



Newsletter December 2010

Issue No. 24

Editor's Note

On behalf of the IGI may I wish all members, sponsoring organisations as well as friends and associates of IGI a happy Christmas and all the success you desire for the new-year.

News Items and articles to: Jonathan Derham at,

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IGI News

Christmas arrangements for the IGI office are:

- closing on 20/12/2010, and
- expected re-opening on 3/1/2011

Members are reminded that CPD forms for 2010 report year and 2011 subscription fees are due 30 April and 31 March respectively.

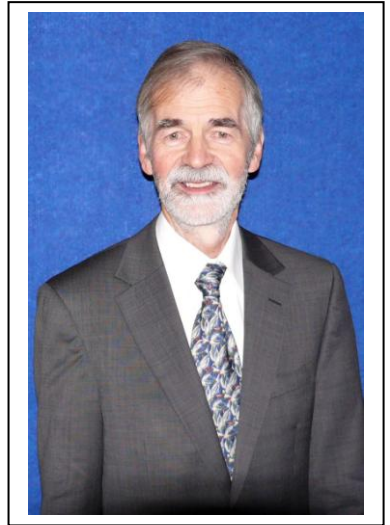
Also track latest IGI news and events at:

<http://www.igi.ie/news.htm>

Congratulations to the following who were recently elected as PGeos: Peter Glanville, Oliver Higgins, Henning Moe and Noretta Noonan. Peter, Oliver and Henning were also awarded EurGeol titles.

Retirement of Peadar McArdle

On Friday 5th November friends and colleagues gathered at Beggars Bush to celebrate the distinguished service that Dr Peadar McArdle gave to the public good, and to wish him well on his retirement.



Peadar, a UCD graduate (Class of '67); took his doctorate in mineral studies; spent time working in Malawi and then Silvermines; took up a post in the Geological Survey of Ireland in 1975, where in 1992 he was appointed Director of the Survey.

A long and very distinguished career, punctuated by some notable achievements (e.g. publication of the 1:100,000 bedrock sheets and memoirs and the 1:500,000 bedrock map of Ireland; Irish National Seabed Survey and its successor INFOMAR; funding for Geoscience Research under the National Development Plan 2007-2013; Implementation of the GSI Review recommendations; Geosciences Education; etc).

Peadar was also very successful in forging strategic alliances with other agencies such as GSNI, Marine Institute, BGS, etc. If all he has achieved professionally was not enough, he was further blessed with being always approachable, a gentleman, an engaging speaker, and a thoroughly nice man.

To mark the occasion and express our appreciation of his contribution to geosciences in Ireland (which I am quite certain will not come to an end any time soon!), IGI President John Kelly, on behalf of the IGI, presented Peadar with a pair of hand-crafted silver and Ballynoe red jasper cufflinks made by Angela Kelly Jewellery of Enniskillen.

New Legislative Framework for Geothermal Energy

In September the Minister for Natural Resources, Conor Lenihan T.D., confirmed that the Government is drafting a Geothermal Energy Development Bill. The Bill will allow for the licensing of companies to explore for and develop deep geothermal energy resources. This will facilitate the development of a new and exciting sector within the sustainable energy area. The General Scheme of the Bill was approved for drafting by the Government at its meeting on 13 July and, together with a draft Regulatory Impact Analysis, is now available on the website of the Department of Communications, Energy and Natural Resources (see link at end of item).

Minister Lenihan said *“this bill will continue the process of moving Ireland towards a sustainable energy environment. Geothermal energy is natural renewable heat that can be used as an alternative to fossil fuels to heat our homes and businesses, either on its own or in combination with other energy sources.*

The Bill will deliver on commitments in last October’s Renewed Programme for Government, which recognised the necessity to stabilise and begin to reduce greenhouse gas emissions. It is also an important step towards reaching the challenging target set by the EU of delivering 16% of our energy from renewable sources by 2020.”

The corresponding target for heat is 12% and it is expected that geothermal energy will contribute significantly towards delivering on this target. The Minister hopes that the introduction of a regulatory framework for the exploration for and development of deep geothermal resources here will facilitate industry in helping Ireland reach its targets and in attracting inward investment to an important renewable energy source.

The Minister said, *“I look forward to taking a lead in ensuring that geothermal energy will facilitate a dynamic progression of new technology and innovation in Ireland’s heat sector in the coming years”.*

Once drafting of the Bill has been completed in the Office of the Attorney General, the Minister will seek

Government approval for immediate publication of the final text and initiation in the Oireachtas.

The Minister went on to stress that geothermal energy is a new area of legislative endeavour in this jurisdiction and that the Bill is likely to be substantial, dealing with a range of matters such as ownership of the resource, regulation and licensing of exploration and development, ancillary rights and protection of third party interests. The Department has engaged closely with industry and interested parties in a series of meetings and workshops to ensure that the legislative proposals have the benefit of their input. The Bill Heads have been published on the website of the Department of Communications, Energy & Natural Resources at this link:

<http://www.dcenr.gov.ie/Natural/Exploration+and+Mining+Division/Public+Consultation+Process+on+Geothermal+Energy+in+Ireland.htm> .

Hungarian Red Mud Spill & Aughinsh Alumina

In October most of you will have followed the news of the spill from the bauxite-processing red mud disposal facility near the small Hungarian village of Devecsery. What many of you may not know is that Aughinsh Alumina in Co Limerick (EPA IPPC Licence Register P0035-04) is the largest bauxite processing facility in the EU and it too has an associated bauxite residue disposal area (BRDA) covering 180 hectares (approximately 230 times the size of Lansdowne road pitch).



Looking over the northern retain wall of the BRDA to the Aughinsh plant (Shannon estuary on left)(Photos JDerham)

The combined disposal capacity of the BRDA is 20,000,000 tonnes. Approximately 2 t of red mud

and sand waste is produced for every 3 t of Alumina produced at the facility.

The abstraction of alumina from bauxite ore is carried out by the Bayer process which involves the digestion (dissolution) of Aluminium hydrate ($\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) out of the bauxite under pressure in high temperature (245 - 255 °C) sodium hydroxide. Insoluble materials, mainly sand and red mud (mainly oxides of iron, aluminium and titanium), are separated by filtration washed and deposited in the on-site landfill, the BRDA.



Looking west over the mud stack from the Aughinish plant site (straw on mud in foreground reduces dusting; dumpers carry salt cake to disposal area)

It is important to note that the recently introduced EU Directive on Extractive Waste Management (2006/21/ED) also covers facilities like Aughinish who directly process ore despite the fact that the processing facility is far removed from the bauxite mine located in the Southern hemisphere.



Mud discharge spigots and fresh flow at Aughinish Alumina

The red mud is pumped to the BRDA as a thickened slurry or tailings, and is spread on the surface from

fixed discharge points (spigots). The moisture content of the red mud is about 75%. The mud can be directed into selected areas of the BRDA by a rotating spigot at the end of the discharge points

The Limerick facility differs in a number of significant ways to the Hungarian facility;

- Use of thickened mud deposition process
- Use of double containment (perimeter permeable wall, lined perimeter drain and lined external perimeter wall)
- Use of composite liner design (HDPE on clay/GCL)
- Use of international geotechnical and reservoir/dam structure specialists to review design, construction and operational phase of the facility.

These aspects are in addition to the extensive monitoring programme for the facility, including stability.

More information:

<http://www.epa.ie/terminalfour/ippc/index.jsp?disclaimer=yes&Submit=Continue>

Search under 'A' for Aughinish Alumina, current licence register P0035-04

Attention contaminated land and water workers, see EUGRIS Web Resource

<http://www.eugris.info/index.asp>

EUGRIS is a web portal offering information and services on topics related to soil and water. EUGRIS operates as a community of collaborating projects, people and organisations who co-operate to supply information for the benefit of everyone and also to promote themselves and disseminate their work.

You will find the following useful information on the EUGRIS website:

- More than 80 general technical information zones related to soil and water
- Six country contaminated land and water management information zones
- 3823 resources (document, software, hardware and web site listings)

- 59 funding programmes listings
- 325 R&D project listings
- 476 organisations listings
- 398 current news items as well as conference / training listings
- A glossary of 506 terms, often linked to national definitions and translations

New BS/ISO Soil Standards

BS ISO DIS 12404 Soil quality — Guidance for the selection and application of screening methods

The ISO Committee Draft International Standard cited above has been published for Public Comment. Comments are due with BSI by 31 December 2010.

This proposed international standard provides guidance on the selection and application of screening methods for assessing soil quality. Guidance is given to choose an appropriate screening method for specific parameters and defines the conditions under which they can be used.



ISO DIS 11504: Soil quality — Assessment of impact from soil contaminated with petroleum hydrocarbons

The ISO Committee Draft International Standard cited above has been published for Public Comment. Comments are due with BSI by 28 February 2011.

This International Standard provides guidance on the choice of fractions and individual compounds when carrying out analysis for petroleum hydrocarbons in soils, soil materials and related materials including sediments for the purpose of assessing risks to human health, the environment and other possible receptors.



ISO DIS 15009: Soil quality - Gas chromatographic determination of the content of volatile aromatic hydrocarbons, naphthalene and halogenated hydrocarbons - Purge and trap method with thermal desorption

The ISO Committee Draft International Standard cited above has been published for Public Comment. Comments are due with BSI by 31 December 2010. This International standard is applicable to all types of soil. If this document is published as standard it will replace BS ISO 15009:2002.



ISO/DIS 11916-1: Soil quality — Determination of selected explosive compounds – Part 1: Method using high-performance liquid chromatography (HPLC) with ultraviolet (UV) detection.

ISO/DIS 11916-2: Soil quality — Determination of selected explosive compounds – Part 2: Method using gas chromatography (GC) with electron capture detection (ECD) or mass spectrometric detection (MSD)

The ISO Committee Drafts cited above have been published for Public Comment. Comments are due with BSI by 28 February 2011.



If anyone would like copies of any of these draft standards please contact:-

michael.a.smith@btinternet.com

www.michael.a.smith.btinternet.co.uk

Please note that there is a prescribed format for comments. These should be sent to: bernard.shelley@bsigroup.com by the dates specified.

EU executive sticks to its position on cyanide ban

More than one hundred environmental groups from across Europe have written to European Environment Commissioner Janez Potočnik calling for a "transparent and balanced" consultation process to be conducted regarding a European Parliament resolution on cyanide mining passed earlier this year. The resolution – one of the strongest ever passed in the European Parliament on an environmental matter

– called on the European Commission to propose a general ban on the use of cyanide mining technologies in the European Union by 2011.

In July, Potočník rejected the resolution, arguing that existing EU legislation should be sufficient to ensure the safety of cyanide mining operations. Environmental groups criticised the Commissioner's verdict which was arrived at without open public discussion but involved (allegedly) concerted industry lobbying.

The green groups are accusing the commission of a "whitewash". Mr Potočník's department has extensive evidence showing that the legislation is not working, they argue. A commission spokesperson insisted alternatives to cyanide use for gold extraction are either more damaging or not affordable.

A full ban would result in the closure of existing safe mines mainly in Sweden and Finland, the spokesperson added. The commission says the 2006 mining waste directive has the strictest limit values in the world for cyanide residues storage. The law also requires the use of best available technologies.

Follow Up:

<http://www.bankwatch.org/newsroom/releases.shtml?x=2257385>

Carbon Sequestration in Soil

[Policy Relevant Research Article]

The world's soils have the potential to store about 3,000 megatonnes of carbon per year by the end of the 21st century, according to a new study. It suggests that restoring carbon to cropland and peat soils through practices such as afforestation and no-till farming could help solve global problems of food insecurity and climate change.

The loss of soil organic carbon (SOC) can be remedied using recommended management practices (RMPs), such as afforestation, conversion of degraded and marginal cropland to pasture, no-till farming, use of compost/manure and crop rotations. Using figures on carbon sequestration gained by different practices, the study estimated that, depending on soils and climate, the potential of these RMPs for the next 50 to 100 years is in the range of 100-1000kg of carbon per hectare per year. On a

global scale, this could translate to as much as 3,000 megatonnes a year. Not only would this improve the state of soils and food security but, according to previous research, it could also reduce atmospheric CO₂ by 50 parts per million by 2100.

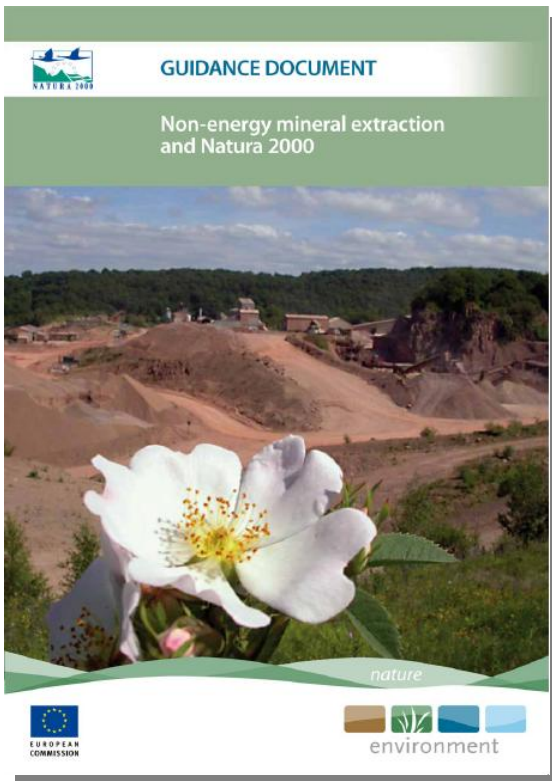
The study investigated the potential impact of this restoration of soil SOC on crop yield. By pulling together information on the relationship between SOC in the root zone and crop yield in various parts of the world, the study concluded that SOC tended to contribute more to productivity in soils that were coarse, poor quality, received low rates of chemical fertilisers and were rain fed rather than irrigated. Depending on climate and other variables, it estimated the proposed increase in SOC could increase cereal and grain legume production in developing countries by 32 million tonnes per year, and roots and tuber production by nine million tonnes per year.

Source: Lal, R. (2010) Beyond Copenhagen: mitigating climate change and achieving food security through soil carbon sequestration. *Food Security*. 2:169-177.

Extractive Industries & Protected Natural Areas – New EU Guidance

In October the European Commission published new guidelines to clarify rules for extractive industries in protected natural areas.

As demand for precious raw materials grows, access to land available for mineral extraction in the EU is becoming ever more important. Some minerals are found on land within Natura 2000 sites (the EU's network of protected natural areas) and the new guidelines explain the procedures to be followed in such cases. The economic implications are high. The industry in question has a turnover of around €49 billion and provides employment for more than a quarter of a million citizens. Natura 2000 is a crucial tool in the challenge of biodiversity loss, and it does not exclude human activities. On the contrary it is a flexible scheme that allows mining and quarrying provided they are sustainable in all respects, and are carried out without compromising the integrity of the network.



http://ec.europa.eu/environment/nature/natura2000/management/docs/nee_i_n2000_guidance.pdf

In a joint statement, European Commission Vice-President Antonio Tajani, in charge of Industry and Entrepreneurship and Janez Potočnik, European Commissioner for the Environment said: *“These new guidelines will give Member States and industry clarity regarding the undertaking of non-energy extractive activities in accordance with Natura 2000 requirements. There is no change of legislation or policy, but merely guidance on existing law. Our central aim is to meet the needs of industry, while avoiding adverse effects on wildlife and nature. The guidelines ensure the proper implementation of the EU ‘Habitats’ and ‘Birds’ Directives.”*

The guidelines relate to Non-Energy Extractive Industry and the potential impacts of extraction activities on nature and biodiversity. They examine how these can best be minimised or avoided altogether, and highlight the importance of strategic planning, the appropriate assessment of new developments, and the need for adequate mitigation measures. The guidelines contain many examples of best practice, and show how some extraction projects are ultimately beneficial to biodiversity, as they can provide highly quality ecological niches.

Mineral resources are spread unevenly across the EU as they reflect geology rather than political frontiers. As extraction can only take place where deposits are commercially viable, some plans and projects come into conflict with competing land uses and broader societal interests, including Natura 2000 sites.

Natura 2000 is the centrepiece of EU nature and biodiversity policy. It is an EU-wide ecological network of nearly 26,000 sites in the 27 EU countries, established under the 1992 Habitats Directive and covering almost 18 per cent of the EU’s land area. The aim of the network is to assure the long-term survival of Europe’s most valuable and threatened species and habitats. Natura 2000 is not a system of strict nature reserves where all human activities are excluded: though the network will certainly include state owned nature reserves, most of the land is likely to continue to be privately-owned and the emphasis will be on ensuring that future management is sustainable, both ecologically and economically.

For the extractive industry in Ireland, information on designated Irish nature and Natura2000 sites see:

<http://www.npws.ie/en/> and

<http://www.environ.ie/en/Publications/Heritage/NatureConservation/FileDownload,2183,en.pdf>

More information:

EU Biodiversity Policy at:

http://ec.europa.eu/environment/nature/index_en.htm

Plant Protection Products in Groundwater
[Policy Relevant Research Article]

A recent study has investigated the effectiveness of the EU concentration limit for Plant Protection Products (i.e., agricultural pesticides) in protecting groundwater ecosystems. In the EU, the quality of groundwater is protected under the Water Framework Directive (2000/60/EC). However, the current assessment of the risk to groundwater from Plant Protection Products (PPPs) is based on threshold values determined for the purpose of using groundwater as a source of drinking water. These do not take into account the potential ecotoxicological

effects of PPPs on the groundwater ecosystem. This contrasts with the risk assessment of surface waters which considers the safe limits for drinking water in addition to the toxicity of the PPPs to the aquatic ecosystems.

In this study, a three-tier approach was used to establish criteria based on ecotoxicological data to protect groundwater ecosystems from the impact of all PPPs registered for use in the EU and which are considered to pose a health or environmental risk (as listed in Annex 1 of the Plant Protection Products Directive 91/414/EEC).

Follow up and reference documents:

<http://ec.europa.eu/environment/integration/research/newsalert/pdf/207na5.pdf>

New index describes overall toxicological risk of a contaminated site or pollutant management facility

[Policy Relevant Research Article]

A new index that condenses the overall environmental impact of pollutants at a particular site into a single value has been developed. This unique number captures the health status of the territory in terms of the risk of the pollutants to animals and plants in ecosystems, human health and the long-term fate of the pollutants in the environment.

An environmental index is used to summarise complex environmental information in a single value. In the case of assessing the potential risk of toxic chemicals at a particular site, it is important to capture the local impact of the pollutants on human health and all parts of the environment, including water, soil, sediment and the air.

Researchers, partly funded by the EU RISKCYCLE project (see references) have developed the Ecotoxicological Risk Index for a Chemical Assessment (ERICA). A database, holding physical and chemical properties and toxicity data derived from experiments or predictive models, was compiled for 186 potentially harmful chemicals.

It is recommended that a minimum of 19 priority toxic substances (likely to be found in water, soil, sediment and the air) are included when each ERICA value is compiled. The 19 chemicals include toxic metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, particulate matter (PM2.5 and PM10), nitrogen oxides, carbon monoxide and ozone, amongst others. Other specific pollutants, identified during initial sampling and analysis of the site under investigation, should also be included.

In compiling ERICA, the physico-chemical properties of each pollutant are combined with the toxicity of the pollutants to human health and to plants and animals in ecosystems. The risk to human health is assessed in terms of both toxic (but not cancer-causing) and cancer-causing impacts. In addition, the longer-term transport and fate of the pollutants are incorporated to arrive at a single number which describes the environmental quality of a specific area, including possible future risk posed by the pollutants. The index can be used by policy makers and managers in risk assessment strategies and monitoring of sites, particularly potentially hazardous areas such as landfills.

The researchers highlight the benefits of ERICA, including the use of a concise and transparent method, based on clear criteria, to arrive at the index; the ability to present an overall picture of the health of a territory; the use of the index to monitor the long-term health of a site; and the ability to be used in cases where there is little data - ERICA can use models to predict potential impacts of pollutants.

Follow up and References:

Borioni, E., Mariani, A., Baderna, D., et al. (2010) ERICA: A multiparametric toxicological risk index for the assessment of environmental healthiness. *Environment International* **36**: 665–674.

The RISKCYCLE Project (Risk-based management of chemicals and products in a circular economy at a global scale) was supported by the European Commission under the Seventh Framework Programme www.wadef.com/projects/riskcycle

Welsh Mine Site Clean-Up Pilot

The Environment Agency in Wales is claiming to have started a 'unique' pilot scheme to stop toxic metals getting into water courses around a former mine at Cwm Rheidol near Aberystwyth.

The mine has historically discharged large amounts of zinc and other metals into the River Rheidol which means it is failing to meet the 'good' water quality standards required by the European Union's Water Framework Directive. Toxic metals will be stripped out of the mine water before it enters the River Rheidol, using an environmentally friendly method that requires no energy source apart from gravity.

The treatment system will use a mixture of waste products, including cockle shells and compost, to encourage natural biological and chemical processes that clean the mine water. Similar methods have been successfully used to remove iron from coal mine waters, but this is the first time the method has been used to remove zinc and other metals from abandoned metal mines, which are numerous in West Wales.

The pilot scheme, if successful could be used elsewhere in Wales, the UK and other countries to treat water that has been polluted from abandoned metal mines, with minimal cost to the environment. Senior environment officer with Environment Agency Wales, Paul Edwards, said:

"The work being done at Cwm Rheidol could also mean good news for other parts of Wales that suffer similar mine water pollution problems. Innovative projects like this one at Cwm Rheidol will help us achieve the challenging targets set by the Water Framework Directive."

Legislation Update

Waste

In November the Department of the Environment, Heritage & Local Government published its proposed legislation transposing the new Waste Framework Directive in Ireland.

Significant changes to national waste management law are proposed.

Follow up:

<http://www.environ.ie/en/Environment/Waste/WasteMgmtPublicConsultations/>

The CRONEBANE HALFPENNY

Around 28 years ago while I (your editor) was on a break in Holland, I had occasion to visit an enormous flea market somewhere near Amsterdam. Amongst the huge variety of stalls was one selling old coins. I sifted through the modest Irish collection and came across the following 220 year old 28mmØ coin...



In itself this is not remarkable, however the reverse side was - especially to me a young geologist interested in mining (see next plate). Around the outside of the reverse face of the coin the text reads ASSOCIATED IRISH MINE COMPANY, and there is a central design bearing a windlass (manually operated shaft winch) above a shield bearing the company's coat of arms displaying two spades, three picks and a horn of gun powder for blasting. It is dated 1789.

So what is the history of this old coin or mine token? I only recently rediscovered it in my box of 'odd stuff' collected over time (including WWII gas mask, hip

flask, army engineers field survey board, etc., - you know the sort of eclectic stuff big boys collect!), and have had only a brief opportunity to do some research.



Such commercial tokens were mass-produced during the late eighteenth century by many British companies at a time when there was a shortage in circulation levels of official coin of the realm. The halfpenny token illustrated here was issued by the Associated Irish Mine Company for payment to their employees who were principally engaged in copper mining activities in the Vale of Avoca.

At a time of rapid industrial growth in Britain's economy it was important for concerns like the Associated Irish Mine Company (AIMC) to have a plentiful supply of "ready cash" to meet the demands of their growing business ventures. Despite calls from many quarters for the Royal Mint to produce new copper coin issues, the British government was reluctant to act. As a result the captains of Britain's Industrial Revolution were forced to enter into contracts with private mints to produce the coinage that they so desperately needed.

The Associated Irish Mine Company (AIMC) was established c.1787 by Abraham Mills (who was later to become Company Chairman), William Roe, Thomas Weaver the elder, Thomas Smith, Charles Caldwell and Brabazon Noble. The company's principal concerns were in copper mining in the Wicklow Hills. The official offices of the company were located at 184, Great Britain Street, Dublin.

The AIMC's premier mine was located at Cronebane, across the river from Ballymurtagh, about two miles north of the present village of Avoca. The company had a second mine half a mile south of Cronebane at Tigrony.

The tokens of the AIMC were extremely prolific and they, together with those issued of the Hibernian Mine Company (HMC), formed the basis of Ireland's currency during the late eighteenth and early nineteenth centuries. This shows how readily exchangeable and accepted such commercial tokens became. This is quite in contrast to the more limited mining "Truck" or "Tommy Shop" token issues which were also a feature of Britain's Industrial Revolution. There are at least thirty varieties of the Cronebane halfpenny recorded many of their differences being very trivial. A further twenty-four contemporary counterfeit type and twenty die mules are also known. Issue dates range from 1789 to 1796. Among the counterfeits may be mentioned pieces bearing different dates, or no date; a different take on the legend, e.g. 'ASSOCIATED IRISH MINERS ARMS'; and with a variety of edge inscriptions.

I should also note that the 'edge' of the coin (part you see when you look at it flat) has an inscription stating 'PAYABLE AT CRONEBANE LODGE OR IN DUBLIN': this being a reference to those places (i.e. the AIMC's head office in Dublin and at Cronebane Miners' Lodge) where the halfpenny tokens were exchangeable, in sufficient quantity, for official coin or notes of the realm. I should also add that it is assumed that the 'bishop' on the face of the coin is St Patrick.

So I had stumbled upon a 250 year old 'find' in Amsterdam with lots of Irish mining history. But alas, because of the wide circulation of these tokens/coins they would seem to be easy to obtain at a good price (even on eBay!). If anyone has other information on its history I would be delighted to receive same.

Information sources (with thanks!):

<http://miningartifactsii.homestead.com/scriptokens.html>
<http://www.mining-memorabilia.co.uk/AIMC.htm>

UCD Fault Analysis Group win Innovation award

The fault analysis research group attached to the UCD School of Geological Sciences was given a NovaUCD 2010 Innovation award in September. The award was presented in recognition of its successes in the establishment of collaborative research links with global industry partners and in acknowledgement of its successful commercialisation activities. The Fault Analysis Group, which includes 13 researchers, is recognised as one of the leading international teams studying the geological and engineering properties of faults and in applying its research outputs to solve problems encountered in hydrocarbon and mineral exploration.



Dr. Tom Manzocchi, Dr. Conrad Childs and EurGeol Professor John Walsh PGeo, Joint Directors of the Fault Analysis Group

Since 2000, when the Group relocated from the University of Liverpool to UCD, it has been awarded €6 million in research funding, secured predominantly from industry partners, including British Gas, Shell, Statoil and Tullow Oil. The Group has also received funding from Enterprise Ireland, IRCSET, Science Foundation Ireland and the European Union.

Dr Pat Frain, director, NovaUCD said, *“The presentation of this year’s award is particularly timely in that it recognises the role played by the Group over several years in developing long-term strategic partnership with industry. Such partnerships are critically important in facilitating the successful commercialisation of university research and maximising its contribution to innovation.”*

Follow up:

<http://www.ucd.ie/nova/mediacentre/2010pressreleases/novanewstitle,63249,en.html>

Long Term Storage of CO₂

[Policy Relevant Research Article]

Capturing and storing CO₂ emitted from power stations or directly from the air is considered to be a feasible way to combat climate change. However, the selection of storage sites will have crucial implications regarding how effective and safe the long-term storage of the CO₂ will be, as CO₂ could leak back into the atmosphere from storage sites.

A recent study has examined the implications of CO₂ leaking from storage sites under a variety of scenarios over 100,000 years. The findings suggest that ocean storage of CO₂ (prohibited in the EU) would lead to long-term warming of the atmosphere, higher sea levels and acidification and dead zones in the ocean. In contrast, **geological storage** with low-leakage rates (one per cent per 1,000 years) would lead to conditions similar to a low-emissions future. This implies that selection of low-leakage sites is key to long-term climate stability.

The study took business-as-usual fossil fuel use as its basis, but with emissions sequestered so as to match a low-emission trajectory with global warming peaking at 2°C. This projects much greater use of geological sequestration than usual; carbon capture and storage (CCS) is usually considered as just one of a range of mitigation options, including energy efficiency and increased use of renewables. The study analysed the consequences of a range of CO₂ leakage scenarios from this very large-scale sequestration over the next 100,000 years. It considered leakage from different storage sites: deep in ocean waters, in marine sediments on the floor of deep oceans and in naturally occurring geologic underground sites found both on land and offshore. Future scenarios were based on the continued use of fossil fuels but with full CCS and varying leakage rates.

The study suggests that, for geological sequestration on the scale proposed, CO₂ would have to be stored

for tens of thousands of years if global warming is to be delayed and other major environmental changes such as ocean dead zones are to be avoided. This exceeds previous estimates that CO₂ must be stored for 4,000 years to be effective and would entail the use of low-leakage sites. An alternative option would be to re-sequester CO₂ that has leaked from higher-leakage sites. However, apart from difficulties in matching leakage rates with re-sequestration rates, the study suggests this approach would place a burden on future generations for many thousands of years, comparable with problems associated with the long-term management of nuclear waste.

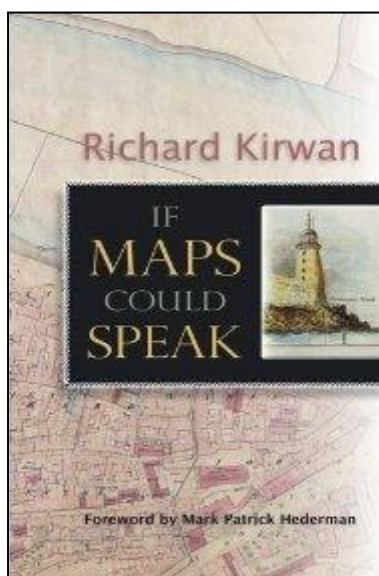
The policy implication of the analysis is that careful selection of geological storage sites is needed to ensure low-leakage rates, thus avoiding the long-term consequences of CO₂ leaking from storage in the future.

Follow up and more information:

http://legalelectric.org/f/2010/06/shaffer_long-term_ccs_leakage100627.pdf

New Book 'If Maps Could Speak'

Maps hold a fascination for many people, and for geoscientists in particular it is my experience that many a happy hour can be lost in poring over maps. No geoscientist holiday is complete (or indeed can commence!) without the map.



A recent publication of *If Maps Could Speak* written by Richard Kirwan, who is a former Director of the Ordnance Survey of Ireland, may be just the stocking filler many of you would like this Christmas.

Map-making is a fascinating subject and Richard has an easy style that shares a deep love of the topic with significant involvement as the OSI moved from older cartographers into the late 20th century application of photographic and digital computer technology and computerisation. The book is also a personal reflection on career through the army (only point of access to the OSI at the time), Public Service and family.

Publisher: Londubh Books **ISBN:** 1907535098

Environmental Tools Directory – Internet Resource

<http://www.environmenttools.co.uk/>

<http://www.environmenttools.co.uk/directory/search>

Listing over 400 green accounting tools, the Environment Tools Directory is stated to be the largest up-to-date and independent database of environmental software tools anywhere on the web. Each of the tools are classified into a number of categories.

Nuclear waste: European Commission proposes safety standards for final disposal

In November the European Commission proposed a new Directive detailing safety standards for disposing spent fuel and radioactive waste from nuclear power plants as well as from medicine or research. In the new Directive Member States are asked to present national programmes, indicating when, where and how they will construct and manage final repositories aimed at guaranteeing the highest safety standards. With the Directive internationally agreed safety standards become legally binding and enforceable in the European Union.

Energy Commissioner Günther Oettinger said: "Safety concerns all citizens and all EU countries, whether they are in favour or against nuclear energy. We have to make sure that we have the highest safety standards in the world to protect our citizen, our water and the ground against nuclear contamination. Safety is indivisible. If an accident happens in one country, it can have devastating effects also in others."



The Commission proposes to set up an EU legally binding and enforceable framework to ensure that all Member States will apply the common standards developed in the context of the International Atomic Energy Agency (IAEA) for all stages of spent fuel and radioactive waste management up to final disposal.

In particular the Directive establishes that:

- Members States have to draw up national programmes within four years of the adoption of the Directive. These should include: plans for the construction and the management of disposal facilities, laying down a concrete time table for the construction, with milestones and the description of all the activities that are needed to implement the disposal solutions, costs assessments and the financing schemes chosen.
- National programmes have to be notified. The Commission may ask Member States to modify their plans.
- Two or more Member States can agree to use a final repository in one of them. It is not allowed to export nuclear waste to countries outside the EU for final disposal.

- The public must be informed by Member States and should be able to participate in the decision making on nuclear waste management.
- Safety standards drawn up by the International Atomic Energy Agency become legally binding. This includes an independent authorities which grants licences for building repositories and checks the safety analysis for each individual repository.

More than 50 years after the first nuclear power reactor became operational (1956 Calder Hall, UK) there are still no final repositories. Year by year, 7,000 cubic meters of high level waste are typically produced in the EU, with the majority of the material being stored in interim storages. High level waste is the part of reprocessed spent fuel which cannot be re-used and has therefore to be disposed forever.

While these interim storages are necessary for fuel elements and high level waste to reduce temperatures and to decrease radiation levels, they are no long term solution as they need continuous maintenance and oversight. As they are typically close or on the surface, there is in addition a risk of accidents, including airplane crashes, fires or earth quakes. **There is a broad consensus among scientists and international organizations such as the IAEA that deep geological disposal is the most appropriate solution for long-term disposal of high level nuclear waste.**



Construction of Posiva underground radioactive waste storage facility at Onkalo, Finland (courtesy of www.posiva.fi)

Out of 27 Member States, 14 Member States have nuclear power plants. Ireland, though not a nuclear power, does have low-volume legacy and orphan

low-level radioactive wastes such as those associated with industry, research and education. A range of sealed and unsealed radioactive sources are used in Ireland's post primary schools and research institutions for teaching purposes. These include sources in demonstration kits, electron capture detectors and check or calibration devices, containing small volumes of low activity sources. Sealed sources are widely deployed for a range of industrial applications such as industrial radiography, level, thickness and moisture gauges, in process control and for the irradiation of medical and food products. Industrial irradiators and radiography equipment typically contain Co-60 or Cs-137 sources with activities of up to several hundred TBq. Industrial gauges are mostly comprised of Co-60, Cs-137 or Am-241 sources with activities ranging from tens of MBq to a few hundred MBq.

These sources, which are at various locations, are currently under the control of the Radiological Protection Institute of Ireland (RPII). The new Directive also seeks to regulate this low-level radioactive material. The RPII has recommended (see reference) that a national storage facility for the interim storage and management of disused radioactive sources should be established, while final disposal options are explored. In addition, a high level inter-departmental group was established in 2008 (under the chairmanship of the Department of the Environment, Heritage and Local Government) to consider and advise Government on the best practice for the safe long term management of Ireland's radioactive waste materials, which is due to be presented to the Government in 2010.

Further information:

1. For more information please see also EU Commission Q&A document on safety standards [MEMO/10/540](#).
2. The proposal for a Council Directive on the management of spent fuel and radioactive waste is available on: http://ec.europa.eu/energy/nuclear/waste_management/waste_management_en.htm
3. RPII, Towards a Radioactive Waste Management Policy for Ireland, 2006
4. The IAEA safety standards: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1273_web.pdf

5. See also a UK Government publication on managing Radioactive waste at, <http://mrws.decc.gov.uk/>

Conferences

The 2nd Annual Brussels Carbon Capture and Storage Summit 2011 : Reaching demonstration and beyond - will the technology be ready for 2020?

26th January 2011 - Sofitel Europe, Brussels

A collaboration between Forum Europe and Bellona Europa, and supported by the CCSA, the 2011 Brussels CCS summit will seek to identify and explore in detail what can be done to clarify and progress the demonstration of CCS, focusing particularly on the issues of finance and regulation. The conference will pose the key question: will the technology be ready in Europe for 2020? Coming hot on the heels of the climate negotiations in Cancun, this conference will serve to deliver up-to-date details on what we can expect for CCS finance and regulation for the foreseeable future.

Registration is now open and can be completed online at www.ccsconference.eu. Please note that places are limited. The conference agenda and details on speakers are also available on the website. Alternatively, please call Kirstie Fagan on +44 (0) 2920 783 026 or email kirstie.fagan@forum-europe.com.



EUROPE MINING FORUM 2011 - 25 and 26 January, 2011. London, UK

The European Mining Sector is exploding with new developments. Several foreign investors are active especially in Norway and Sweden, exploring for gold, base metals and diamonds. Both the EU and local governments have realized that mining can be their prime source of driving the economy therefore they have been taking various initiatives in promoting mining as a major activity in the region.

Fleming Gulf's Europe Mining Forum 2011 aims to explore Europe's mining potential by aligning goals between governments & the extractive sector.

- Get an insight into what are the initiatives of EU and the local governments towards the Mining sector; legislations and policies
- Discuss the strategic importance of Raw Materials supply within the region
- Learn more about the environmental impact of the extractive activities and environmental policies
- Find out how technology plays a major role in overcoming various challenges in executing projects
- Discover how to exploit the underexploited – where is the potential?



The Transport and Fate of Groundwater Contaminants

9 February 2011, Burlington House, London

The Hydrogeology Group of the Geological Society of London is organising a one day meeting on Wednesday 9th February 2011 at Burlington House with the theme "The Transport and Fate of Groundwater Contaminants". The meeting intends to examine key transport and attenuation processes and current issues relating to contaminants in groundwater and how our perceptions and understanding of the problems and their solutions have progressed.

Follow up: <http://www.geolsoc.org.uk>



The European Raw Materials Conference 2011: Responding to the global race for raw materials

1st March 2011 - Le Chatelain All Suite Hotel, Brussels

The Inaugural European Raw Materials Conference will take place on the 1st March 2011 and is timed to coincide with the release of the European Commission's communication on Raw Materials. It will offer a forum for key stakeholders to set a road map for Europe's political and practical responses to the threats associated with the global race for raw materials.

Follow up: www.rawmaterials-conference.eu

Editors Note: See more on the EU raw materials initiative in IGI Newsletter #23 (Sept 2010), available at <http://www.igi.ie/publications/newsletters.htm>

IGI Workshop & Conference outputs

Keep an eye on the following linked page for IGI conference and workshop presentations.

<http://www.igi.ie/publications/Past-IGI-Conferences.htm>

Recent additions are the presentation from the May 2010 workshop on EU Directives and the Geosciences.

Photo-File



'Rock Buckling' or 'Erratic Goat' or 'Rock-a-Billy'

I could not decide, so chose for yourself!

Source: Photo by Lizzie Derham.

Please send a favourite geo- or env-picture to this spot.

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