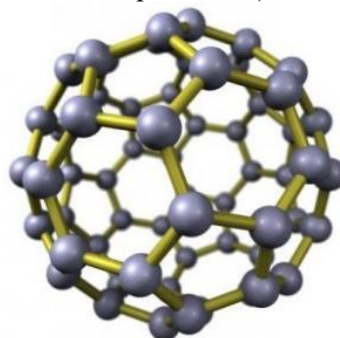


You can read the original Nature letter here:

<http://www.nature.com/nature/journal/v315/n6016/pdf/315207a0.pdf> and three scientists won the Nobel Prize for Chemistry in 1995 for their work on ozone depletion. (http://nobelprize.org/nobel_prizes/chemistry/laureates/1995/).

Buckyballs discovered 25 years ago

1985 also saw the discovery of buckyballs (<http://www.nature.com/physics/looking-back/kroto/index.html>; <http://buckyball.smalley.rice.edu/>). They won the Nobel Prize for Chemistry in 1996. (http://nobelprize.org/nobel_prizes/chemistry/laureates/1996/press.html)



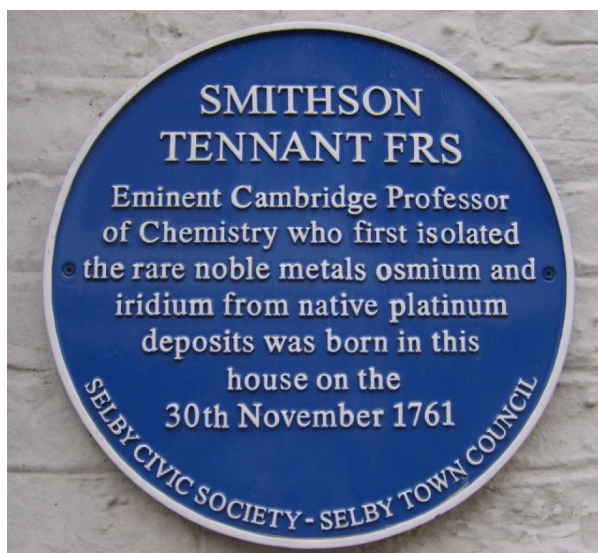
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The Element Makers: 9

Smithson Tennant 30th November 1761 – 22nd February 1815

Adrian Ryder tutorajr@gmail.com

Smithson Tennant was the only child of the Rev. Calvert Tennant, younger son of a respectable family in Wensleydale near Richmond, a Fellow of St. John's College, Cambridge, and Mary Daunt, daughter of a surgeon in Selby. He was born in Selby, Yorkshire on the 30th of November 1761. His father had the living of Great Warley, Essex in 1758 but on his marriage, in 1759, moved to his wife's home in Selby as the vicar. Here, bent on bringing up the boy in the same line as himself, Calvert began to teach him Greek at the tender age of five. However the Rev. Calvert died in 1772 and then Smithson attended various country grammar schools for the next ten years. Before this schooling ended Smithson was to suffer the loss of his mother, who, while out riding with him, was thrown from her horse and died instantly, a fate that Smithson himself was to undergo later. Mary's father had died in 1758 and her mother in 1770 and as Mary had been the sole surviving child Tennant found himself with no parents, grandparents or siblings but the sole heir to the Tennant and Daunt estates.



Historic plaque marking the birthplace of Smithson Tennant in Selby, Yorkshire

Smithson was to be a retiring and unsociable student in the various schools he attended and was regarded as indolent with regard to schoolwork. However, he had a passion for reading, especially

books on science, and gleefully repeated experiments described in them rather than being involved in the more usual boyish activities.

While at school in Tadcaster, Yorkshire, he attended a course of lectures given by Mr. Walker on experimental Philosophy and while in his final school at this time, Dr. Croft's in Beverly, he spent much time in the excellent library there. Here he carefully read Newton's *Treatise on Optics*.

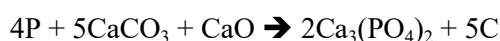
Tennant's interest in Science led him to apply for a position at the laboratory of the famous Dr. Joseph Priestley but found himself rejected as Priestley could not be bothered with a mere novice. This rebuff led Smithson to return to the study of the classics begun by his father and by his twentieth year he had mastered both Greek and Latin. Dr. Joseph Priestley is famous for his discovery of the element oxygen, for his invention of soda-water, for his refusal to accept the fall of the phlogiston theory and for his support of the French Revolution. This resulted in a mob burning down his house and church in 1791 forcing him to flee to America.)

In 1781 Tennant went north to Edinburgh to pursue a degree in Physic (medicine.) Here he attended lectures on anatomy, surgery, chemistry and material medica. While here he followed the chemical lectures given by Dr. Black, and notebooks of his based on Joseph Black's lectures still exist in the archives of Cambridge University. Tennant moved south to Christ's College, Cambridge in the following year. Here he studied mathematics but spent more time with chemistry and botany. At this time he developed a method of economising the amount of fuel used in distillation but did not formally report on his method until some 30 years later. Dr. Joseph Black is known for his work on latent and specific heats and for his discovery of carbon dioxide.

In the summer of 1783 Tennant toured the Low Countries with Busick Harwood, later Sir Busick. Harwood was noted as an expert on the sense of smell of fish and a noted teller of bad stories. He

was to become Professor of Anatomy at Downing College, Cambridge. The following summer saw Tennant travel to Denmark and Sweden where he met with Carl Wilhelm Scheele (1742-1786), who impressed him with the simplicity of the apparatus used by him in his researches, and Johann Gahn (1745-1818), from whom he learned the techniques of the blowpipe.

Returning from his travels with many mineral specimens and new chemical techniques, Tennant proudly demonstrated these to his Cambridge friends and in January 1785 was admitted as a Fellow of the Royal Society. Tennant was rather slow to send communications to the Society and it was only in 1791 that he made his first communication; this was on his method of extracting carbon from carbon dioxide trapped in calcium carbonate, using phosphorus.



The summer of 1785 saw Tennant travel in France, Holland and the Netherlands during which time he met with Claude Louis Berthollet (1748-1822) and Jean Claude Delameth rie (1743-1817), using the opportunity to study their chemical methodology.

In 1788 Tennant received his MB degree and left Cambridge for London where he took chambers at 4 Garden Court, Temple, just east of Somerset House, which was then the home of the Royal Society. He was to maintain this as his principal residence for the rest of his life.

In 1792 Tennant made another visit to the continent, arriving in Paris to find the city in revolutionary turmoil and he had the good sense, on August 9th, to proceed swiftly out of Paris to Lausanne in Switzerland, where he had conversations with the Edward Gibbon, the historian. He then went on to Rome and Florence where he viewed the objects of art and met with the scientists of the day. August 10th saw the Parisian mob besiege the Tuileries Palace, heralding the end of the French monarchy and the beheading of the king, Louis XVI and many of the nobility. Tennant returned by way of Germany where he was unimpressed by the state of the sciences there, finding them unwilling to come to grips with the latest changes in chemical theory.

Back in England Tennant lived quietly, as his health was deteriorating, and on the advice of his doctor began his custom of riding daily, this being at a fixed time no matter what work he was doing. In 1796 he was awarded his Doctorate in Physic begun in Edinburgh some fifteen years previously. He now began to practice medicine but quickly found that he had no heart for it and so discarded it for more chemical experimentation.



Small African raw diamonds, the black spots on some being unchanged carbon.(Photo Author)

In 1796 Tennant reported his findings on the combustion of diamond to the Royal Society, showing that the weight of carbon dioxide released from the diamond was exactly the same as that released from an equal weight of carbon.

With regard to the above, a neighbour and close friend of Tennant's at Garden Court, Mr. John Whishew had this to say of him:

"it is worthy of remark, that Mr. Tennant had ascertained the true nature of the diamond some years before he made the above communication to the Royal Society. In conversing about this time with a particular friend he happened to mention the fact of this discovery. His friend, who had often lamented Mr. T's habits of procrastination, urged him to lose no time in making his experiment public; and it was the consequence of these entreaties that the paper on the diamond was produced."

During one of his rides Tennant came across farmers who were experimenting with new crops - rape-seed and root vegetables. Tennant decided that here were topics that would gratify his imagination. He first purchased seven acres near Epworth in Lincolnshire and then a further 500 acres, but later sold off 335 of these, built himself a summer house and became a gentleman farmer. He was to spend his summers here over the years to come, but always returned to London for the cooler seasons of the year.

In 1799 Tennant, following complaints that some dolomitic limestones were in fact detrimental to good crop growth, allowed part of his fields to be limed with the dolomite and the rest with the calcium limestone. The results were impressive and he set out to investigate the chemistry of both. His experiments showed that dolomite, a magnesian limestone, was a compound rather than a mixture as previously supposed.

In 1802 Tennant, while performing experiments on crude platina, discovered in it a singular dark powder in which he discovered two new metals. These he named iridium and osmium. He reported on the findings in the *Philosophical Transactions of the Royal Society* on June 21st 1804.

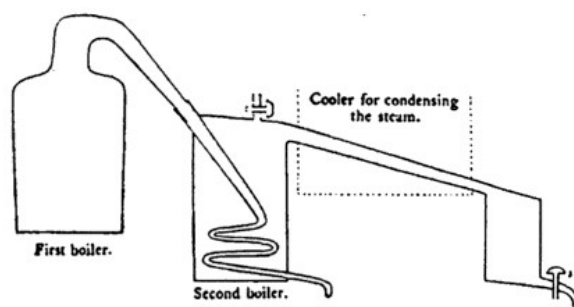
As a result of his various findings the Royal Society awarded Tennant the Copley Medal in November 1804.

Tennant made two visits to Ireland, in 1805 and 1806, by way of Scotland. Although Tennant was an inveterate traveller he suffered greatly from sea-sickness and kept his sea journey to the minimum, and so to visit Ireland he took the shortest sea journey, probably from Stranraer to Larne. Tennant now spent time in visiting the 'sights' such as the Giant's Causeway and with his interest in agriculture was on the lookout for differences between Irish and English farming methodology. He also took note of the manufactories and general state of the country. With regard to farming he noticed that methods to enrich the soil were poorly employed and innovation was absent. With regard to the country itself Tennant noted the difference between the teeming masses of people in Ireland as compared to the small number then to be seen in Scotland. Tennant found that the books used in education were of a narrow and illiberal frame and for this he laid the blame at the Catholic clergy who, he felt, would benefit greatly from imbibing a portion of the spirit of Protestantism.

Tennant was now a 'name' in the English science scene and he began having open evenings at his home, where visitors were entertained with a variety of scientific curiosities. As a result of these he was invited to give a regular course of lectures in 1812 to the public of both sexes which were said to have highly delighted the audiences.

In 1813 he lectured to the Geological Society on his analysis of a volcanic substance, containing boracic acid, from the Lipari islands. This may have been the catalyst which saw him appointed Professor of Chemistry in the University of Cambridge.

1814 Tennant delivered a paper to the Royal Society on the easiest method of isolating potassium and another on the economy of heat in distillation by heating a second boiler from the condensation of the first, the method worked out by him in Edinburgh in 1781-1782.



Tennant's economical distillation unit

During this year Tennant was on a Royal Society commission dealing with the possible dangers of the proposed introduction of gas lights throughout the city. Here, working with his long time friend and collaborator Dr. William Hyde Wollaston (there will be more about this in a later article), he found that gas contained in a small tube did not ignite. This finding was not formally reported for some years and the principle was independently found by Sir Humphry Davy, who had been abroad at the time, and was utilized in his famous Davy Lamp.

In September of 1814 Tennant again went to France:

"being impatient to observe the changes that an eventful interval of twenty years had produced in that highly interesting country".

Arriving in Calais on the 18th of February 1815, he continued on the 20th with his friend Baron Bulow, of the Prussian Embassy to London, to Boulogne to embark for home on the 22nd.

However, contrary winds on the day forced the boat on which he was to travel to remain for a subsequent tide. Baron Bulow and Tennant set off on horseback to view Bonaparte's Pillar which lay about a league off. While returning they digressed from the road to have a look at a small

fort. While crossing the drawbridge into the fort a bolt gave way and the pair was thrown from their mounts. The Baron suffered only a loss to his dignity but Tennant struck his head, fracturing it. His horse landed on top of him complicating matters and he died within an hour. Tennant was buried in the public cemetery of Boulogne, and the funeral was attended by most of the English residents of that town.

So ended the life of a first rate chemist who had read papers on eight different subjects to the Royal Society but never pushed himself forward, delighting rather in being able to pick and choose, for experimentation, those topics that struck his fancy. Tennant would not sit for any portrait and so no picture of him is to be found. However he is said to have been tall and slender with a thin face and light complexion, and several persons saw a close resemblance to the well known portraits of Locke. Tennant never married and so his line ended with him.

References

Sketches of the Royal Society and Royal Society Club, Sect. X, 1849, p 156-161

Smithson Tennant: the Innovative and eccentric eighth Professor of Chemistry, Melvyn Usselman, Dept. of Chemistry, University of Western Ontario.

Miscellaneous Works of the Late Thomas Young M.D., F.R.S. &c; John Murray London 1855.

Annals of Philosophy, Thomas Thomson, Science 1845

See also:

Smithson Tennant: meteorites and the final trip to France, Mark, I. Grossman, *Notes and records of the Royal Society*, September 2007 vol. 61 no. 3 265-283, available at:

<http://rsnr.royalsocietypublishing.org/content/61/3/265.full>

Bicentenary of Four Platinum Group Metals

PART II: OSMIUM AND IRIDIUM – EVENTS SURROUNDING THEIR DISCOVERIES, W. P. Griffith, *Platinum Metals Review*, 48 (4) October 2004, 182-189, available at:

<http://www.platinummetalsreview.com/dynamic/article/view/48-4-182-189>

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Unexpected chemists #1

Sometimes one comes across people who are famous in one field of study or achievement, but who also were interested in chemistry as a sideline. One such person was Sir Edward Elgar, the English composer, famous for the Pomp and Circumstance marches, his cello concerto and many other works. Elgar had a well-equipped home laboratory and patented a machine for dispensing hydrogen sulphide, the 'Elgar S.H. Apparatus'. Here is a contemporary account of Elgar's chemistry.

"One day he made a phosphoric concoction which, when dry, would "go off" by spontaneous combustion. The amusement was to smear it on a piece of blotting paper and then wait breathlessly for the catastrophe. One day he made too much paste; and, when his music called him and he wanted to go back to the house, he clapped the whole of it into a gallipot, covered it up, and dumped it into the water-butt, thinking it would be safe there.

Just as he was getting on famously, writing in horn and trumpet parts, and mapping out woodwind, a sudden and unexpected crash, as of all the percussion in all the orchestras on earth, shook the room, followed by the "rushing mighty sound" he had already anticipated in 'The Kingdom'. The water-butt had blown up: the hoops were rent: the staves flew in all directions; and the liberated water went down the drive in a solid wall.

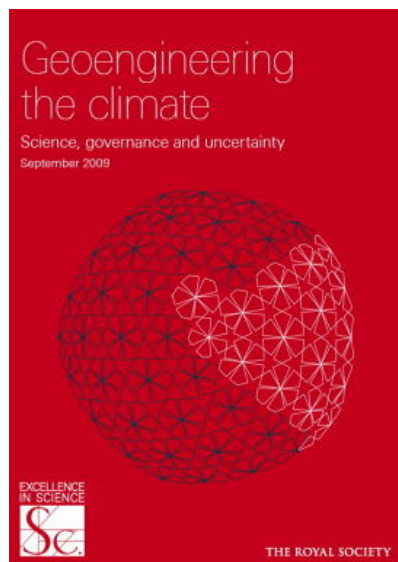
Silence reigned for a few seconds. Then all the dogs in Herefordshire gave tongue; and all the doors and windows opened. After a moment's thought, Edward lit his pipe and strolled down to the gate, andante tranquillo, as if nothing had happened and the ruined water-butt and the demolished flower-beds were pre-historic features of the landscape. A neighbour, peeping out of his gate, called out, "Did you hear that noise sir: it sounded like an explosion?" "Yes," said Sir Edward, "I heard it: where was it?" The neighbour shook his head; and the incident was closed."

W. H. Reed describing Sir Edward Elgar (1857-1934), English composer and amateur chemist

Climate Change: Geoengineering

Stop emitting CO₂ or geoengineering could be our only hope

Royal Society Press release 28/8/09



The future of the Earth could rest on potentially dangerous and unproven geoengineering technologies unless emissions of carbon dioxide can be greatly reduced, the latest Royal Society report has found.

Geoengineering the climate: Science, governance and uncertainty (published today, 1st September, by the Royal Society) found that unless future efforts to reduce greenhouse gas emissions are much more successful than they have been so far, additional action in the form of geoengineering will be necessary if we are to cool the planet. Geoengineering technologies were found to be very likely to be technically possible and some were considered to be potentially useful to augment the continuing efforts to mitigate climate change by reducing emissions. However, the report identified major uncertainties regarding their effectiveness, costs and environmental impacts.

Professor John Shepherd, who chaired the Royal Society's geoengineering study(2), said, "It is an unpalatable truth that unless we can succeed in greatly reducing CO₂ emissions we are headed for a very uncomfortable and challenging climate future, and geoengineering will be the only option left to limit further temperature increases. Our

research found that some geoengineering techniques could have serious unintended and detrimental effects on many people and ecosystems - yet we are still failing to take the only action that will prevent us from having to rely on them. Geoengineering and its consequences are the price we may have to pay for failure to act on climate change."

The report assesses the two main kinds of geoengineering techniques Carbon Dioxide Removal (CDR) and Solar Radiation Management (SRM). CDR techniques address the root of the problem rising CO₂ and so have fewer uncertainties and risks, as they work to return the Earth to a more normal state. They are therefore considered preferable to SRM techniques, but none has yet been demonstrated to be effective at an affordable cost, with acceptable environmental impacts, and they only work to reduce temperatures over very long timescales.

SRM techniques act by reflecting the sun's energy away from Earth, meaning they lower temperatures rapidly, but do not affect CO₂ levels. They therefore fail to address the wider effects of rising CO₂, such as ocean acidification, and would need to be deployed for a very long time. Although they are relatively cheap to deploy, there are considerable uncertainties about their regional consequences, and they only reduce some, but not all, of the effects of climate change, while possibly creating other problems. The report concludes that SRM techniques could be useful if a threshold is reached where action to reduce temperatures must be taken rapidly, but that they are not an alternative to emissions reductions or CDR techniques.

Professor Shepherd added, "None of the geoengineering technologies so far suggested is a magic bullet, and all have risks and uncertainties associated with them. It is essential that we strive to cut emissions now, but we must also face the very real possibility that we will fail. If "Plan B" is to be an option in the future, considerable research and development of the different methods, their environmental impacts and governance issues must be undertaken now. Used irresponsibly or without regard for possible side effects, geoengineering could have catastrophic

consequences similar to those of climate change itself. We must ensure that a governance framework is in place to prevent this."

Of the CDR techniques assessed, the following were considered to have most useful potential:

- **CO₂ capture from ambient air** this would be the preferred method of geoengineering, as it effectively reverses the cause of climate change. At this stage no cost-effective methods have yet been demonstrated and much more research and development is needed.

- **Enhanced weathering** this technique, which utilises naturally occurring reactions of CO₂ from the air with rocks and minerals, was identified as a prospective longer-term option. However more research is needed to find cost-effective methods and to understand the wider environmental implications.

- **Land use and afforestation** the report found that land use management could and should play a small but significant role in reducing the growth of atmospheric CO₂ concentrations. However the scope for applying this technique would be limited by land use conflicts, and all the competing demands for land must be considered when assessing the potential for afforestation and reforestation.

Should temperatures rise to such a level where more rapid action needs to be taken, the following SRM techniques were considered to have most potential:

- **Stratospheric aerosols** these were found to be feasible, and previous volcanic eruptions have effectively provided short-term preliminary case studies of the potential effectiveness of this method. The cost was assessed as likely to be relatively low and the timescale of action short. However, there are some serious questions over adverse effects, particularly depletion of stratospheric ozone.

- **Space-based methods** these were considered to be a potential SRM technique for long-term use, if the major problems of implementation and maintenance could be solved. At present the techniques remain prohibitively expensive, complex and would be slow to implement.

- **Cloud albedo approaches** (eg. cloud ships) the effects would be localised and the impacts on regional weather patterns and ocean currents are of considerable concern but are not well understood. The feasibility and effectiveness of the technique is uncertain. A great deal more research would be needed before this technique could be seriously considered.

The following techniques were considered to have lower potential:

- **Biochar** (CDR technique) the report identified significant doubts relating to the potential scope, effectiveness and safety of this technique and recommended that substantial research would be required before it could be considered for eligibility for UN carbon credits. (see p.33 below)

- **Ocean fertilisation** (CDR technique) the report found that this technique had not been proved to be effective and had high potential for unintended and undesirable ecological side effects.

- **Surface albedo approaches** (SRM technique, including white roof methods, reflective crops and desert reflectors) these were found to be ineffective, expensive and, in some cases, likely to have serious impacts on local and regional weather patterns.

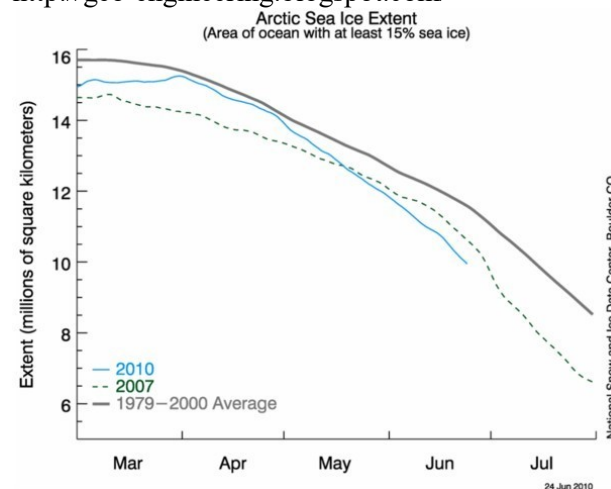
You can read the full report on line at:

<http://royalsociety.org/displaypagedoc.asp?id=35151>

□

Arctic sea ice: latest news

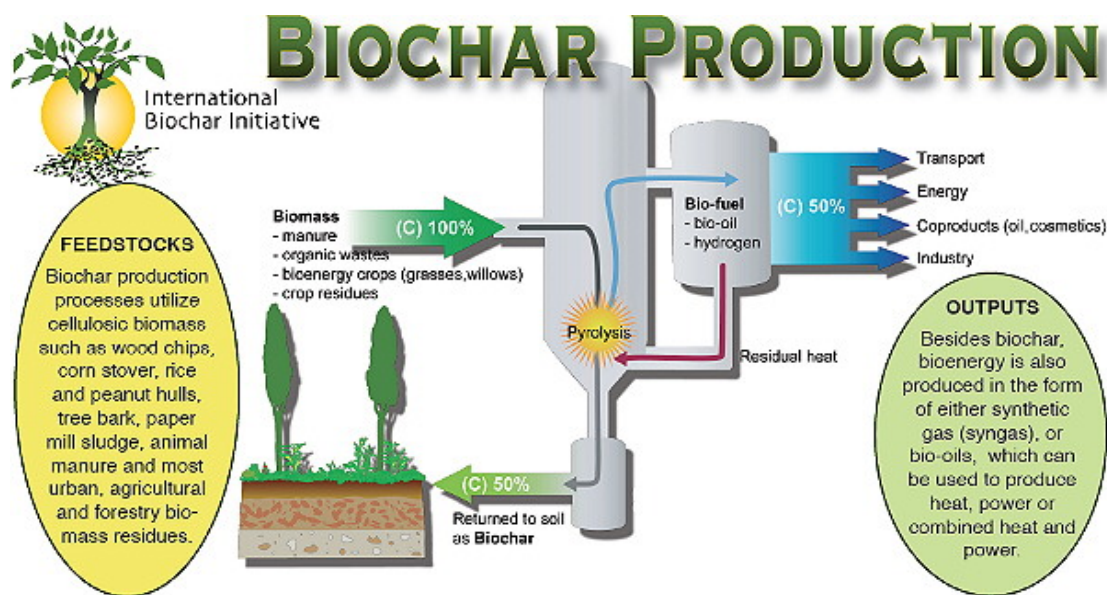
<http://geo-engineering.blogspot.com/>



Biochar - a new name for charcoal and a possible environmental panacea



http://www.gutenberg.org/files/16728/16728-h/images/image_09.jpg



<http://www.science.unsw.edu.au/uploads/28174/ufiles/news/BIOCHAR2.JPG>

Charcoal is made by the pyrolysis of wood in the absence of air - volatile chemicals are distilled off leaving charcoal, a porous form of carbon, behind. This was the fuel that powered the early iron industry until it was replaced by coke, obtained from coal, in the early 1700s. Since charcoal is obtained from wood it is carbon neutral - wood is fixed carbon derived from atmospheric CO₂, and if it is burnt there is no net increase in CO₂ levels. However, if we stop at charcoal nearly all the carbon in CO₂ is locked up in the charcoal, until

this is burnt or decays. Charcoal has been used a soil conditioner and fertiliser, for example in the Amazon region, where the black carbon-enriched soils are known as *terra preta*, and while improving soil fertility the charcoal itself only breaks down very slowly over hundreds of years.

Thus a 'new' way of removing CO₂ from the atmosphere is to grow biomass and then convert it into biochar, which is then buried in soil. It is really an old solution to a new problem. This

sounds great but there is a catch. If biomass is grown specifically to produce biochar, then this involves clearing land, disturbing the soil and then planting and harvesting crops, which can produce more emissions of greenhouse gases than are harvested and fixed in biochar. The idea is best suited to waste biomass, which otherwise would be burnt or just left to rot, rather than to new biomass grown specifically for the purpose. It can be used on the waste produced from other biofuel processes, rather than burning them or putting them in landfill. In other words, biochar can be **part** of the solution but is not a universal panacea for slowing climate change. In the process of producing biochar some of the energy needed comes from the process itself, as the gas and liquids produced can be burnt as fuel - only part of the energy in the biomass can be recovered and much of it is locked up the biochar. A pilot plant in Germany converts sewage sludge into biochar. Other people are turning animal wastes into biochar. The buried carbon also improves the soil so this is an additional benefit. The diagram below outlines the process of producing biochar.

Diary

2010

Variety in Chemistry Education (ViCE)

Sept. 2-3
Loughborough University,
Loughborough, UK

<http://www.heacademy.ac.uk/physsci/events/detail/2010/vi-ce-2010>

SMEC10

**Inquiry-based learning:
Facilitating authentic
learning experiences in
science and mathematics**

Sept. 16-17th
Dublin, DCU
<http://www.dcu.ie/smec/2010/index.shtml>

29th. ChemEd-Ireland

October 9th
Dublin, DIT
Claire.mcdonnell@dit.ie

National Science Week
Nov. 7 -14th

2011



International Year of **CHEMISTRY** 2011

ASE Annual Conference

Jan. 5-8
University of Reading
<http://www.ase.org.uk/>

47th BT Young Scientist and Technology Exhibition

Jan. 12-15
RDS, Dublin
<http://www.btyoungscientist.ie/>

ISTA Annual Conference

8-10 April
Thurles
www.ista.ie



July 24-28, 2011

ChemEd 2011

July 24-28
Western Michigan University,
Kalamazoo, USA
www.semcto.com/chemEd2011.html

9th. ESERA

September 5th - 9th 2011
Lyon, FRANCE
<http://www.esera2011.fr/>

30th. ChemEd-Ireland

October 22nd
UCC, Cork
d.kennedy@ucc.ie

2012

22nd ICCE/11th. ECRICE
Rome

Sources and weblinks:

[http://www.garnautreview.org.au/CA25734E0016A131/WebObj/d07119990GeneralSubmission-DepartmentofAgricultureandFoodWA-Lehmann_2006_char_review/\\$File/d07%20119990%20General%20Submission%20-%20Department%20of%20Agriculture%20and%20Food%20WA%20%20-%20Lehmann_2006_char_review.pdf](http://www.garnautreview.org.au/CA25734E0016A131/WebObj/d07119990GeneralSubmission-DepartmentofAgricultureandFoodWA-Lehmann_2006_char_review/$File/d07%20119990%20General%20Submission%20-%20Department%20of%20Agriculture%20and%20Food%20WA%20%20-%20Lehmann_2006_char_review.pdf)

<http://news.bbc.co.uk/2/hi/science/nature/7924373.stm>

<http://www.time.com/time/magazine/article/0,9171,1864279,00.html>

<http://www.ehponline.org/members/2009/117-2/EHP117pa70PDF.PDF>

<http://www.biochar-international.org/>

Classical Chemical Quotes #4

Justus von Liebig
(May 12, 1803 – April 18, 1873)



**The secret of all those who make discoveries is
that they regard nothing as impossible.**
Justus von Liebig

Conference Reports

Demonstration course at UL a flaming success!

4th Chemistry Demonstration Workshop

14 – 17th June 2010, University of Limerick

Peter E. Childs & Sarah Hayes

Department of Chemical and Environmental Sciences, University of Limerick and the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL), University of Limerick peter.childs@ul.ie and sarah.hayes@ul.ie

It was a flaming June in more senses than one in Limerick. In the third week of June the 4th Chemistry Demonstration Workshop for chemistry teachers and trainee teachers ran for three and a half days, organised by Peter Childs and Sarah Hayes, and it ran in blazing sunshine. There are few nicer places to be in on a June evening than the leafy banks of the Shannon.

There were plenty of flames, flashes and bangs in the laboratory as teachers practised putting the excitement back into science teaching. The course showed teachers how to integrate simple chemistry demonstrations into their JC and LC lessons, and how to put on a science magic show themselves.



The course participants and presenters - Sarah Hayes second from left, Peter Childs far right. (Photo: Press 22/University of Limerick)

The course opened on Monday the 14th of June with the arrival of the 13 course participants to the Department of Chemical and Environmental Sciences at the University of Limerick. After a nice lunch in the Paddocks and spending some time getting to know one another we moved into the laboratory. The first sessions were illustrated talks on 'Why do demonstrations?' and 'Safety in doing demonstrations.' Instead of taking our afternoon coffee break back over at the Paddocks the Department of Chemical and Environmental

Sciences (CES Department) had a delicious surprise in store.



Edith Kearney and Patrice Mulvihill watch Bridget Hogan and Leo Kirby (CES Department) as they whip up some ice-cream. (Photo: Sarah Hayes)

We all watched as Bridget Hogan and Leo Kirby whipped up delicious ice-cream in an instant, using liquid nitrogen, something made famous by Heston Blumenthal. It was the perfect refresher after the heat of the lab and the scorching weather outside! Then it was back to the lab to see how a real 'Science Magic Show' operates. The show was presented by Áine Regan and Anne O'Dwyer, both post-graduate students in the CES Department.

Participants got a thick file of material to sort out and review, plus access to chemistry demonstration books. Their homework was to look for interesting demonstrations from the various resources that they hadn't done before. The second day of the workshop started by following the circuit style set-up we had trialled last year. A series of demonstrations were set up that have been used in UL's Science Magic Shows and the teachers got a chance to try out all of them and add them to their own portfolio of demonstrations. This was great as it allowed the

teachers to build up their confidence through trying out tried-and-tested demonstrations that they had already seen in the 'Science Magic Show'. It also meant that all participants started off with a basic set of chemical demonstrations that they could do and take away to use in their schools or science magic shows.



Edith Kearney shows us how to make 'cannon fire'. (Photo: Press 22/University of Limerick)

After the circuit teachers were encouraged to try out some demonstrations that they would like to do from the course materials provided, their new Royal Society of Chemistry Classic Chemistry Demonstrations book or from the internet. Once these demonstrations were assessed for safety and availability of materials, the teachers were good to go and this approach allowed for a large number of demonstrations to be tried out and shared among the group.



Anthony Sweeney and Susan Burke show some real 'flashy' paper. (Photo: Press 22/University of Limerick)

The guiding principle behind this workshop is to use the first two days to get the participants really comfortable with doing demonstrations (no matter how flaming or explosive they are), and to then allow them to use their new found confidence to research and try out new demonstrations in a safe

environment. The goal is to build confidence and expertise based on knowledge and an awareness of safety, and learning from mistakes. You can do spectacular demonstrations if you know what you're doing and take the proper precautions. We also want teachers by the end of the course to have the confidence and skills to take a demonstration from the literature and to do it safely themselves.

Michael Hennessy from SLSS came in on the third day of the course to give a session on using the SLSS website and other IT based chemical resources in the classroom. This session was given in the new IT suite in the C.E.S. Department.

Once this session was over, it was back to the grindstone and the teachers continued trying out new demonstrations in the laboratory, while preparing for their own 'Science Magic Show' in pairs. The participants were allocated to pairs who had the brief to devise, script, practise and finally present their own Science Magic Show at the end of the workshop to the other teachers (and invited guests). These shows were videoed so teachers could learn from their and other's performances after the workshop was over. These videos are only circulated to participants and sponsors – they are not for public consumption! Unfortunately due to time constraints at the end two pairs of teachers did not get to perform, which was very disappointing. We had cut the workshop down to 3 ½ days from 4 days and we may reinstate the extra ½ day to give the extra time needed for the presentations.



Burn baby burn: Catherine O'Dwyer and Lydia Slattery sacrifice a jelly baby! (Photo: Press 22/University of Limerick)

The course participants stayed in Cappavilla student village on campus at the University of Limerick. This was a fantastic location, on the banks of the river Shannon, with all of the

University and local amenities within walking distance. All meals and coffee breaks were had in the Paddocks restaurant, where our every whim was attended to and we were often surprised with ice cream as a treat on the hot summer's days. The residential aspect is an important part of the course as it helps teachers bond and encourages cooperation and sharing during the lab sessions.

Evenings were spent doing homework and researching demonstrations to be tried out for the next day, or so the teachers told us, however we do have several eyewitnesses who claim to have seen the participants of the chemical demonstration workshop in the SinBin on Monday night. Of course the teachers have claimed that these reports are entirely false and they were tucked up in Cappavilla studying furiously!

On Wednesday night, the evening before the S-day (Science Magic Show Day), we all went to the Stables bar in UL for some Dutch courage, and finished the evening in the Scholars bar in UL with a good Trad session.

We had time to enjoy some delicious home made pavlova with fresh strawberries, which course participant Dr. Peter Davern (of CES Department) brought in on Thursday morning, and promptly became the most popular course participant.



Eating *al fresco* at The Paddocks and enjoying pavlova. (Photo: P.E. Childs)

Of course, sometimes we took any excuse to do some 'serious' demonstrations outside the lab, given the beautiful weather and this resulted in an extended lunch break so that we could try out a large scale Mentos and Diet coke demonstration. This is too messy to do indoors although we have

also devised a small-scale version which can be done in the lab, but it's not as much fun.



Peter Childs tries to make his escape from the Diet The Diet Coke and Mentos eruption (note the lab coat and safety goggles!) (Photo: Sarah Hayes)



Lorraine O'Dwyer, Ciara Power and Anthony Sweeney during their Science Magic Show. (Photo: Sarah Hayes)



Which witch is which? Marie Spillane and Patrice Mulvihill burning money. (Photo: Sarah Hayes)



Patrice Mulvihill freezes some fruit during her Magic show. (Photo: Sarah Hayes)

As usual the course finished with the participants putting on their own 'Science Magic Show' on the last day. There were seven shows in total, but as previously mentioned due to time constraints only five shows were performed. The shows that did go ahead were videoed and these videos will be sent to all course participants. All of the shows, both the ones that went ahead and those that didn't, were fantastic. The planning and thought that everyone of the course participants put into their shows was absolutely amazing. Every show had a different theme, from safety in industry to Hogwarts witches and wizards. Each show was planned out and put on in fantastic style, despite having no dress rehearsal!

This workshop is residential and most of the costs are covered by the sponsors - the Second Level Support Service (through Tim Regan and Brendan Duane), Pharmaceutical Ireland (through Siobhan Murphy) and the RDS Science Live for Teachers programme (through Dr Claire

Mulhall). The workshop was also supported by the Department of Chemical and Environmental Sciences at the University of Limerick and the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL). The course organisers and presenters were Peter Childs (CES) and Sarah Hayes (NCE-MSTL), together with Michael Hennessy (SLSS).

Nearly 50 teachers or student teachers have attended the first four workshops. This year we gave three student scholarships to UL students and we hope to extend this to other universities, who are training science teachers. We hope to run a 5th Chemical Demonstration Workshop in June of next year (2011), subject to sponsorship being available. Places are limited (though we have yet to reach our capacity of ~20) - so if you are interested please e-mail either Sarah Hayes or Peter Childs to reserve a spot. The dates will be announced later - either 3rd or 4th week in June.



Peter Davern tries out the corn flour bomb for his magic show. (Photo: Sarah Hayes)

If you missed this year's workshop, why not make a date for next year? Next year's Chemistry Demonstration Workshop is likely to be held in the 2nd. week of June, 2011. Contact peter.childs@ul.ie or sarah.hayes@ul.ie for details. If you think this course looks great fun - it was! Sign up for next year to experience it for yourself.

Anne O'Dwyer and Aine Regan have been going round schools in Munster putting on their Science Magic Show 2009-10 and are continuing in the 2010-11 school year. If you want to book them contact them at: aine.regan@ul.ie or anne.m.o'dwyer@ul.ie. □

10th European Conference on Research in Chemical Education (ECRICE), Kraków, Poland

Vicki Hennessy and Aine Regan

Background

The 10th European Conference on Research in Chemical Education (ECRICE) took place in Kraków, Poland 4th-7th July 2010. As well as ECRICE, the 4th International Conference Research in Didactics of the Sciences (DidSci) was also held in the same university 8th-9th July. More than 190 delegates, (including 9 from Ireland), from 42 countries all over the world attended the conference which took place in the 'Pedagogical University of Kraków', which is the oldest pedagogical university in Poland. Presently, the Pedagogical University has more than 20,000 students. This 10th meeting follows successful conferences held in Istanbul (2008), Budapest (2006) and Ljubljana (2004). The conference considers all levels of research in chemical education, much of it focused on second level chemistry teaching and learning.

The 10th. ECRICE, which was chaired by Peter E. Childs, created an opportunity to exchange experiences on research in chemical education carried out at every education level - from primary school up to graduate studies and lifelong learning. Delegates came to familiarise themselves with the most recent achievements in various research and educational centres around the world. The conference timetable consisted of three days of oral presentations, poster sessions, 7 plenary lectures and workshops.

A list of the conference abstracts is available at:
<http://ecrice2010.ap.krakow.pl/>

Plenary Lectures & Interesting Ideas

The first plenary lecture was given by Judith Bennett on factors that affect young people's interest and participation in science. She spoke about how the views students have on science, school science and scientists are often negative and there are a variety of factors that contribute to this. The findings of this study identify a number of strategic, contextual, structural and practical features within schools that impact positively on the uptake of science.

Ingo Eilks spoke about making chemistry teaching relevant and inclusion of authentic and controversial socio-economic issues into teaching. This is achieved by inserting debates into

chemistry teaching which allow for open discussion and individual decision making processes. Student's comments and reflections were positive about this teaching approach.

George Bodner gave a very interesting lecture on problem solving, 'The difference between what we do and what we tell people to do'. In this lecture he talked about the linear and logical sequence of steps that are given by textbooks when solving a problem and similarly the way a solution to a problem is routinely worked out by instructors. These approaches have little similarity to the way a novice would solve the same problem. Some experiments that were carried out to get a better understanding of how good problem solvers successfully solve novel problems they encounter and how students react to this.

Liliana Mammino spoke about how teaching approaches are influenced by underprivileged or disadvantaged educational contexts. This can be tackled by a number of ways including the early familiarisation with basic skills of the scientific approach, the value of classroom interactions, students' active engagement in their learning process and lastly the importance of references to everyday experiences to promote concreteness perceptions about chemistry.

Beata Brestenska's lecture 'Digital Technologies is not only a basic necessity for chemistry education it is a challenge for personalisation of learning' discussed the importance of technology in teaching and the benefits it offers to students.

Rachel Mamlok-Naaman discussed teaching inquiry-based issues with a historical approach.

Lastly, Andrzej Danel gave an excellent lecture on 'School laboratory for 1 cent' and demonstrated simple experiments. He discussed the importance of the practical element of chemistry and how it is vital for student understanding. However, many schools do not have access to laboratory equipment or chemicals so it can sometimes be a challenge to do all the exciting lab demonstrations that students would enjoy and learn from. Andrzej went on to show experiments which can be carried out using cheap and simple laboratory equipment such as

disposable syringes, coca-cola cans, medicine vials and plastic pipettes.



Members of the Chemistry Education Research Group, University of Limerick at the Przegorzaly Castle, where the conference dinner was held.

The Irish Contingent

There were a total of 9 Irish delegates at the 10th ECRICE: 6 from the University of Limerick and 3 from Dublin City University, so Ireland was well represented.

Sarah Hayes (UL) was the first Irish representative to speak on Monday morning. Along with carrying out her PhD, Sarah is also the project officer for “Physical Sciences” with the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL), in the University of Limerick. Her discussion was based on “Factors affecting the take-up of third level science in Ireland with special reference to the Transition Year”. This proved to be of great curiosity to many of the delegates, as many had never heard of “Transition Year” before.

Áine Regan (UL), who is currently undertaking a Masters in the University of Limerick, spoke about “Retaining Weaker Students in Undergraduate Science Programmes”. This subject matter was of immense interest amongst the delegates, as it seems to be a common factor worldwide and it led to some very interesting points being made.

James Lovatt (DCU) gave a very interesting talk on ‘Using a quantitative approach to investigate teaching and learning of undergraduate chemistry’ He discussed the findings of analysis tools used to investigate student profiles in undergraduate chemistry and the advantages and limitations of this approach.

Peter Childs concluded the UL representation on Monday with a discussion on “Does the Irish education system produce pupils who can think?”. He also gave a plenary lecture on Wednesday evening based on “Science education in Ireland: strengths and weaknesses”.



Peter Childs during his plenary lecture

Wednesday morning was brought to a noteworthy start by Dr. Maria Sheehan. Maria, who recently received her doctorate, is a Chemistry and P.E. teacher in Saint Caimin’s, Shannon. She spoke about “ITS Chemistry! The development, implementation and evaluation of an intervention programme aimed at developing thinking skills and understanding in Chemistry”.



The gorgeous view from balcony of the Przegorzaly Castle where the conference banquet was held

Anne O’ Dwyer was the final UL representative to speak. Anne is currently conducting her PhD under the supervision of Dr Noreen Hanly and Dr Peter Childs in the University of Limerick. Anne’s topic was based on the title “An investigation of the difficulties of Organic

Chemistry at third level". This again aroused a lot of interest amongst the delegates and once again it seems to be an issue of great concern in many countries.

Richard A. Hoban (DCU) presented a poster on his work. His poster was entitled 'Student's Abilities in Transferring Mathematical Knowledge to Chemistry' and discussed that teaching and assessment of the undergraduate calculus course needs to be focused on getting students to explain the underlying mathematical knowledge which is being presented to them in order to transfer their learning.

Social Events

On Sunday the 4th July, there was a Welcome Reception in the Country Restaurant, "Karcza Pod Blacha", introducing many to Polish cuisine. There were some mixed reactions amongst the Irish as it was the first time many had experienced such delicacies! This dinner provided individuals with the opportunity to mingle and socialise, discussing science-related topics, the similarities and differences in various countries.

On Tuesday evening there were five different tours organised, from which you chose one. These included:

- A city tour of Krakow by a historical tram
- Auschwitz and Birkenau museums
- Wieliczka saltmine
- Nowa Huta Tour
- The traces of Jewish culture in Krakow by historical tram.

A good number of delegates visited the remains of the Auschwitz and Birkenau concentration camps,

which was a very sobering and moving experience.

On the final night, Wednesday 6th July, there was a Conference Dinner in the "Przegorzaly Castle". With the windy roads leading there, I had to wonder at times if we would actually reach our destination; but alas the bus driver knew exactly what he was doing!! We were greeted at the entrance of the castle by a champagne reception and proceeded to have an amazing night, full of good food and company, as this was the last night we would spend with our new friends we had made throughout the week. There was a stunning view from the castle over the river and plain leading to Krakow, as the photo shows.

Conclusion

ECRICE 2010 created ample opportunities for teachers, lecturers, educators and researchers to exchange experiences on research in chemical education carried out internationally. Krakow was a lovely city to visit and the organisation of the conference was excellent and delegates were made very welcome by their Polish hosts.

The 11th ECRICE will be held in 15-20 July 2012 in Rome, in conjunction with the 22nd ICCE, and I would encourage all persons who are interested in chemistry education to attend!

Aine Regan is finishing a Master's in Chemical Education at the University of Limerick and Vicki Hennessy is doing a part-time Master's in Chemical Education at UL, while teaching full-time in Cork.

□

21st. BCCE, Denton, Texas, USA

Anne O'Dwyer and Maria Sheehan

Background

The 21st Biennial Conference of Chemical Education (BCCE) took place in the University of North Texas from the 1st to the 5th of August 2010. The University is located in the town of Denton which is at the peak of the triangle between Forthworth and Dallas in north-east Texas. Denton with a population of about 120, 000 is also home to the Texas Women's University. The University of North Texas is a large University on an extensive campus with

about 30,000 students. The hot and humid weather with an average temperature of 38° C provided a climate shock for many of the conference attendees.

This meeting is designed for those teaching Chemistry at both second and third level. The conference provides opportunities for those involved in teaching Chemistry as well as Chemistry Education research to meet both formally and informally to share and discuss ideas. The dense conference schedule included

four and a half days of presentations, workshops and symposia on developments and research of the teaching and learning of Chemistry at second and third level. The workshops and symposia ran in the morning and the afternoon, with plenary lectures on two evenings. The poster sessions and BOAF (Birds Of A Feather) meetings ran during the mid-day break. With over 18 parallel sessions running at any time, as well as 10 workshops sessions, it was difficult to strategically plan and organise your day. Choosing certain symposia to attend meant missing out on a large variety of different discussions. However, a list of the conference abstracts is available at http://www.bcce2010.org/program_schedule/program_schedule.php.

Keynote Speakers

There were three plenary talks given during the course of the conference in a variety of different topics. Jim and Jenny Marshall from the University of North Texas kicked off proceedings on Sunday evening with a description of their travels to over 30 countries, investigating all the sites associated with the discovery of the elements. The title of this project was 'the Rediscovery of the Elements'. In their presentation, Jim and Jenny, related the adventures experienced during this journey and their observations of underlying themes of the history of the elemental discovery process, most notably how ambiguous the discovery site of many of the elements were.

On Monday evening Nizam Peerwani, Chief medical examiner of Tarrant County in Texas, looked at the role of a forensic examiner dealing with violations of human rights at an international level. His work has taken him to numerous countries around the world where his skills as a forensic pathologist give voice to those who died unjustly.

The final plenary speaker of the week was Kent Kirshenbaum, from New York University. His lecture showed opportunities that exist to engage students and the public in scientific investigations through an exploration of food and cooking. He described how a gathering of students, chefs, scientists, nutritionists, writers and artists based at New York University participate in interdisciplinary discussions in the overlapping influences of science and cooking. An number of scientific topics that are presented include polymer chemistry, hydrophobic interactions, pH dependence of reaction rates, and molecular

neuroscience. The main objectives of this programme are to excite students about chemistry, to formulate new recipes, to encourage cooking skills at every level, to impart knowledge relevant for making dietary choices and to improve human health.

Relevance of Chemistry Education Research for the Irish Chemistry teacher:

Laboratory Learning:

Many of the speakers favoured a hands-on approach to practical assessment in the laboratory rather than the traditional written laboratory reports. The effectiveness of different laboratory practices were discussed. These included cooperative problem-based approaches and inquiry based sessions. Most were in favour of steering from the recipe style procedures towards student directed learning. In many longitudinal Chemistry courses at third level where a topic e.g. Organic Chemistry is taught over two semesters, the focus of the laboratory sessions for both semesters were different. In the first semester students learn the skills and techniques necessary to carry out the processes and reactions studied in the course. In comparison, the second semester then allows the student more freedom to work on an individual laboratory-based project of their own interest applying what they have learned previously. Novel innovations and investigations for laboratory sessions can be seen in the abstracts that can be found at the web address listed above.



A Texan Rodeo included as part of the Gala dinner

Assessment in Chemistry Education:

Assessment presents a challenge for those teaching Chemistry at second and third level. Many innovative assessment ideas were shared at the conference. The use of practice tests to prepare students for the final examinations were

discussed. A lot of emphasis was placed on logical reasoning and problem solving skills to provide more depth in evaluating the students' knowledge. Web-based and online methods of assessment have increased in popularity by many. There are many advantages to this method of assessment; instant feedback, ease of correction, more flexibility for lecturer and students etc. The constant need to link assessment to the students' Learning Goals was reiterated by many.

Strategies for engaging pupils in Chemistry:

There were a number of interesting talks looking strategies that have been developed for engaging students in Chemistry. Many centred on the idea of linking the content of different courses with the experiences and interests of the student. Investigations into the effect of context based learning and problem based learning have shown successful results in engaging the learning and developing appropriate investigative skills. Chemistry can be introduced and developed using many concepts, those presented at this conference included Crime Scene investigations, the science of terrorism which looked at elements of terror, explosions and bioterrorism and getting students to connect chemistry to everyday consumer products.

The Irish in Texas

Ireland was well represented at this conference with a total of six oral presentations included in the conference programme. Michael Seery from Dublin Institute of Technology spoke about an online module teaching computer applications for Chemistry that was previously taught face-to-face in DIT. Claire McDonnell, also Dublin Institute of Technology, spoke about the development and effectiveness of research-oriented and research-led measures introduced to undergraduate Chemistry courses in Dublin Institute of Technology over the past number of years. Ann O'Dwyer, from the University of Limerick spoke about her investigation into the areas of difficulty in Organic Chemistry for third level Chemistry students. Maria Sheehan outlined research that has been carried out into the cognitive development of Irish pupils/students and the effectiveness of an intervention programme for second level Chemistry pupils aimed at developing thinking skills and alleviating difficulties pupils have with a number of different Chemistry topics. Peter

Childs, submitted a paper outlining the strengths and weaknesses of the Irish education system, with special mention given to the place of Science/Chemistry in Irish primary and secondary schools.



Some of the Irish contingent appropriately attired with their straw hats.

Overall Impressions

As well as the formal meetings and discussions, there were many opportunities to meet and chat with educators and researchers from around the globe informally. Visiting Texas during 'Straw Season' meant donning the traditional Texas straw hats. A two-page briefing of Proper Hat Etiquette was included in the conference book, thankfully most of which applied only to the men. Claire McDonnell (Dublin Institute of Technology) flew the Irish flag at the Mole Fun Run which took place at 6.02 a.m. on the second day of the conference. The early morning temperatures provided a more comfortable climate for the 6.0207 km run. The Mole Breakfast was also held at 6.02 a.m. on the second last day of the conference. The Ice-cream social on Monday evening was well appreciated in the evening sun. However, all will agree that the Texas BBQ Gala was a most memorable conference dinner. Held at the Circle R Ranch, live country music, barbequed food, racing armadillos and a live rodeo to finish made it an enjoyable evening for all.

Maria Sheehan teaches fulltime at St. Caimin's Community School, Shannon, Co. Clare and has recently completed a PhD in Chemical Education at UL with Peter Childs. Anne O'Dwyer has finished one year of her IRCSET-funded PhD project in Chemical Education at UL.

□

Chemical and Mining News

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Pfizer announces closures

In May 2010 *"Pfizer said it plans to exit operations at its solid-dose plant in Loughbeg and biotechnology plant in Shanbally, both close to Ringaskiddy, Co Cork, and at its aseptic facility in Dun Laoghaire, Dublin."*

The company said it would make a "concerted effort" to find buyers for all three sites earmarked for closure. It is also to reduce operations at its solid-dose facility in Newbridge, Co Kildare. The plans are to come into effect over the next 18 months to five years. The company said that a reduction of the Newbridge operation would impact 275 jobs, with a further 510 at risk due to the plant closures - 210 in Dun Laoghaire, 225 in Loughbeg and 75 in Shanbally.

"Pfizer is keenly aware of the impact these changes will have on its colleagues, the community, and the country, and the company will make a concerted effort to sell the sites where operations are intended to be discontinued," the company said."

Read more:

<http://www.breakingnews.ie/ireland/pfizer-to-cut-almost-800-jobs-458127.html#ixzz0xLkc0Ka0>

Xstrata and Minco in €7m zinc exploration deal

Irish Times 02/02/10

Swiss-based multinational mining and commodities group Xstrata and Irish company Minco are set to spend €7 million this year on developing a potential zinc find in Ireland. The companies own the rights to a zinc deposit at Tobermalug, Pallasgreen, Co Limerick, which has already been established as holding over 11 tonnes of zinc and lead, and which could stretch to much more than that.

Minco announced that it has agreed to spend \$10 million (€7 million) on a further exploration programme, which will be aimed at increasing proved reserves in the deposit to 15 million tonnes. The 2010 programme will include about 70,000 tonnes of diamond drilling in about 150 drill holes allocated within and adjacent to the Tobermalug zinc-lead deposit, and on further exploration drilling in the general Caherconlish area within a 3.5km radius of Tobermalug. Minco

said the programme agreed between it and Xstrata Zinc, the Irish subsidiary of Xstrata, will have three key objectives: to increase the tonnage and grade of the existing deposit, to explore for lateral extensions of the deposit and to explore additional ore deposits in the Caherconlish area.

Along with Tobermalug, their work to date has identified zinc and lead at nearby Caherconlish South and Srahane west. Minco says the three deposits could potentially contain more and higher grades of zinc and lead. According to Xstrata, only around 30 per cent of the potential resource has yet been explored. Tobermalug is one of the biggest onshore exploration programmes undertaken in Ireland in the last 50 years. The partners spent over €2 million on the project last year. Minco holds 23.6 per cent of the licence while Xstrata owns 76.4 per cent. The entire deposit covers an 11sq km area spanning northeast Limerick and southwest Tipperary.

Board to plan science and IT park

Irish Times 22/12/09

An Advisory Board consisting of prominent businessmen, academics and public servants has been appointed to advance plans to develop the country's first science innovation and technology park, in Cork. Backers of the plan have spoken of the possibility of up to 6,000 high-end jobs being created by a Silicon Valley-style innovation and research campus, to be built in Curraheen on a 150-acre site on the outskirts of Cork city.

The promoters include Cork County Council, University College Cork and Cork Institute of Technology.

Mr. Buckley, founder of Digicel, described the project as hugely significant for Cork but also a pivotal development for the country as a whole. *"Global research has shown that such parks become significant drivers of economic growth. If we are serious about creating a knowledge-based economy, then the location of overseas and Irish-owned companies at the park will assist in the sharing of knowledge and innovation and create the environment for the commercialization of research,"* he said. The Cork site is unique in Ireland because of its proximity to the buildings and landholdings of two third-level institutions

that have a significant track record in research and innovation.

It is not actually Ireland's first as Limerick's Plassey Technological Park has been in business for decades.

Rise in new firms investing in Ireland

Irish Times 22/12/09

The number of companies investing in Ireland for the first time rose by 11 per cent this year in spite of the economic downturn. New figures from IDA Ireland show that, despite a 30 per cent global decline in foreign direct investment in 2009, Ireland continued to outperform in attracting companies, with the level of foreign direct investment falling by just 4 per cent compared to the previous year. Overall, there were 125 new investments by multinationals this year, resulting in the creation of 4,500 jobs. However, net employment within IDA-supported companies fell by 10 per cent, or 13,400, during 2009.

Among the companies choosing to invest in Ireland for the first time in 2009 were Bentley Systems, Maxim Integrated Products, Big Fish Games, Lumension Security, Vattenfall, Hovione, Everest Reinsurance, Gerson Lehrman, Buy.com and SuccessFactors. In addition, a number of companies expanded their operations in Ireland this year. These included HP, McAfee, Trend Micro, Merck, Facebook, Abbott and Gilead.

Investment in research, development and innovation (RDI) rose 10 per cent compared to 2008, the figures show. RDI investments accounted for 49 per cent of all investments secured during the year. Overall, the level of RDI investment was in excess of €500 million, with IBM, Boston Scientific, Citi, Intel, Pfizer, Helsinn, HP, PayPal, Colgate-Palmolive, Alps Electric and Sita among the companies to invest.

IDA-supported companies directly employed 136,000 people and accounted for €110 billion, or 70 per cent, of total exports in 2009. According to the IDA, client companies were responsible for €19.1 billion in direct expenditure within the Irish economy during the year. The IDA is in the process of completing a strategic review of its business. It intends to publish a Strategy 2020 during the first quarter of 2010.

Swiss and Belgian groups among bidders for Co Tipperary mine

Sunday Times Business 21/03/10

Xstrata from Switzerland, and Nyrstar, a Belgian mining company are said to be in the running to take over the Lisheen zinc mine near Thurles. The mine, one of Europe's leading suppliers of zinc concentrates, is in its second decade of operation and has only about an estimated four years of useful life. It employs more than 370 people.

Tánaiste announces €56 million for industry-led research

Irish Times 11/03/10

The Tánaiste, Mary Coughlan, has announced a €56 million investment in industry-led research with the launch of nine Competence Centres. A mix of multinationals and small and medium-sized indigenous firms will be directly involved in nine centres designed to bridge the difficult gap between the laboratory and the market place. Five of the centres are already under way, specialising in bioenergy and biorefining, IT innovation, applied nanotechnology, composite materials and microelectronics. Centres are also planned for manufacturing productivity, energy efficiency, financial services and e-learning. Each centre will be based in one of the State's universities, supported by higher education institutes.

Ms Coughlan said the new programme was about converting R & D into new products and services, "where the net gain will be more and better jobs". The Tánaiste talked of a "departure from the traditional approach to R & D in favour of a collaborative system" where competing companies pool resources to share knowledge, risk and rewards.

An example of the new approach is collaboration between Xilinx, Irish firm S3 in the microelectronics competence centre located in the Tyndall Institute, University College Cork. Another is the coming together to work on composite materials in University College Dublin of aircraft manufacturer Bombardier and Irish SME ÉireComposites.

The investment will be delivered in two waves, with €32 million allocated to the first five and a further €24 million over the next five years across all nine. Successful participants were consortiums which responded to an advert inviting proposals. Similar models have been running for decades in other European countries like Austria, Denmark and Sweden. "We had to adapt it to Ireland because we are unusual in the number of multinationals we have working alongside the

indigenous sector,” said Martin Lyes, divisional manager, research and innovation, Enterprise Ireland.

Targets have been set for the centres which are expected within five years to have produced at least 80 pieces of commercially viable intellectual property, to have more than 60 engineers and scientists directly employed and working on industrially relevant research and to have achieved active collaboration with a wider community of 180 companies.

Pharma sector must reposition to face challenges – report

Irish Times 17/03/10

Ireland’s pharmaceutical sector needs to reposition itself and “scale up” its existing operations if it is to retain its multibillion-euro pharmaceutical industry and stave off the major challenges facing the sector in the next decade, according to a new strategy document launched by PharmaChemical Ireland in New York. Representatives from PharmaChemical Ireland, Minister for Children Barry Andrews, the IDA and multinational pharma companies located in Ireland attended the strategy launch, which aimed to showcase Ireland as an attractive investment location.

The document was launched at the annual meeting of the Drug, Chemical and Associated Technologies Association, a major industry event for the US pharmaceutical sector. It highlights the challenges facing the global pharmaceutical industry as patents for major “blockbuster” drugs are expiring, emerging replacement products coming through the research pipeline are lacking, and the industry is opening up to generic competition.

It warns that Ireland is particularly exposed to industry changes, as many of the world’s major drugs are produced here. The culmination of a year-long consultation with the Irish pharmaceutical industry, the report makes many recommendations, including: shortening the time it takes for a drug to move from clinical trial to the market; transforming sites to include onsite pilot plant and clinical trials manufacturing facilities; enhancing tax breaks for intellectual property and RD activity; and reducing manufacturing costs through the development of innovative manufacturing processes.

The report also calls for an increased focus on innovation and R & D. “Traditionally, Ireland was perceived as a global manufacturing source for

pharmaceuticals, something we did very well. But simple high-volume manufacturing will not sustain the long-term future of the industry,” director of PharmaChemical Ireland Matt Moran said yesterday.

He said Ireland needs to combine its manufacturing activities with process and product development at pharmaceutical facilities, as well as increasing its R & D output. “This will set us apart from competitors and increase the level of intellectual property undertaken in Ireland.” The pharmaceutical industry was worth €44.17 billion in 2008, according to PharmaChemical Ireland – representing 50 per cent of total Irish exports in value terms. It is estimated that the industry employs in excess of 24,500 people in Ireland.

Innovation taskforce says 120,000 jobs can be created

Irish Times 10/03/10

Approximately 120,000 new jobs could be created if Ireland transforms itself into an innovation centre, according to the report from the Government’s Innovation Taskforce.

The report says “we need a sea change in attitudes – in public and private sectors – towards innovation and entrepreneurship, to recognise that they involve risk, and occasionally result in failure”.

At second level, it says “we need to raise levels of competence and attainment in maths and sciences so that they feed into science and related disciplines at third and fourth levels. We believe that mathematics attainment is crucial in this regard and suggest additional measures to improve this, such as the awarding of CAO bonus points to those taking higher level mathematics for Leaving Certificate.”

The report recommends that the current Strategy for Science, Technology and Innovation (SSTI) 2006-13 should continue until 2020. “We believe that current economic difficulties should not be allowed to diminish the level of investment which we believe is necessary and inhibit the return on investments already made,” says the report.

The Innovation Taskforce has been described as one of the most important committees assembled by the Government. It is chaired by secretary general of the Department of the Taoiseach Dermot McCarthy. Members include Lionel Alexander, a vice-president with Hewlett Packard; Dr John Hegarty, provost of Trinity

College Dublin; and Dr Chris Horn, co-founder of Iona Technologies.

Bright future remains for Irish pharmaceutical sector

www.pharmachemicalireland.ie 21/05/10

PharmaChemical Ireland, the IBEC group that represents the Irish pharmaceutical and chemical industry, held its AGM in Cork, and presented a new industry strategy, which detailed the major challenges ahead for the sector and how best these can be met. The group said that despite current challenges and recent job losses, a bright future remains for the sector.

PharmaChemical Ireland Director Matt Moran said: "The global pharmaceutical sector is entering challenging times with the impending expiration of patented drugs, a diminished volume in research pipelines, a rising cost base, increasing competition and stringent regulatory requirements. However, the industry in Ireland is well placed to

address these challenges with the active support of Government, its agencies and the research community. We have identified a blueprint for the type of operation that will survive into the future, and it is our aim to drive the industry in Ireland towards this 'factory of the future' model that combines high quality, cost-effective manufacturing with process and product development. Leading international countries are grappling with the challenge of stimulating genuine collaborative initiatives between international and indigenous companies and research centres to develop and commercialise new products and services. Ireland's small size and flexibility is a definite advantage in this regard as it is an ideal development test bed for the global industry to experiment and scale up new product and services. Even though the environment is tough, the industry has a fantastic track record in this country. We have the people, the capability and the drive to rise to the challenge."

Environment, Energy and Health News

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EU anti-pollution law on agricultural nitrate proving effective

Irish Times 13/02/10

The implementation of legislation to prevent nitrates from agricultural sources polluting ground and surface waters is proving effective, according to a newly published European Commission report on the implementation of the nitrates directive. However, in some regions, nitrate concentrations exceed water quality standards and farmers must adopt sustainable practices, said the report. It reported that between 2004 and 2007, nitrate concentrations in surface water including rivers, lakes and canals remained stable or fell at 70 per cent of monitored sites. Quality at 66 per cent of groundwater monitoring sites was stable or improving.

The report revealed a number of regions where nitrate levels were "worrying" in groundwater sites, including parts of Estonia, southeast Netherlands, Belgium, the UK, several parts of

France, northern Italy, northeast Spain, southeast Slovakia, southern Romania, Malta and Cyprus.

The agricultural use of nitrates in organic and chemical fertilisers has been a major source of water pollution. While nitrates are a vital nutrient to help plants and crops grow, high concentrations are harmful to people and nature.

The Irish Farmers' Association environment committee chairman Pat Farrell said the report proved farmers were playing their part in safeguarding water quality.

Inquiry into farm animal deaths to continue

Irish Times 12/01/10

The Department of Agriculture is to continue its investigations into mysterious animal health problems on a Kilkenny farm after its latest scientific report failed to explain the cause.

In a statement, the department said the report had not identified "any single factor that, on its

own, could account for the intermittent negative effects observed on this farm”.

Minister for Agriculture Brendan Smith will now refer the report to “an inter-agency group” involving three Government departments and two State agencies, for their consideration. The department rejected criticism of the report by farmer Dan Brennan who claimed that the scientists had ignored certain test results and had failed to investigate the role of a brick factory located near the farm.

Mr Brennan, who farms 170 acres in Co Kilkenny, believes chemical pollution is responsible for his herd suffering from stunted growth, low milk yields and high calf mortality. He said trees on his farm had also died. A spokeswoman for Cement Roadstone Holdings said there was “no evidence to link the Ormonde Brick factory with the specific problems that have been investigated on the farm”. She added that the report’s conclusion “supports the company’s long-held position on this matter” and that the company had “provided full co-operation to all State agencies involved in this process”. The brick factory, located close to the farm, has existed since 1969. Production was suspended “indefinitely” in December 2008 “following years of reduced national demand for fired clay brick”.

Geothermal energy may be available in two years

Irish Times 13/02/10

Heat sourced from the Earth’s core could be used to power homes, businesses and public buildings in south Dublin within two years under Ireland’s first geothermal energy project. The pilot geothermal project in Newcastle, Co Dublin, is to get under way in 2010 and when completed could provide up to 25 per cent of the south Dublin local authority area’s energy needs.

The Department of Communications, Energy and Natural Resources said the main points of legislation that would enable the development of the geothermal industry nationally would be completed in the near future. The Bill will deal with issues such as ownership of the resource, regulation and licensing of exploration and development, ancillary rights and protection of third-party interests. While the heads of the Bill will be drafted by the end of this month, no date has been set to implement the legislation.

Extracting geothermal energy involves drilling bore holes to a depth of 4km and pumping hot water from reservoirs in wells at the base to the

surface. The hot water is then circulated through a heat exchanger where the heat is harnessed and transferred to the district heating network. Connected users, such as homes and businesses, access the energy through a heat exchanger. One key advantage of geothermal energy is that it can supply heat at a constant rate and is not subject to variables such as weather.

Pádraig Hanly, managing director of GT Energy which is undertaking the Newcastle project with the assistance of Sustainable Energy Ireland, said geothermal energy offered huge potential for the whole country. “Heat from the Earth’s core is constantly radiating out into the atmosphere and being wasted . . . This is a real opportunity for us to harness that resource and get away from importing so much fuel.” He said that the company’s plans included drilling a hole of up to 4km depth at Newcastle within the next six months, and to have the first customers connected in two years.

Water pollution caused major disruption at Intel plant

Irish Times 28/01/10

Extreme temperatures and water contamination have seriously disrupted production at the giant computer chip manufacturer Intel in Leixlip, Co Kildare. An Intel Ireland spokesman said the recent cold weather was a “unique situation” and had affected the company severely. This was due in part to rapidly falling temperatures, which at one point reached as low as -12 degrees at the plant.

Water contamination caused additional problems for the company, which employs 4,200 people directly and indirectly and is the largest employer in Kildare. The US multinational makes computer chips which are used in 90 per cent of the world’s PCs. There were concerns locally that ammonia and nitrates may have contaminated water after local authorities used an agricultural fertiliser to replace the salt component in grit on roads. This was due to a chronic shortage of rock salt.

Intel has its own pumping station on site and tests water for impurities, as extremely pure water is required for its manufacturing processes. However, it is not equipped to test for ammonia, and water samples had to be sent off-site for analysis. A spike in ammonia levels was witnessed early in January, not long after urea was scattered on the road, the company said. General water supplies were tested in a number of local

authority areas, including Kildare. Although the levels of chemicals were within safe levels, Intel's water quality requirements are more stringent. "Clean from an Intel perspective is a level of purity that is unheard of anywhere in the country," a spokesman for the firm said.

Study shows big rise in pollution of rivers

Irish Times 17/12/09

The levels of pollution in rivers and streams in Ireland have risen dramatically in the last two decades as a result of increased housing development and intensive agriculture and forestry. Water quality at wells and springs, which are the source of a quarter of drinking water supplies, has also declined due to contamination by animal and human faeces, a major new study shows.

Water Quality in Ireland 2007- 2008 shows the percentage of rivers considered to be "high-quality sites" – or largely pollution-free – has fallen to 17 per cent in 2006-2008, down from 30 per cent in the period 1987-1990. The biggest percentage decline in "high-quality sites" was experienced in the northwestern Neagh-Bann and Shannon regions, while the largest numbers of largely pollution-free sites are in less densely populated and less intensively farmed parts of the country, typically the southwest and west.

The report, which was published by the Environmental Protection Agency (EPA), concludes the dramatic reduction in water quality has been caused by nutrient inputs, siltation and acidification as a result of forestry, agriculture and housing. It says "high-quality sites" are important to support aquatic species that are sensitive to siltation and pollution, such as freshwater mussels and juvenile salmon, which are both in decline.

Dr Jim Bowman, programme manager of the aquatic environment programme at the EPA, said the key contributor to pollution levels was municipal and agricultural discharges, and added that it would be a huge challenge to protect the remaining "high-quality sites" and restore those that had degraded.

The report analyses water quality in 13,200km of rivers and streams, 433 lakes, 89 tidal water bodies and 275 groundwater sources. It found a slight decline in the quality of water in lakes in the period 2006-2008 when compared with a previous EPA assessment in 2004-2006. There were 34 fish kills reported in 2008, up from 22 in

2007. Most of the kills are associated with local authority operations and agricultural activities. The reports notes this is lower than in the period 2004-2006, but says it is still unacceptably high as each fish kill is a "catastrophic disturbance" for aquatic life.

It found water quality had improved in the estuarine and coastal sites that it monitors, and that Irish shellfish-growing waters were typically of a "high quality". However, the EPA's analysis of groundwater (wells and springs), which accounts for 26 per cent of drinking water supplies here, highlighted an increase in pollution levels in 2006-2008, when compared with 2004-2006. It found 67 per cent of groundwater sites had faecal coliforms, which are caused by animal and human faeces. This is a 10 percentage point rise from the 2004-2006 EPA water study. The number of bathing waters complying with the EU minimum requirements regarding pollution levels fell in 2008 when compared with 2007. Some 93 per cent of bathing sites met the EU requirement, a drop of four percentage points from the previous year.

Study into feasibility of Irish Sea electricity grid

Irish Times 09/03/10

A new study on the feasibility of an undersea electricity grid in the Irish Sea, which would link off-shore renewable energy farms in Ireland and the UK, has been approved by Minister for Energy Eamon Ryan. The project, which will examine the potential to connect wind, wave and tidal-energy sites by a new grid, is being supported by governments in the Republic, Scotland and Northern Ireland. Dubbed the Isles project – for Irish Scottish Links on Energy Study – it is EU Commission-funded.

Mr Ryan told *The Irish Times* the move was strategic in that a high-voltage connection in the Irish Sea would itself link in with the electricity grids on both islands, and in turn would link into a proposed 10-state, sub-sea electricity grid shared among countries in northwestern Europe. He said the decision to proceed with the study showed Ireland was "as good as it gets, electrically" in terms of developing renewable energies.

The announcement of the study comes as 10 of Europe's largest energy and engineering firms joined forces to launch a new lobby group committed to advancing plans for a pan-European supergrid capable of supporting new renewable energy capacity. The Friends of the Supergrid

(FOSG) group includes companies 3E, AREVA TD, DEME Blue Energy, Elia, Hochtief Construction AG, Mainstream Renewable Power, Parsons Brinckerhoff, Prysmian Cables & Systems, Siemens and Visser & Smit Marine Contracting.

Sea energy contracts for two Ireland-based firms

Irish Times 17/03/10

Two Irish renewable energy firms have been awarded lucrative licences as part of the first commercial wave and tidal energy licensing round globally. SSE Renewables and Open Hydro will be involved in four projects which will involve investment of close to two billion Euro by the Irish companies. They will deliver a maximum of 80 MW to the UK grid.

Gas storage facility would secure supply, firm claims

Irish Times 24/03/10

A proposed £250 million natural gas storage facility almost a mile under Larne Lough would provide a significant amount of Ireland's gas needs and help ensure security of supply, according to the company behind the project. Plans for the project to store 500 million cubic metres of natural gas have been submitted by Islandmagee Storage Ltd (IMSL), an entity run by English company Infrastrata and Mutual Energy Limited.

Bill Cargo, an executive director of Mutual Energy, which also owns the gas interconnector between Scotland and Northern Ireland, said the proposed facility was the equivalent of a "huge gas warehouse". It would allow the major gas suppliers in Ireland and Britain to buy and store gas when it was at its cheapest. He explained that the gas would be stored in seven under-sea caverns, each 160 metres high and 80 metres wide. These can be created because of ancient salt beds that lie under Larne Lough.

"There is a Permian rock salt structure about a mile under the surface that was laid down about 275 million years ago and we believe it is about 200 metres thick at this location. The Larne Lough area is the only place off Ireland where these type of salt structures exist," he said. "We drill down into the rock and pump sea water in. It will dissolve the salt and then you extract the concentrated salt water. Over an 18-month period

you leach out the cavern and create these cavern structures," said Mr Cargo. He said it was a well-proven safe gas storage technique, with 70 similar facilities worldwide, including three in the UK. The caverns would be connected to the gas interconnector.

The project would take seven years to complete with the drilling work starting from the shore, and going down 1,500 metres, creating 200 construction jobs with an additional 20 to 30 longer-term operational posts. This proposed development at Islandmagee would make a significant contribution to the security of energy supplies and is designed to supply up to 5 per cent of UK and Ireland daily peak demand.

Conference to be told of benefits of afforestation

Irish Times 26/03/10

Delegates at the 2010 National Forestry Conference will be told by the Society of Irish Foresters, the professional body of foresters in Ireland, that with only 10 per cent of land area under forest, Ireland has huge scope to plant more trees. In addition to providing climate-change benefits by locking up carbon, forests also provide rural employment and other significant economic and environmental benefits.

The current shortage is expected to increase by more than 1.8 million cubic metres per annum by 2018. It will be difficult to achieve the Government's targets for renewable energy through biomass despite the fact Ireland can grow timber faster than most of the developed world. The figures have been compiled by the National Council for Forest Research and Development, which will soon launch wood supply and demand forecasts for Ireland. These will detail the increased wood supply and corresponding increasing demand leading to the potential wood shortages which, it says, will have significant implications for the timber industry and the emerging wood energy market.

Meanwhile, new figures from farm advisory service Teagasc show that fertiliser use, one of the major indicators of farming activity, has shown a dramatic decline and is at its lowest level in decades. A study of national usage of the major nutrients, nitrogen, phosphorus and potassium on grassland and agricultural crops covered 2004-2008 and raised concern at ensuring future soil fertility. The researchers found a drop of 20 per cent in the levels of nitrogen, 40 per cent in phosphorus and a 37 per cent decrease in

potassium usage. The extent of the decrease was more dramatic on grassland than on tillage crops. "Reducing fertiliser usage is a positive step in reducing costs to farmers and has the desirable effect of lessening the impact of agriculture on the rural environment," said the author, Stan Lalor.

Electric car 'juice points' go live in the capital

Irish Times 27/03/10

Ireland's first electric vehicle (EV) charging stations or "juice points" went live in Dublin on March 26th. The four kerbside charging posts are the first of 1,500 due to be installed across the State under the Government's ambitious plan to electrify motor transport in Ireland. By the end of June, a further 12 will be installed at locations in Dún Laoghaire/Rathdown, Cork, Limerick, Waterford and Portlaoise, the ESB said. The utility company plans to build 3,500 charge points by the end of 2011 – a total of 2,000 domestic units and a further 1,500 on-street units.

There are currently only about 30 privately-owned non-commercial EVs on Irish roads but the Government's target is to have 2,000 by the end of 2011 and 6,000 by the end of 2012. The ESB has the largest commercial fleet of 15 electric vehicles but it plans to extend this to 60 by the end of this year.

To use the charge points, motorists have to register at www.esb.ie/ecars to acquire a personalised electric fob which will allow them access the on-street plug point. It takes about two hours to recharge most EVs up to 80 per cent, and between six and eight hours for a full recharge which will allow the cars go for up to 160kms. However, the ESB plans to install 30 fast chargers along major urban routes, at 60km intervals, by the end of next year, which can recharge EVs in 20 minutes. The recharging will be free for the initial phase of the roll-out.

Electric cars are significantly cheaper to operate than their fossil-fuel counterparts, costing an estimated three cent a mile to operate compared to 15 cent for a conventional vehicle. Plug-in hybrid vehicles have yet to arrive in Ireland but Toyota's plug-in Prius is due to go on sale here later in the year.

Potential health risk at historic mine sites

Irish Times 26/03/10

Three of Ireland's historic mine sites, Tynagh in Co Galway, Silvermines in Co Tipperary and Avoca in Co Wicklow, have been identified as a potential risk to health, according to a major new survey. More than 100 sites in 32 mining districts were assessed as part of the Historic Mine Sites Inventory and Risk Classification. The study concluded that of the 32 mining districts assessed, 22 districts will not require any intervention, seven will require further monitoring while three - Tynagh, Silvermines and Avoca - will require additional site-specific risk assessment by the landowners.

The study was commissioned jointly by the Environmental Protection Agency (EPA), the Geological Survey of Ireland (GSI) and the Department of Communications, Energy and Natural Resources. According to the EPA, the objectives of the report were "to identify any significant risks to the environment and human and animal health at these historic mine sites so that these risks can be managed and the sites made safe".

The EPA also said the report would help "to plan ahead for the forthcoming EU directive on the management of wastes from the extractive industries". The directive will require member states to prepare an inventory of closed waste facilities within their jurisdictions by May 1st, 2012. A comprehensive remediation project is currently under way at the Silvermines site and is being overseen by the Department of Communications, Energy and Natural Resources. A full assessment of the Avoca site, where the State is the landowner, has recently been completed. Proposals for Tynagh are under consideration.

The full report is available to download free of charge from epa.ie/downloads or from gsi.ie, where a map of the mines can also be found.

EPA has 'closed the file' on lead alert in Galway

Irish Times 23/02/10

The Environmental Protection Agency (EPA) has "closed the file" in relation to lead contamination of Galway city water supplies 17 months ago. Galway City Council has welcomed the development, and says it is now self-sufficient in "high quality water" for residents. It attributes this

to management measures taken in response to the cryptosporidium contamination of 2007, and the lead-piping issue the following year.

Some 261 houses in the old Mervue area of the city required new piping after lead levels were detected in the suburb in August 2008. The Shantalla, Bohermore and the Claddagh areas of the city, where lead piping was used in many properties built before 1970, were also affected. Blood tests carried out on 35 residents living in 12 houses which showed up elevated lead levels proved clear in all cases.

Galway City Council director of services Ciaran Hayes said even if the EU reduced lead limits further in 2013, as planned, the city would still be compliant. At the time of the lead alert, the EPA confirmed that Galway City Council had been advised of the difficulties with its outdated pipe network in 2004.

The EPA said that some “99 per cent” of samples taken in 944 public water supplies in the State were “compliant” with the current lead standard of a maximum of 25 micrograms per litre.

Flooded valleys key to huge power plan

Irish Times 01/03/10

Plans to build a new electricity generating system, combining large-scale wind farms with huge hydro-power storage reservoirs in valleys on the west coast, are at an advanced stage, according to *The Irish Times*. “Spirit of Ireland”, billed as a national project for energy independence, has been under discussion for several months with the Department of Communications, Energy and Natural Resources, as well as other agencies. It would involve identifying up to five coastal valleys from counties Donegal to Cork, building dams on their seaward side and flooding them with sea water. These would provide a hydro-power back-up for the wind farms.

Typically, wind farms only produce 25 to 35 per cent of their maximum possible electricity output. The proposed hydro-generating stations would come into play when wind speeds were either too low or too high to be useful. Each of the

reservoirs would be about 100 times the size of Turlough Hill, Co Wicklow, where the peak was levelled in the early 1970s to create an artificial oval reservoir that can store 1,800 megawatt hours of hydro energy.

The bowl-shaped valleys, created during the Ice Age, are located in areas with some of the best wind conditions in Ireland. “Many are in areas of low population density, where land is of marginal or no use for farming,” the project’s website says. It notes that a successful plant similar to the project being planned here has been in operation on the Japanese island of Okinawa for more than 10 years – “built in more difficult terrain than the glacial valleys on Ireland’s west coast”.

Other selling points are that it would achieve energy independence in five years, save €30 billion on the import of fossil fuels, slash carbon dioxide emissions from electricity generation and “create the potential to add €50 billion to our economy”. This would arise from the value of the project itself and its potential to export electricity to Britain. Such is the scale of “Spirit of Ireland” that several interconnectors would be needed to supplement the one being planned.

€350 million Co Offaly power plant approved

Irish Times 17/03/10

An Bord Pleanála has approved plans to build a 350 megawatt gas-fired power plant near Ferbane in Co Offaly. Lumcloon Energy, the private consortium behind the project, expects to create up to 500 jobs during its two-year construction and 50 permanent jobs when the plant is completed.

The 350 million Euro gas-fired electricity generating facility planned on the site of an old ESB peat station at Lumcloon near Ferbane, is specifically designed as a backup for Ireland’s growing wind energy market. Capable of feeding into the national grid in a matter of minutes, given a lull in the wind, designers believe the new plant will be necessary to support Ireland’s wind energy target of 40% by 2020.
