Geology Matters

The Newsletter of the Geological Survey of Ireland
Nuachtlitir Suirbhéireacht Gheolaíochta Éireann
Issue No. 3, September 2005

Welcome to Issue Number 3 of the GSI Newsletter. As you can see from the title block we have a new title – **Geology Matters**. We hope that the new title better reflects what the newsletter is about and can become an important bulletin for airing matters in relation to geology.

Our feature GSI section for this issue is Bedrock. The principal goals of the Bedrock Section are to provide bedrock geological information to all sectors of the geoscience community and to those in need of such information at various scales, levels of detail, and specific sub-disciplines. Having just completed the 1:100,000 scale Map Report Series it is timely to review this fantastic achievement and to look forward to the future. There are important articles from all members of the section, so please have a read.

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We have a look at the Geological Survey of Northern Ireland's **Tellus** project. The project is, in summary, a countrywide geochemical and airborne geophysical survey designed to provide benefits to the environmental, resource and planning sectors. Work on the geochemical part of the project commenced last year while the geophysical work started this year. The article by Project Manager, Mike Young brings you right up to date.

Our agenda section also features Northern Ireland and reports on some of the areas where GSI has collaborated with the Geological Survey of Northern Ireland in recent times.

There is also our regular feature the Director's Discourse as well as a report on the fourth North Atlantic Minerals Symposium (NAMS), future meetings in which GSI has an involvement and some developments in the GSI. Please enjoy the read and do provide us with feedback.

New faces at the Senior Management Table

Following the retirement of Dr. Ralph Horne (Assistant Director) and the resignation of Mr. Michael Geoghegan (Principal Geologist) an internal competition was held to fill the vacancies arising. Following the selection process the following were appointed: Dr. Pat O'Connor (Assistant Director), Dr. Eibhlin Doyle (Principal Geologist) and Mr. Koen Verbruggen (Principal Geologist). We wish to congratulate them all on their promotions and wish them well in their new assignments. In the near future competitions will be held to fill the consequential vacancies at Senior Geologist level.

DR. RALPH HORNE RETIRES AS ASSISTANT DIRECTOR

Dr. Peadar McArdle, Director GSI

Dr. Ralph Horne's recent retirement was marked by a lively social event at Beggars Bush, with a wide range of people gathering to wish him well and acknowledge his sustained contribution to GSI. There were people from the geological community, colleagues both serving and retired as well as several members of Ralph's family present.

Ralph was born in Aberdeen, Scotland, where he graduated in geology. He then joined the British Antarctic Survey and this began a distinguished scientific career, unravelling the geological history of a previously unexplored region. He was awarded a PhD by Birmingham University for this work. Not only that, but the Horne Nunataks, on Palmer Land, were named for him.

He joined GSI in 1969, initially in the role of mapping geologist. His contribution to our knowledge of the geology of southwest Ireland is reflected in our maps and publications. His Guide to the Geology of Dingle, the first of its kind to explain geology to the wider public, has been a constant best-seller for GSI and paved the way for many subsequent outreach products.

Promoted to Principal Geologist in the late 1970's, Ralph took responsibility for technical aspects of mining and exploration. He provided advice to the Department on all relevant matters, established robust systems, protocols and standards, and presided over a very active period of mineral exploration in Ireland. He also undertook research on the origin of mineralization and he identified a set of regional transverse fractures, which have an abiding relevance to the origin of many deposit styles including the important carbonate-hosted zinc-lead deposits.

Ralph was appointed Assistant Director in 1981, only the fourth person to occupy this post. Over the next 24 years he clearly put his stamp on the job and acted as Officer-in-Charge for more than four years, while GSI had no Director. As budget manager he established sound management systems and developed a sound relationship with Departmental headquarters that has served GSI well over the years. Ralph also had effective responsibility for the role of chief operations officer, a post that absorbed his insightful and knowledgeable personality. He was also responsible for all support services, which are essential for successful productivity in a safe and healthy environment.

It was very clear at his retirement event that GSI was losing an Assistant Director who commanded the respect and affection of all his colleagues. We wish Ralph and his family a long and fulfilling retirement.

DIRECTOR'S DISCOURSE

Dr. Peadar McArdle, Director GSI

Moving and Shaking

The **Richter Scale** is a term we hear when there is report of an earthquake. But what is the Richter Scale? **Seismology** is the study of earthquakes and seismic waves. **Seismic waves** are the waves of energy caused by the sudden breaking of rock within the earth or an explosion. They are the energy that travels through and around the earth. A **seismologist** is a scientist who studies earthquakes and seismic waves.

Charles F. Richter, a seismologist in California, devised the Richter Scale in 1935. It was originally devised to describe the magnitude (or size) of an earthquake in California but it is now used all over the world. The magnitude of an earthquake is a measure of the amount of energy released. Each earthquake has a **magnitude** assigned to it. This is based on the amplitude of seismic waves measured at a number of seismograph sites, after being corrected for distance from the earthquake. Magnitude estimates often change by up to 0.2 units, as additional data are included in the estimate.

Although each earthquake has a **magnitude**, its effects will vary greatly according to distance, ground conditions, construction standards, and other factors. The scale is given in Table 1.

Richter Magnitude	TNT* for Seismic Energy Yield	Example (approximate)
-1.5	200g	Breaking a rock on a laboratory table
1.0	13kg	Large blast at a construction Site
1.5	150kg	
2.0	1 tonne	Large quarry or mine blast
2.5	4.6 tonnes	
3.0	29 tonnes	
3.5	73 tonnes	
4.0	1,000 tonnes	Small nuclear weapon
4.5	5,100 tonnes	Average tornado (total energy)
5.0	32,000 tonnes	
5.5	80,000 tonnes	Little Skull Mountain, Nevada Quake, 1992
6.0	1 million tonnes	Double Spring Flat, Nevada Quake, 1994
6.5	5 million tonnes	Northridge, California Quake, 1994
7.0	32 million tonnes	Hyogo-Ken Nanbu, Japan Quake, 1995; largest thermonuclear weapon
7.5	160 million tonnes	Landers, California Quake, 1992
8.0	1 billion tonnes	San Francisco, California Quake, 1906
8.5	5 billion tonnes	Anchorage, Alaska Quake, 1964
9.0	32 billion tonnes	Chilean Quake, 1960
10.0	1 trillion tonnes	San-Andreas type fault circling Earth
12.0	160 trillion tonnes	Fault Earth in half through centre, OR Earth's daily receipt of solar energy

Table 1. The Richter Scale, together with the approximate amount of energy released and some examples or comparisons. *TNT is an explosive.

While 160 trillion tonnes of explosive is a frightening amount of energy, consider that the Earth receives that amount of energy in **sunlight** every day.

The Richter scale is logarithmic, that is an increase of 1 magnitude unit represents a factor of ten times in amplitude. The seismic waves of a magnitude 6 earthquake are 10 times greater in amplitude than those of a magnitude 5 earthquake. However, in terms of energy release, a magnitude 6 earthquake is about 31 times greater than a magnitude 5.

More understandable descriptions are provided in Table 2 as well as an estimate of the number of earthquakes of the relevant magnitude earthquake.

Magnitude	Earthquake Effects	Estimated Number Each Year
2.5 or less	Usually not felt, but can be recorded by seismographs.	900,000
2.5 to 5.4	Often felt, but only causes minor damage.	30,000
5.5 to 6.0	Slight damage to buildings and other structures.	500
6.1 to 6.9	May cause a lot of damage in very populated areas.	100
7.0 to 7.9	Major earthquake. Serious damage.	20
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.	One every 5 to 10 years

Table 2. Descriptions of the different types of earthquake and an estimate of the number of occurrences of each type each year.

GSNI'S TELLUS PROJECT GETS UNDERWAY

Mike Young, Manager, Tellus Project, GSNI

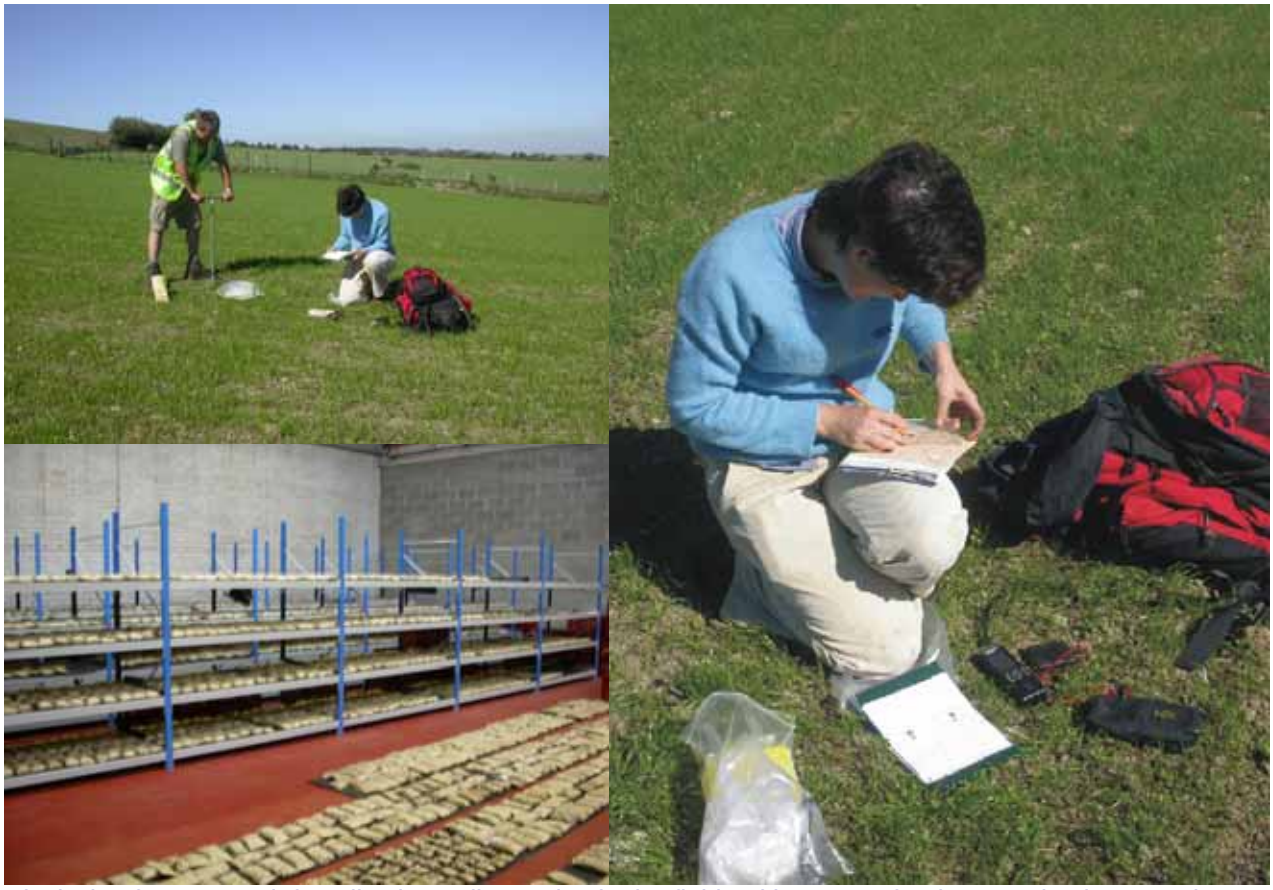
The Tellus Project is now well underway in Northern Ireland. This is the Northern Ireland component of RESI, the Resource and Environmental Survey of Ireland, conceived originally in the 90s as an all-Ireland project, by GSI, GSNI and BGS, with the USGS acting as catalyst. Finance for the Northern Ireland component was allocated by the Department of Enterprise, Trade and Investment (DETI) in 2003 and work started in May 2004. Cost-benefit studies for RESI (by University College Dublin) and for Tellus (by PricewaterhouseCoopers) both identified major benefits to the economy and the environment.

The principal components of Tellus are geochemical surveys and a low-level airborne geophysical survey, both covering the whole land area of Northern Ireland. Previous surveys of more limited scope have contributed significantly to mapping and mineral development. The new surveys will provide greater detail and higher resolution. Geological mapping, mineral exploration and environmental monitoring in Northern Ireland will all benefit from the new initiative. The goals of the project have been defined as:

- To advance the development of Northern Ireland's natural resource industry through new discoveries and provide the basic geological data and framework for decision-making and development planning;
- To provide a baseline of information against which to measure future environmental change;

- To contribute to sustainable land-use planning decisions by detecting and mapping geological conditions that may be associated with natural hazards and land drainage;
- To detect and map certain forms of industrial and agricultural contamination and the conditions under which these might develop;
- To help government to comply with the requirements of legislation on the assessment and monitoring of natural resources, soils and waters, including European Directives.

The geochemical survey will establish the natural geochemical baseline signature and any anthropogenic overprint. This is a multi-media survey of soil, stream-sediment and stream-water samples in both rural and urban areas. Soils and streams are sampled at approximately one site per 2 km^2 to the specification of the British Geological Survey's Geochemical Baseline Survey of the Environment (G-BASE) standard.



Clockwise from upper left: collecting soil samples in the field; taking notes for the sample site; sample storage prior to being sent for analysis.

Soil samples are taken from two depths (20cm and 50cm) at each site to provide an insight into vertical geochemical variations. Urban soils will be sampled at a distribution of four sites per km^2 and will be analysed for inorganic and organic compounds. The rural soils survey began in the summer of 2004, when most of western Northern Ireland was completed. Sampling continued through the winter of 2004/5 and is currently underway in Cos. Antrim, Down and Armagh. Soil sampling in rural areas should be completed by the end of 2005 and the urban work by mid-2006.

The stream sediment sampling is an extension of a regional survey begun by the BGS in the 90s, when western Northern Ireland was sampled on behalf of the Department of Economic

Development and the Department of Environment. This work will be completed in the east during this summer field season.

Soil and stream sediment samples are being analysed for more than 50 elements by XRF and ICP-MS/ AES, and for platinum group elements by lead fire-assay. Soils are also analysed by aqua regia digest ICP-MS. Waters will be analysed by ICP-MS and ion chromatography. Contracts for the analysis have been awarded to BGS, SGS Minerals and Alcontrol.

The airborne survey is being flown by the Joint Airborne-geoscience Capability, a newly formed technology partnership between the BGS and the Geological Survey of Finland (GTK). BGS has acquired GTK's De Havilland Twin Otter aircraft, which has already been used to survey much of Finland. The aircraft is equipped with magnetometer sensors on each wing-tip, a 256-channel gamma-ray spectrometer, a frequency-domain electromagnetic system, a laser altimeter and GPS navigation system. The main line direction is 345/165º and line spacing is 200m. Nominal ground clearance is 56m over rural areas and 250m over urban districts. Lines extend 1km into the Republic of Ireland, as authorised by the Irish Aviation Authority.

Clockwise from top left: the magnetic and electromagnetic sensors on the wing tip of the aircraft; the radiometric sensors inside the aircraft; recording and operations inside the aircraft; and post survey processing.

The last regional geophysical survey of Northern Ireland was a total-field aeromagnetic survey flown at 2km line spacing for the BGS in 1959-60. The magnetic anomaly maps revealed regional and local faults and fractures, and delineated prominent magnetic lithologies, results which are described in GSNI's publication 'The Geology of Northern

Ireland' (2004). The new magnetic survey, flown at one-tenth of the line spacing and at lower altitude, will resolve more detailed magnetic textures, which will assist structural and lithological mapping, particularly in areas covered by glacial materials. The radiometrics will further support geological and soils mapping and provide a detailed base-line on natural and artificial radionuclide distribution. The four-channel EM system will map variations in electrical conductivity in the upper 30m and contribute to both mineral exploration and environmental mapping.

The airborne survey, based at Enniskillen, started in July 2005 and at the time of writing most of Cos. Fermanagh and Tyrone have been covered. Early results show greatly improved definition in the magnetics, and different lithologies and structures are defined by radiometrics and EM conductivity. The Fermanagh Dyke swarms are particularly well defined in these early images. Survey will continue this year until October and begin again next spring, with a view to completion by midsummer 2006.

Data will be made available under licence to academic and commercial users. Existing data are already licensed to mining companies and the project is expected to promote further mineral exploration. 2003 and 2004 saw a substantial increase in mineral exploration licensing in Northern Ireland and the area under licence or application is now at its highest level since 1991.

The survey will establish baseline geochemical and physical characteristics of soils and streams and provide a context for evaluating environmental change. Mapping vital trace elements in agricultural soils and surface waters and measuring levels of natural and artificial contaminants in agricultural and urban areas will contribute significantly to land-use planning. The airborne EM and radiometric surveys will also contribute to mapping certain classes of ground conditions, notably ground and groundwater salinity, acid ground conditions and radon susceptibility.

A substantial programme of public information is underway to raise public awareness of Tellus and its value for planning and development. In addition to presentations to government departments, local councils and environmental organisations, several innovative events and initiatives have generated a wider interest in geology and the environment in schools and colleges throughout Northern Ireland.

AGENDA

Collaboration Between GSI and GSNI

Peadar McArdle[1] and Garth Earls[2]

1. Director, Geological Survey of Ireland.
2. Director, Geological Survey of Northern Ireland.

Co-operation between the Geological Survey of Ireland (GSI) and the Geological Survey of Northern Ireland (GSNI) has always been high on the agenda of both organisations. However, in recent time this co-operation has increased. We each sit on the others Consultative Committees and recently there have been exchange business meetings to discuss areas of further collaboration.

As you will know geology does not recognise political boundaries and over the years both organisations have collaborated in exchanging information about the geology on either side of the border. This has led to improved understanding and knowledge on both sides. Much of

this contact has been informal. However, we have had more formal collaboration in recent times on several projects, some with funding from the EU.

Currently we are working on the final phase of the Bréifne project (see issue 2). The principal aim of the project is to develop a new, branded tourism destination, to be known as "Bréifne". It is envisaged that the brand will attract increased tourist numbers to the Region from the domestic and international markets, thereby leading to the creation of new employment and investment in the area.

Both organisations are also considering a range of other opportunities. These include:

- Bréifne: An extension to the current project.
- Landslides: The possibility of joint susceptibility mapping in the northern 12 county area.
- Mourne – Gullion – Cooley: To consider the preparation and publication of an outreach map for the general public.
- University field trips to Ireland: To consider a renewed marketing campaign to attract student field visits to the classic sites of geological interest in Ireland.
- Irelithos: For GSNI to consider involvement in this project (matching stone used in buildings with their original source).
- 1:500,000 scale map: Launch event in November, 2005.
- Aggregates: Possible Armagh – Monaghan aggregate potential mapping project.
- Mine wastes: Possible GSNI involvement with disused mine site inventory.

Both organizations are committed to the fullest co-operation. It is only by co-operating that we can fully understand our geology and contribute to the enhancing our environment and contribute meaningfully to sustainable development.

FEATURED SECTION: THE BEDROCK PROGRAMME

In this issue we feature the work of The Bedrock Programme. Led by Dr. Andy Sleeman the Bedrock section provides much of the fundamental information upon which the rest of the Survey relies. At present Andy leads a team comprising Dr. Brian McConnell, Dr. Sarah Gatley, Dr. Markus Pracht and Ray Scanlon. The articles here detail the important work of this section.

THE 1:100,000 BEDROCK MAP SERIES

Dr. Andy Sleeman
Head of Bedrock Mapping Section

The 1:100,000 Bedrock Map Series comprises 21 map sheets covering the whole of the land area of the Republic of Ireland and adjacent areas across the border into Northern Ireland. The last map in the series was published in 2003 and the last accompanying explanatory booklet is due to be published shortly.

The 1:100,000 series started in 1984, following a decision made the previous year to use the Ordnance Survey of Ireland (OSI) ½" topographic base on which to depict the geology. GSI had been promised 1:50,000 topographic base maps by OSI in the mid 1970s, but these had failed to materialise, so GSI had no other viable base map option on which to show the results of the detailed 6" field mapping programme that had been started by the Director, Dr. Cyril

Williams in 1967. By the early 1980s it had become crucial for the reputation of GSI to produce Bedrock maps, whatever the scale, as soon as possible.

Initially, it was decided that the geology would be published at ½" to the mile scale, but subsequently a decision was made to enlarge the OSI ½" base photographically to the nearest metric equivalent of 1:100,000.

Compilation of four maps was underway in the second half of the 1980s, namely Sheets 6 (North Mayo), 16 (Kildare – Wicklow), 19 (Carlow - Wexford), and 23 (South Wexford). It was intended that these would be published as full colour maps, produced by traditional cartographic methods within the GSI Cartographic Unit (along the same lines as maps published in the British Geological Survey) and printed at the Ordnance Survey.

Following the 1991 Review of the Geological Survey, speed of compilation and map production was emphasised, for the same reasons as in 1983, and a decision was made to produce the maps as black and white dyelines (similar to the 1:25,000 Bedrock Series which was first published in 1988), to hasten the completion of nationwide coverage. It soon became evident that it would be difficult to read the black and white linework maps with the amount of detail that it was intended to show. The decision to abandon 'quick & dirty' black and white maps in favour of digitally produced colour maps (using Autocad & ArcInfo output on a large Calcomp plotter) was made following a cost-benefit analysis and presentation in 1993 to the then Minister, Mr. Bobby Malloy T.D., of the advantages of digitally prepared colour maps. An extra sum of IR£60,000 was allocated at the time to purchase equipment towards a digital map production system (DMPS) in 1993.

The DMPS involved Bedrock geologists digitising the compilation maps in Autocad and transferring Autocad .dxf files to Cartography where they were imported into ArcInfo. Cartography then produced ArcInfo coverages so that the maps could be published by output to a Calcomp plotter in colour, with legends generated semi-automatically from Dataflex databases supplied by Bedrock Section, and imported into ArcInfo.

Part of the DMPS involved the development of a specific customisation of the software by Paradigm Technology Ltd. for GSI. This enabled the geologist to enter data from different sources onto different "layers" in the customisation. Each linetype and symbol type to be used in the series was defined and customisation supplied so that the linetype or symbol could be replicated automatically from a tablet menu and added to the correct layer.

At about the same time it was decided that each map should have an explanatory booklet published simultaneously. This was to be aimed at a wide market, and so the geology was to be described not only for geologists but also for other specialists, or the interested public, who needed or wanted geological maps. The introduction of the DMPS was not without teething problems that led to initial delays. Staff shortages also and the introduction of booklets further extended the eventual completion of the series. Latterly, maps were published ahead of the accompanying booklets and at the time of writing the last booklet, for Sheet 11, is about to go to the printers.

The first map in the series to be published was Sheet 6, North Mayo, in 1993. This was finished in Cartography before the DMPS was introduced and so was produced by traditional cartographic methods, scribing the linework, and producing colour separations photographically for printing by conventional methods.

All subsequent maps were produced using the Digital Map Production System (DMPS) output on the Calcomp plotter, and latterly on its replacement. The last map in the series to be published was Sheet 15 (Galway - Offaly), which appeared in 2003.

In 2003 it was decided to join all the maps together into a seamless GIS in ArcView. This was done as a multi section project involving Bedrock, Cartography, Information Technology and Groundwater. As the compilation of the series had progressed over more than a decade, some of the sheet boundaries inevitably did not match due to more recent interpretations as well as minor problems with the raster bases not quite matching. The geological interpretation was "fudged" in order to ensure that boundaries and polygons crossed sheet boundaries where appropriate and joined up. No new geological work was done, however, to resolve any mismatches.

The principal sources of information for the new map series came from:
GSI Field Surveys:- The map series is based on GSI field surveys conducted mainly at the six inches to 1mile scale using OSI topographic base maps. The original surveys were started in 1845, when GSI was set up, and completed by 1890, when the last of the one-inch to 1 mile compilation map series was published. Some map revisions were made in the first half of the 20th century (principally in the coalfields) but no systematic mapping was undertaken again until the revitalisation of GSI after the appointment of Dr. Cyril Williams as Director in 1967. Since 1967 detailed re-mapping at six inches to the mile scale continued into the 1980s, by which time more than 1/3rd of the country had been remapped. This included contract mapping on behalf of GSI by PhD students in UCC and TCD.

Some reconnaissance mapping was undertaken by GSI from 1974 onwards, primarily in the midland Carboniferous areas, and field checking and drilling (to try and solve known problems) was undertaken to a limited extent during the compilation programme from 1992 until completion in 2003.

Published Maps:- Some of the maps were compiled largely from non GSI maps published at the one inch to one mile scale by W.S. Pitcher of Liverpool University (Donegal, Sheets 1 / 2 and 3 / 4) and B. Leake and J. Tanner of Glasgow University (Connemara Sheets 10 / 11); also P.M. Bruck of GSI and later UCC (North Co. Tipperary – parts of Sheet 15). These university maps were compiled from field work based on larger scale six inch to one mile mapping from MSc/PhD studies and GSI mapping (Bruck).

A compilation map, published in 1988, at one inch to one mile by G. Stanley (GSI) (The Limerick Basin) was also used in Sheet 17.

Compilations made by M. Hitzman of Chevron Mineral Corporation of Ireland and Ivernia West plc from Open File data, and published in 1992 by GSI at the 1:100,000 scale, were also incorporated into sheets covering the midlands Carboniferous (Sheets 12, 13, 15, 16, 18, and 19).

The geology for corners of the maps which cross the border into Northern Ireland has been supplied by the Geological Survey of Northern Ireland from their 1:50,000 Map Series and/or the GSNI 1:250,000 map of Northern Ireland.

Open File Data:- Data in the form of six inch and one inch maps deposited by exploration companies along with borehole logs and locations were also used in the 1:100,000

compilations. These sources proved most useful in the midlands Carboniferous, where GSI and other data were scarce, apart from the original 19th century mapping.

Other mapping:- The 1:100,000 series also used field surveys (mostly six inch to the mile) carried out in MSc/PhD mapping made available to GSI by Universities in Ireland and further afield. Unpublished compilations at 1:50,000 scale offered by I.A.J. MacCarthy (UCC) were also incorporated into parts of Sheet 24.

Other exploration company compilation maps, not available in the Open File, were made available to Bedrock Section. These covered areas on Sheet 15 principally.

The Future:- Now that all the maps in the 1:100,000 series have been combined as a seamless product in ArcGIS, the geological data can be used as a starting point for the new 1:50,000 GIS Map Series. Much remains to be done, however, to rectify the 1:100,000 data to fit the 1:50,000 base. Methodology has been developed to rectify the data but there is unfortunately no quick fix. The new map series will attempt to address those areas where there is little or no detailed modern mapping with new field studies and drilling to improve our knowledge of the geology. The new series will also add other point datasets not published with the 1:100,000 series.

1:100,000 Bedrock Geology of Ireland, seamless GIS edition

Ray Scanlon

A new CD product of the entire 1:100,000 Bedrock geology of Ireland, in ESRI GIS format is soon to be released. This is a joint GIS development project by Eddie McMonagle of the GSI Cartography Unit and the staff of the Bedrock Section, and will contain seamless ESRI Shapefiles based on the printed 1:100,000 map series.

There are six layers in the dataset, the bedrock polygons, structural linework, stratigraphic linework, mineral localities from the map series, a set of lines showing the positions of cross sections and an index map to the 1:100,000 maps and booklets.

The CD will contain the free ESRI GIS viewer ArcExplorer, so clients without ESRI software or other GIS systems can also view and query the data. A project file for ArcExplorer will be included so most data can be viewed with the same colours as the printed maps. All the printed maps, including sections and marginalia, are also planned for the CD in PDF format.

ArcExplorer was chosen because it has the ability to load web mapping services, such as that available from GSI, as a separate layer. This means, for instance, that a county Groundwater Protection Scheme can be viewed as a layer over the Internet along with the data on the CD.

Other CD products being developed currently include county CDs, and it is envisaged that the products will be easily adaptable to meet individual client needs.

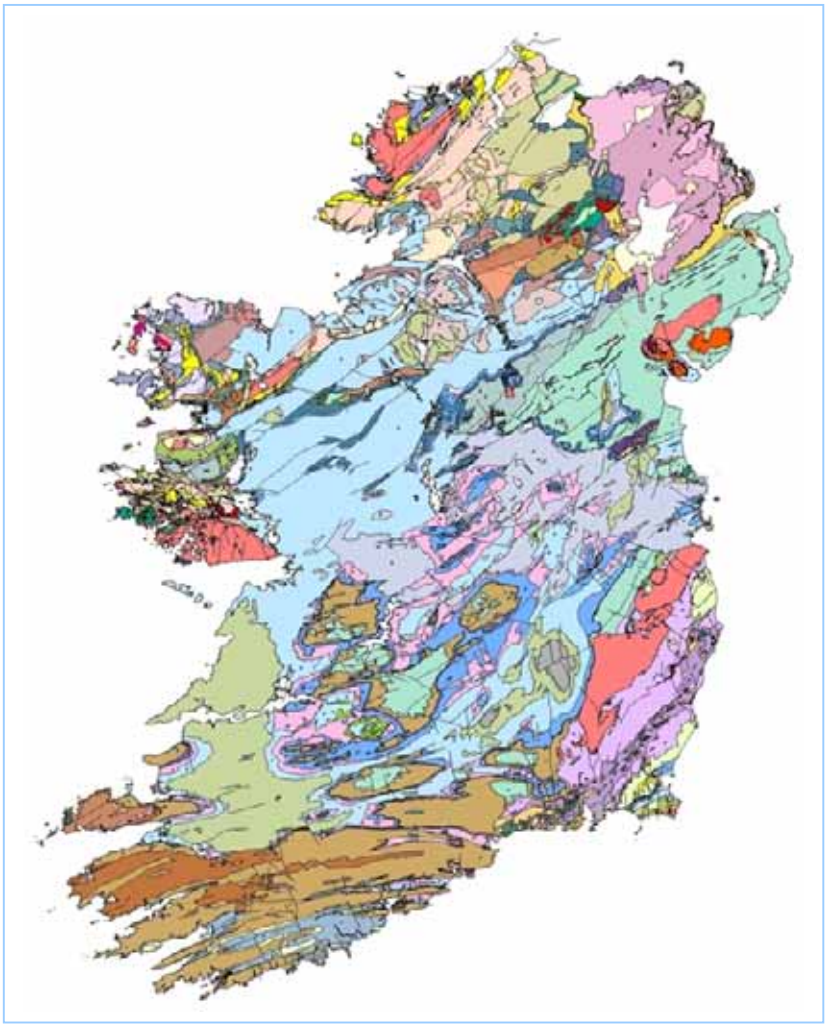
The entire 1:100,000 bedrock geology is also soon to be up-loaded to the GSI web mapping service (http://193.178.1.182/website/gsi_multi/viewer.htm) for free viewing, querying and printing over the internet using only a standard web browser. This will replace the partial coverage that is currently available, limited to the southeast of Ireland, and it is envisaged will be a valuable free resource for many of our clients.

NEW 1:500,000 SCALE GEOLOGICAL WALLMAP OF IRELAND

Brian McConnell

In addition to the CD and web mapping detailed elsewhere in this newsletter, another product derived from completion of the seamless digital version of the 1:100,000 scale bedrock map series will be a new bedrock geological map of the island of Ireland. Produced in conjunction with the Geological Survey of Northern Ireland, the map groups the more than 1,100 geological units of the 100k scale map into 83 lithostratigraphical and igneous units. A cross-section and a space-time legend shows the geology in 3D and the history of assemblage of the Precambrian and Lower Palaeozoic geology. The map is intended as a replacement for the 1963 1:750,000 scale Geological Map of Ireland, with the increase in scale allowing more detail to be shown.

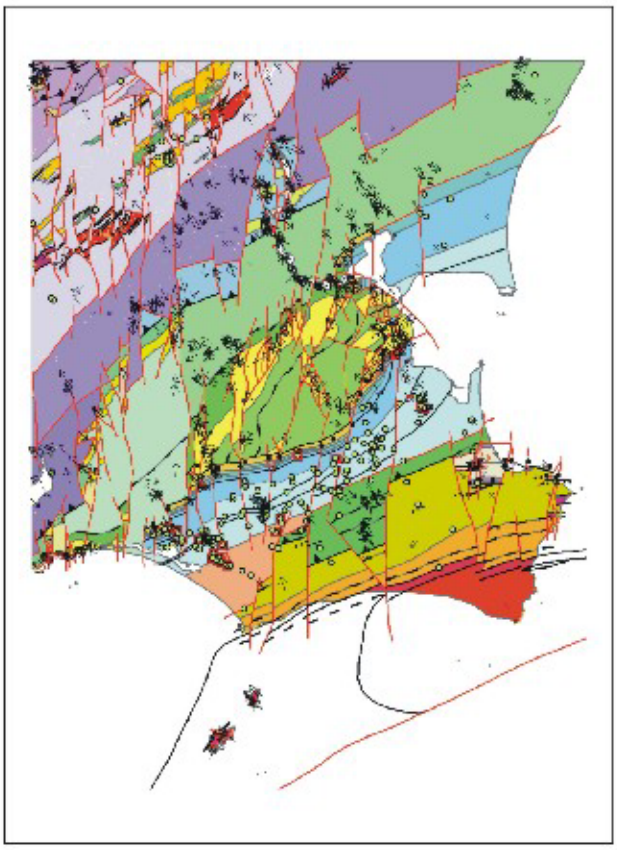
Initially to be produced as a printed wall map, the map will ultimately form the basis of a digital geoscientific thematic atlas in GIS format, with themes derived from GSI databases such as geophysical maps, mineral localities, significant boreholes and geoheritage localities as appropriate to the scale.



1:50,000 BEDROCK GEOLOGY MAP SERIES

Ray Scanlon

The first two maps in this new series are nearing completion, with the first, South Wexford (OSI Discovery sheet 77), due for publication this year, to be followed by Monaghan (OSI Discovery sheet 28A) next year. The maps are to be published in a digital GIS format, similar to the upcoming 1:100,000 seamless dataset CD. One of the main benefits of the 1:50,000 scale maps is that the geology has been 'rectified' to fit the newly available OSI 1:50,000 base maps, a bugbear of the 1:100,000 series.



Geology of part of the Wexford 1:50,000 (Sheet 77) scale map sheet.

The datasets to be included are largely derived from Bedrock Section's databases and also from scanned 1:10,560 maps using both modern and nineteenth century mapping. This new map series is seen as an opportunity to provide clients with all the available point data that have been used to compile the maps and to revise the mapping based on new field work and drilling where appropriate.

GIS Datasets will include:

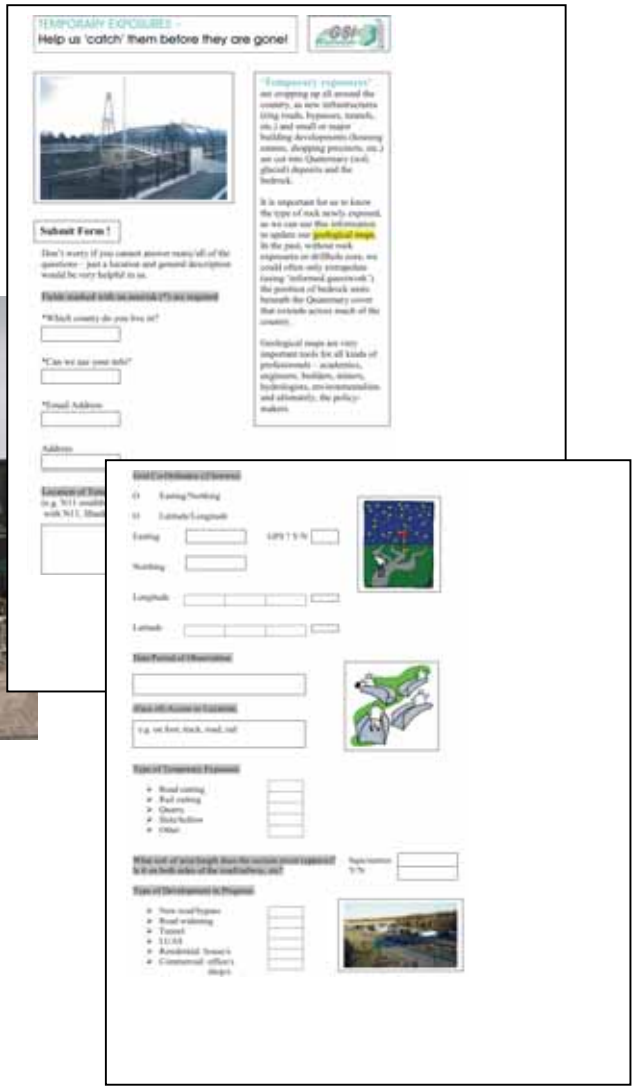
- Bedrock polygons: with additional attributes added from the Bedrock Section Lexicon Database, which provides much additional information on the age, nature and origins of the geological formations and references to the literature which defined them;
- Stratigraphic linework: unconformities, metamorphic aureoles etc.;
- Structural linework: faults, fold axes etc.;
- Outcrop polygons: derived from 1:10,560 mapping, including outcrop descriptions as recorded on modern and nineteenth century maps;

- Mapping symbols: Derived from 1:10,560 mapping with a rotated set of point symbols with attributes of structural type along with attributed strike and dip/plunge allowing statistical analysis of the data etc.;
- Borehole localities: attributes on length, depth to bedrock, angle, azimuth etc. linked to the GSI corestore and details of additional borehole records held within the GSI Open File database and linked to a standardised borehole log for each borehole;
- Palaeontological age determinations carried out for GSI; and
- Mineral localities, derived from Mineral Section's GIS datasets.

A 'TEMPORARY EXPOSURE' MONITORING INITIATIVE – WELCOMED BY ALL

Sarah Gatley

After decades of geologists from academic, exploration and surveying backgrounds alike, bemoaning the lack of a formalised system for logging 'Temporary' exposures, GSI is poised to launch a two-tiered scheme of data capture.



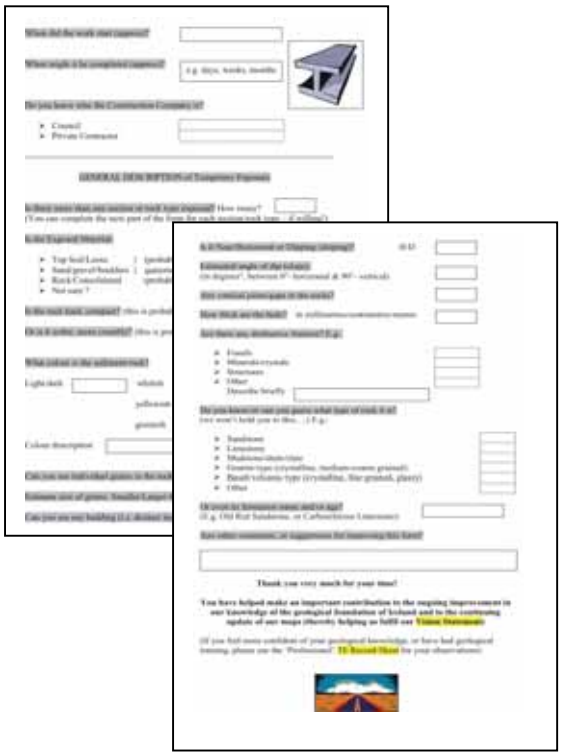
A temporary exposure in Dun Laoghaire, Co. Dublin

At the current level of nationwide infrastructural development, many of the rising number of temporary exposures (TEs) are concealed and lost before there is an opportunity to record them.

TEs represent an ongoing wealth of new bedrock and Quaternary data that is vital for the continuing update of our geological maps. This is particularly relevant in those areas under extensive Quaternary cover and with little or no bedrock drilling information. Of course, the data recovered from TEs in Quaternary deposits is equally important to us.

The acquired data will contribute to a Temporary Exposure Database (TED), and will be a growing resource of national importance. It will complement the GSI Geotechnical Database which contains the results of site investigations carried out predominantly in

Quaternary/subsoil layers as part of urban and major infrastructure projects. Any new bedrock data will be incorporated into Bedrock's current 1:50,000 mapping programme in which the 100k scale bedrock maps are being updated at the new, larger scale.



An initial web-based scheme, which utilises a 'TE-Spotting Form', is aimed at any willing volunteer from geological or non-geological background and can be found on the GSI website at www.gsi.ie. Its format is similar to that of GSI's 'Landslide Ireland' reporting form and is designed for simplicity so that any interested and observant member of the public can transmit information back to GSI about temporary exposures they come across in their neck of the woods, or further afield. The form assumes no geological knowledge and the person is guided through a series of options for describing the rocks or sediments. Digital photos would be highly desirable, not only because they are 'worth a thousand words', but in providing a lasting record of what may prove an ephemeral feature, they will form an integral part of the database.

In parallel with this web initiative, GSI awaits the go-ahead and funding for a scheme using the professional experience of qualified geologists who have some available time to record TEs for GSI. A 'TE Record Sheet' for such geologists is also available online.

The idea for this project arose from a TE Working Group, set up within GSI, to investigate the best methods of capturing this invaluable data. From a range of options, and with current limited GSI staffing levels, it was decided the first approach would be to use a system of retained 'volunteer' professional geologists.

A small number of potential 'Temporary Exposure Geologists' (TEGs) were approached earlier in the year with an outline of the proposal. The response was prompt and enthusiastic; the majority were interested and willing to participate although reservation concerning their available time remains a universal and understandable factor. GSI hopes that after an initial 'pilot' year, additional professional geologists will participate.

When the scheme is up and running, each TEG will be allocated an agreed area of monitoring within an approximate 35km radius of their home or working base. The TEG's work is then envisaged as a combination of visiting a site on the advice of GSI, and 'ad hoc' observations during normal travels around their or another's allotted area.

GSI will contact county councils, engineering companies, etc., in the first instance for information on ongoing/upcoming work in their respective areas. The well-documented plans of the National Roads Authority (NRA) will be a useful tool within this strategy and any additional contacts or information gained by the TEG will enhance the data network.

TEMPORARY EXPOSURE (TE) RECORD SHEET									
TE No (TEXID)/TEG initials & own no.		Record Sheet No:			Total No. Sheets:				
Exposure Type & Duration	road cutting	railway cut	quarry	cliff	hole/hollow	other		temp	permanent
Bedrock/Quat deposit	bedrock (continued below)		quaternary:	sand		gravel		boulders	
Locality:	town/land:			county:			50k/6" Map		
Grid Ref	easting:			northing:			GPS	map/other	
General Descript/proximity to road									
Length of section/areal extent									
General Litholog. Description									
Rock Type	sandst	limest	mudst/shale	cong	granite/rhyol	basalt/gabbro	dolerite:	schist	gneiss
Lithology (colour/grainsize)	colour			grainsize					
Bedding (e.g. flat/massive)	flat	dipping	massive	other					
Dip/Strike	dip:		strike:						
Sedimentary Structures	current-bed:	trough	planar	ripple marks	bioturb/burrows		erosionl surfs/channels		slumping
Fossil content									
Structure	jointing		fracture		cleavage		foliation		
Mineralisation/Quartz veining					Dyke/sill				
Weathering									
Contacts (above, below)	conformable				unconformable				
Stratigraphic name/Age									
Geological interpretation/Dep Env									
Other Comment									
Section Log (LOGID)		Log No (LOGID)							
Sample Description		Sample No (SAMPID)							
Photo Description		Photo No (PHOTID)							
Date of exposure/work (approx)		Scheme/Work done by (e.g. cc, engnrs)							
Recorded by		Date of Record							

A TE Record Sheet (available on the GSI website) will facilitate a quick summary of observed features (and help data entry into the TED). A preliminary TE record supplied by the TEG will be assessed and prioritised by GSI to ascertain whether further, more detailed work is required on the section.

We await the implementation of this long-overdue monitoring system with interest and anticipate at least a partial solution to the continuing loss of invaluable geological data.

INTO THE DEEP….

THE DRILLING OF A COLD-WATER CORAL CARBONATE MOUND IN IRISH WATERS

Xavi Monteys, Marine Geology and Geophysics Programme

Thinking about Coral Reefs one always tends to visualize them in a warm, bright and shallow area, such as in Australian waters or the Bahamas. However, they have also been found in gloomy, cold and deep waters, off the coasts of 41 countries including Ireland. They occur at depths of hundreds of metres to just a few tens of metres, in several settings across almost all of the world's oceans.

Locating these coral banks has been possible because of the latest acoustic and optic marine technologies. These enable high-resolution mapping of even the deepest oceans, and provide detailed video footage of the seafloor using remotely operated vehicles. The Irish National Seabed Survey (managed by the Geological Survey of Ireland in co-operation with the Marine Institute) has widely used these technologies to carry out a unique and comprehensive seabed mapping project since 1999, covering an area to date of 470,000 km^2 (more than six times the Irish land territory).

Clockwise from top left: examining drill core aboard the JOIDES Resolution; drilling on the JOIDES Resolution; the JOIDES Resolution anchored in Dublín Port.

Deep-water corals are widespread along the European continental margin where they are often associated with carbonate mounds. Carbonate mud mounds are found in Irish Atlantic waters along the edges of the Rockall Trough and the Porcupine Bank and extending into the Porcupine Seabight. They are massive features some reaching heights of hundreds of metres, and stretching several kilometres across their bases and are composed of carbonate mud, the skeletal remains of corals and material from associated fauna together with sediment.

The idea of drilling into these giant mounds to unveil the secrets trapped in these cemeteries of coral and sediments originated a few years back. But it was only in May of this year that the idea finally materialized when an international research expedition took place entirely in Irish waters. The expedition concentrated on drilling the Challenger mound (170m high) in the Porcupine Seabight. From an environmental perspective this mound was chosen very carefully as it is mostly covered by dead coral.

The expedition was part of **t**he Integrated Ocean Drilling Program (IODP), an international marine research programme that explores the Earth's history and structure as recorded in seafloor sediments and rocks. IODP is managed by an American management agency, IODP-MI, and funded by USA, Japan, ECORD (European interests) and China.

The platform to carry out this ambitious drilling programme was the American rig vessel, the Joides Resolution (124m). Leaving Dublin Port on April 28th she successfully drilled 11 holes, of average 200m length, in three target sites, recovering 1,400m of sediment core.

Scientists from the expedition are now working up answers to some very important questions. They have already demonstrated that the mound developed around 1.8 million years ago and consists of a 155m thick sequence of coral fragments and sediments from top to base. They are now studying the coral fragments for information about the past climate in the region in order to perhaps predict future trends. Such research and results originating from an innovative and prestigious expedition in Irish waters will heighten awareness of the development of cold-water coral banks in the Atlantic, and will significantly enhance Irish marine science's reputation across the globe.

IRISH NATIONAL SEABED SURVEY: ANNUAL SEMINAR 2005

Enda Gallagher, Marine Geology and Geophysics Section

The National University of Ireland, Cork will this year host GSI's Annual Seminar of the Irish National Seabed Survey (INSS) on 18th November. The annual seminar is now arguably the foremost information and discussion forum for the Irish marine science community. Indeed its sphere of importance is now extending overseas, with a sizeable number of international visitors emerging each year. The 2004 seminar, held in Galway, attracted more than 120 interested parties. This year a welcome reception will be held in the university on the previous evening for early arrivals.

The shift in focus from data acquisition to data usage and value added projects, adopted by last year's seminar will be maintained this year. Hence most presentations will outline research projects and industry applications arising out of the use of INSS data. A minority of presentations will deal with data acquisition in 2005. As usual, the seminar will incorporate an exhibition involving poster displays, video, maps, products and seabed samples. Also, as with other years, a CD-ROM of the seminar will be available for distribution shortly after the seminar.

IRISH GEOLOGICAL ASSOCIATION/GEOLOGICAL SURVEY OF IRELAND

DU NOYER GEOLOGICAL PHOTOGRAPHY COMPETITION 2005

Entries are invited for the Seventh Du Noyer Geological Photography Competition

George Victor Du Noyer, who served as a geologist with the Geological Survey of Ireland from 1847 to 1869, was a skilled field artist whose numerous sketches and pictures, with their combination of artistic skill and technical accuracy, were the "field photographs" of their day. This competition seeks to encourage the same blend of artistic and scientific skills through the medium of photography.

The photographs entered may be recently taken images or older, historical photographs, especially ones not in any archive and liable to be lost. These latter photographs could then be preserved.

Entrants may submit photographs (prints, slides, digital images etc. – all are acceptable) illustrating an aspect of field geology in one or more of the following categories:

1. **Open category (photographs taken in Ireland)**
2. **Photographs by a person under 18 (photographs taken in Ireland)**
3. **Historical photographs (photographs of geological gatherings, persons etc. taken in past years)**
4. **Photographs taken overseas by geologists based in Ireland**

Total prize money of €600 will be awarded over the four categories.

All photographs entered must be clearly labelled with the following information:
Name, address, telephone number, fax, Email of entrant/photographer.
Short title/ description of geological/historical content of the photograph(s).
Place and Date when taken.
Category being entered.
[Please write on a label and stick it onto the back of the photograph(s)]

The competition will be judged by a panel including representatives of the IGA, the GSI and external nominees and their decision will be final. Entries will be exhibited and prizes awarded at the GSI Awards ceremony in December. Entries will be returned after the competition.

Entries should be sent to: The General Office, Geological Survey of Ireland, Beggars Bush, Haddington Rd, Dublin 4 and the envelope marked "Du Noyer Competition".

The closing date for entries for the seventh [2005] competition is:

Friday, 18th November 2005

CONFERENCE REPORT: NAMS 2005
HALIFAX, NOVA SCOTIA
May 15th to May 18th 2005

Gerry Stanley, Minerals Programme

The fourth North Atlantic Minerals Symposium (NAMS) conference took place in Halifax, Nova Scotia as part of the 2005 The Geological Association of Canada – Mineralogical Association of Canada (GAC-MAC) meeting. The GAC-MAC meeting itself had up to 14 parallel sessions one of which was NAMS as well as sessions on Economic Geology. Specific themes for both NAMS and the Economic Geology session are indicated in the Table below.

Date	NAMS themes	GAC-MAC Economic Geology themes
Monday AM	Diverse topics in economic geology Environments in the North Atlantic Region	Copper
Monday PM	Environments in the North Atlantic Region	Nickel
Tuesday AM	Sediment hosted base metal deposits	Gold
Tuesday PM	Ni-Cu-PGE environments in the North Atlantic Region	VMS
Wednesday AM	Magmas to massive sulphides – global view	
Wednesday PM	Magmas to massive sulphides	

The sessions that were probably the most useful were:

- Sediment hosted base metal deposits
- Ni-Cu-PGE environments in the North Atlantic Region
- Magmas to massive sulphides – global view

There were eight papers in the Sediment hosted base metal deposits session with five by speakers from Ireland reporting largely on structural aspects in the Irish carbonate hosted base metal deposits. An excellent paper by Alex Brown covered sediment-hosted stratiform copper deposits.

Tony Naldrett presented an excellent summary of Voisey's bay in the Ni-Cu-PGE session. In all there were six papers in the session – all on Voisey's Bay. Three of the papers came from the INCO newly funded INCO Innovation Centre at Memorial University dealing with practical mining issues at Voisey's Bay.

The session 'magmas to massive sulphides – global view' was a session on Volcanic Associated Massive Sulphides. It comprised papers from Europe, Australia and Canada and presented an excellent overview of the current state of our understanding and highlighted some of the unresolved issues on this important group of deposits. The keynote address was given by Rod Allen.

Garth Earls presented his paper 'Carboniferous gold in Northern Ireland – Myth or reality'. His co-authors were Jamie Wilkinson and Adrian Boyce. He closed his presentation by

referring to gold intersected in the Carboniferous in Co. Limerick. Vincent Gallagher and Gerry Stanley presented a poster on the 'Gold Potential of Caledonides of Southeast Ireland'.

The keynote paper in the 'Environments in the North Atlantic Region' was on intrusion related gold deposits and was presented by Craig Hart. In an excellent descriptive paper Craig emphasised the distinguishing features of this style of deposit and the fact that these deposits have only been recognised as a distinctive class since 1999. Not all workers agree that such a class is warranted and the deposits can easily be viewed as a variant of other deposit styles (e.g. orogenic gold).

In addition there was a plenary NAMS talk presented by Murray Hitzman. Murray's paper **'A (R)evolution in mining - Implications for exploration'** examined the trends in the industry over the past century highlighting bulk mining as exemplified by Bingham Canyon and the introduction of Environmental Impact Assessment. He went on to speculate that there would be a new mining paradigm which will necessitate the discovery/production of: 1) high grade deposits that can be mined with little ground disturbance (underground methods); and 2) larger, bulk tonnage deposits will be mined by in-situ methods. Exploration for small, high-grade deposits will require sophisticated geologic concepts. Exploration for larger, bulk tonnage deposits that can be exploited in-situ will require extreme attention to site hydrogeology to ensure that pumping can be conducted without undue influence to the existing groundwater resources.

Abstracts can be downloaded individually from the conference website www.halifax2005/ca

One of the field trips associated with the meeting was to Newfoundland to review the principal gold deposits and occurrences of the island. At present there are no operating gold mines on the island although two operations have just closed down and another two are likely to open in the next 18 months or so. The trip therefore consisted of visiting a number of prospects, examining trenches, drill core and documentation relating to the deposits.

The trip began in St. John's in the east of the island and progressed westwards finishing at Deer Lake. Geologically the trip commenced in the Avalon Zone and progresses westwards into the Gander Zone, the Dunnage Zone and finally into the Humber Zone (Figure 1). The equivalent of these zones can be traced into Ireland and Barry Long has produced a Pre-Carboniferous geological map of Ireland showing these different zones (Figure 2).

The itinerary and deposits visited were:

- Neoproterozoic **epithermal** gold mineralization in the Eastern Avalon Zone.
- Neoproterozoic **intrusion related** gold mineralization in the Western Avalon Zone. **Mesothermal** and **epithermal** mineralization in the Gander Zone.
- **Mesothermal** and **epithermal** (?) in the Eastern Dunnage Zone between Gander and Twillingate.
- Gold mineralization in the Eastern Dunnage Zone in the Glenwood and Gander River areas.

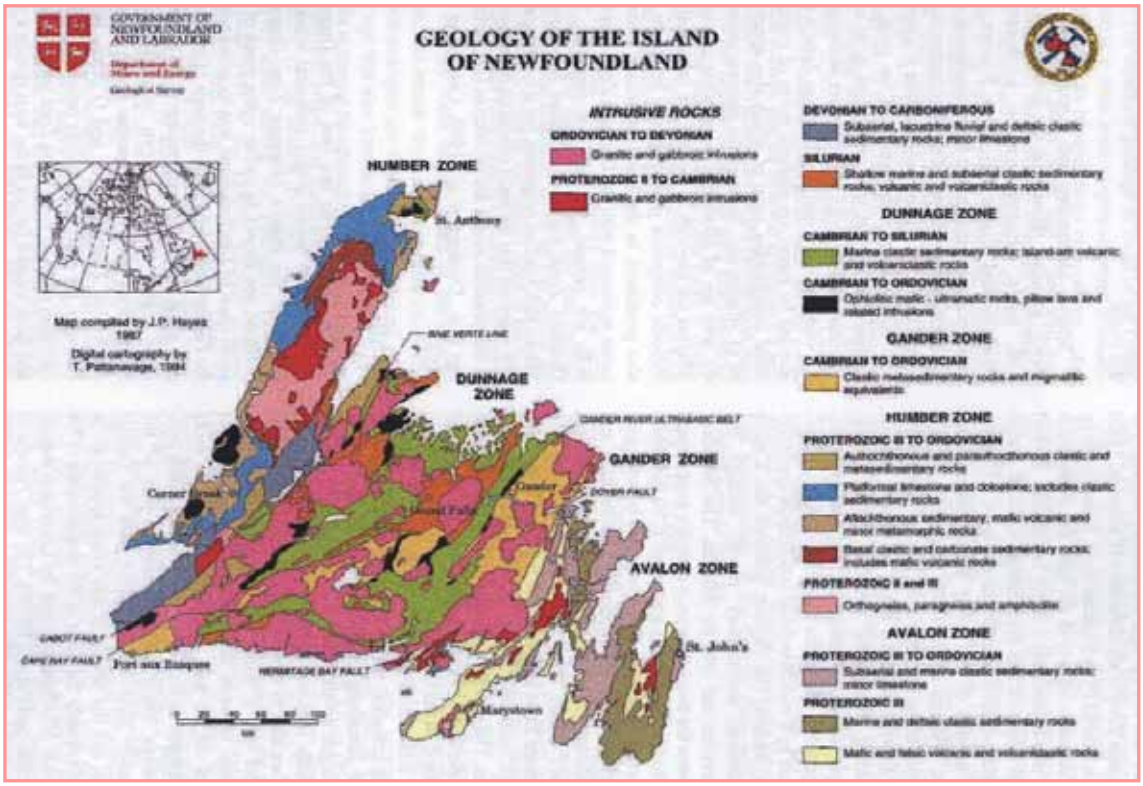


Figure 1. Geological map of Newfoundland showing tectonic zones.

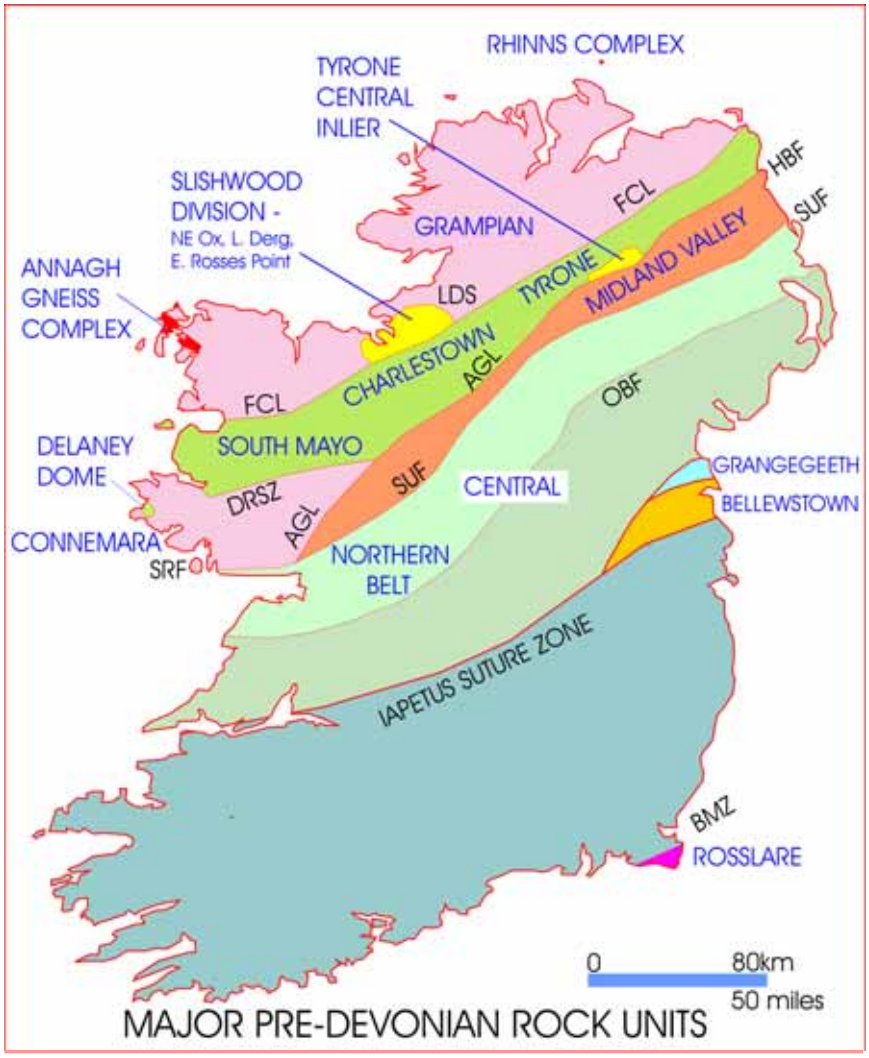


Figure 2. Pre-carboniferous geology of Ireland (Long 2003).

- **Mesothermal** gold mineralization in the Eastern Dunnage Zone in the Badger area. **VMS related** gold mineralization in the western Dunnage Zone in the Green Bay area.
- Gold mineralization in the Baie Verte area.
- **Mesothermal** and **Carlin** (?) gold mineralization in the Humber Zone.

Below are a number of photographs taken while on the field visit.

Gold from the Nugget Pond deposit.

Epithermal textures from the Stallion Prospect.

Epithermal textures from the Steep Nap Road prospect.

Listvenites displaying the characteristic green colour of fuchsite (a Cr mica).

Typical Au mineralization from the Stog'er Tight deposit.

Quartz host rock at the Golden Promise Prospect.

SIGN OUT/SIGN IN/SIGN OUT

Matthew Parkes, Irish Geological Heritage Programme

In the first GSI News we proudly reported that after many efforts a sign had been erected outside the GSI, pointing to its location inside the Beggars Bush Barracks. Sadly in June 2005, the sign was stolen and disappeared one night. The Gardai investigated it as a case of criminal damage/theft. Ironically, they had difficulty finding the GSI precisely because of the lack of an external sign! The good news is that the sign did in fact turn up again, found in the rubbish collection store for the residents of Beggars Bush. However, the tortuous saga continued, with the removal of the metal post before the sign could be securely reinstated. Again the Gardai were contacted. Happily we can now report the sign has been reinstated in a new position, and is unlikely to be interfered with again. If you are trying to find GSI or other offices of the Department of Communications, Marine and Natural Resources in the Beggars Bush building, you should be able to see the sign outside of the complex pointing the way.

It is also perhaps a good opportunity to remind visitors, that parking spaces are situated at the side and rear of the building, and that those in the front of the square are for residents, who operate a clamping scheme. Don't get caught out!

OPEN FILE: DIGITAL DEVELOPMENTS

Gerry Stanley, Gordon Poole and Irene Hogan, Minerals Programme

The Open File is a databank of the reports submitted by mineral exploration companies of their work required under the terms of their Prospecting Licence (PL). Originally set up in 1984, the databank has grown so that it now contains over 75,000 individual items.

With the development of digital technologies a decision was taken to scan the databank and to place it initially in the GSI's Document Management System (DMS). This led to the development of a comprehensive database with a high level of functionality.

So what is available to you, the customer?

1. The database.

The database allows the user to search the entire databank to identify those papers or records for which the user is looking. The database is searchable by PL, by various scale OS maps, or by county. The former is for specific searches while the latter allow more regional searches. The searches return a list of reports for the area being sought including reports on the area, which may have been issued under a different PL number. The user can then 'click' on any report and get a complete listing of the items in the report. The database is also searchable by company and / or year. This provides the facility for the user to look for a report by particular company either in a particular time period or without that restriction.

Another feature of the database is the facility to quickly see which reports have had drilling carried out on them. Each report has a separate entry indicating how many drill holes are contained in that report. By 'clicking' on the relevant entry a listing of the drill holes is provided for the report. Alternatively, the user can 'click' on a 'Show all drill holes' button and all drill holes for the area being searched are provided.

Copies of the database are available on CD free of charge. To obtain a copy please send your request to:

Ms Irene Hogan
Geological Survey of Ireland
Beggars Bush
Haddington Road
Ballsbridge
Dublin 4.
Tel. + 353 1 678 2751. Fax + 353 1 678 2589. e-mail. irene.hogan@gsi.ie

Another feature under development is the ability to search by keyword. GSI has developed a list of approximately 100 keywords which describe the items within the database. So if you want to find soil geochemistry for an area or you want a complete listing of micropalaeontology reports it will be possible to do so. However, please be patient as we are still in the process of generating the keywords for the more than 75,000 items in the database. The database will soon be placed on the web where you will be able to search the database.

2. The Document Management System (DMS)

The DMS is a facility developed within GSI which allows a user to view documents scanned into the system. In the first instance you have to locate the document you are looking for. This is achieved by searching the database described above. Having used the database and identified the item(s) you wish to view the user may 'click' on the item and review it. It's as simple as that. Four clicks to view your favourite Open File item.

It is possible to save this digitally or to have a paper copy made. There are charges associated with this part of the service.

This facility will only be available at the GSI's Customer Centre. In time we envisage having the service available over the web but for the time being it will only be available at the GSI office.

THE CASE FOR GEOSCIENCE FUNDING

Peadar McArdle, Director

The Geoscience sector comprises the providers of geoscience-based commodities, services, research and education, together with their customers and stakeholders. Geoscience-based industry (mining, quarrying, offshore gas, groundwater supplies, and peat extraction) is worth over €2 billion annually to the Irish economy, while geoscience services (mapping, consultancy and contracting) generate €130m turnover annually with 1,000 employees. State bodies have an aggregate geoscience budget of about €32m/year, and they and the third level sector have a combined annual research income of €11.5m.

This sector-wide Geoscience Initiative, prepared by GSI on behalf of the geoscience sector, aims to nurture multi-disciplinary world-class research in Ireland in the context of Government strategy to enhance economic competitiveness through increased investment in R&D - the Lisbon Agenda. Government will consider this proposal as part of its overall response to this agenda with the assistance of the Chief Science Adviser. The Total Cost of the Initiative is estimated at €160.90 million over the five-year timescale. Four major themes are identified - Energy, Environment, Marine and Infrastructure.

Energy: secure and diversified supplies

The EU goal is that renewables will contribute 12% of total energy needs by 2010. Geoscience can contribute to assessments of geothermal energy, offshore wind, tidal and wave energy sources (through near-shore seabed bathymetry surveys), and land-based wind energy potential (through landscape characterisation).

Priority Actions

- Developing a 3D model of the Irish underground.
- Identification and evaluation of zones of high potential for geothermal energy.
- Understanding the deep underground.
- Development of long term monitoring of underground heat and fluid flow.
- Participation in an international geological project to aid identification of potential hydrocarbon resources in offshore Atlantic Ireland basins.

Environment and health: addressing emissions to air and water

Economic development, urbanisation and intensive agriculture represent significant pressures on Ireland's environment. Geoscience has a key role in understanding and monitoring our environment, with critical inputs to make on two issues relating to emissions to air and water: (1) Climate Change - linked to greenhouse gas emissions to the atmosphere, and (2) implementation of the EU Water Framework Directive.

Priority Actions

- Identify and evaluate zones of high potential for geological storage of carbon, enabling initial assessments of an appropriate operating strategy.
- Targeted surveys to manage high-quality groundwater supplies.
- Research to understand climate change, groundwater resources, and offshore geology.
- Developing long-term monitoring of appropriate aspects of the geological environment.
- Targeted surveys to improve radon hazard detection.
- Targeted geochemical surveys to identify areas affected by toxic hazards.

Marine: developing a unique source

Ireland's seabed is ten times that of its land area. This marine resource was worth €3 billion in 2003, with almost 50,000 people directly or indirectly employed. Ireland has an international reputation for seabed mapping based on the Irish National Seabed Survey (INSS).

Priority Actions

- Data acquisition, management and interpretation.
- Data integration and exchange.
- Development of value added products.
- Development of a world-class geoscience capability based on participation in IODP.
- Seabed monitoring - ocean floor observatories, seismic and tsunami monitoring systems.

Infrastructure: building on sound foundations with quality materials

Geoscience contributes to effective infrastructural development by providing cost-effective information on ground conditions and how people interact with it.

Priority Actions

- Develop high-resolution monitoring networks for geohazards in targeted areas.
- Landslides inventory and monitoring.

- Monitoring of abandoned mines.
- Aggregates for infrastructural development.
- Mineral resources for economic development.

Measures to support the initiative
The initiative will involve a number of support measures: a detailed scoping and costing study; a comprehensive outreach programme; socio-economic studies of impact and achievements of the Geoscience sector in Ireland; and promotion of the broader use of digital geoscience data in the community. Full consultation with appropriate stakeholders will inform decision-making, and results will be widely disseminated through:

- Ad-hoc workshops of key stakeholders.
- Periodic public seminars.
- Site visits, exhibitions, brochures and web content.

Further information
Read more about this exciting development, including the expected outcomes and benefits of each priority action, on www.gsi.ie We will keep readers informed on progress regarding its potential funding.

PORT OF LONDON AUTHORITY VISIT TO GSI

Enda Gallagher, Marine Geology and Geophysics Programme

Following on from contacts made at Hydro04 in Galway in November 2004 and subsequent discussions with the Port Hydrographer, John Dillon-Leech, the Port of London Authority visited the GSI Marine Section on June 9th this year. The purpose of the meeting was for the Authority to learn from the Irish National Seabed Survey (INSS) experience in data acquisition and management. The Authority has a lot of survey worked planned around the London basin over the coming years and they felt GSI's knowledge of, in particular, equipment options, software requirements and data management infrastructure would be of use to them in their planning process.

GSI provided demonstrations during the full-day meeting encompassing our near shore survey capabilities and results from Dublin and Dun Laoghaire Harbours. We also outlined our data archiving systems and highlighted ancillary data issues, in particular the kinds of problems that arise in this area. Data users within the INSS team demonstrated software packages such as Fledermaus and Caris and provided advice on various processing systems and packages available on the market today. This was useful as the Authority is currently carrying out an evaluation process. The Authority sent 4 of their team including Hydrographic, GIS and Information Systems personnel. The meeting was highly productive for both parties and the Authority has extended an invitation to GSI for a return visit.

SEABED LOSES ITS MANAGER

Dr. Peadar McArdle

Mr. Michael Geoghegan, Manager of the National Irish Seabed Survey (INSS) for the past 5 years, has returned to work in the private sector. This was actually Mick's second stint with GSI, for he had been on the staff throughout the 1980's also.

Mick graduated from NUI Galway where he subsequently completed an MSc in geophysics. Following a period in mineral exploration in Ireland, he joined the marine geology team in GSI being assembled at that time by the late Ray Keary. Mick developed a love of the marine that has never deserted him, thanks at least partly to Ray's passion and vision. In due course Mick resigned from GSI and worked around the globe on offshore geophysical projects.

This international experience was invaluable when Mick returned to GSI and became manager of the INSS. The scale and range of this survey was without parallel elsewhere in the world, with much of it undertaken in partnership with the Marine Institute. Involving several ships at many points, and with the range of techniques extending from bathymetric to deep seismic, its organization would certainly have taxed a lesser individual. But Mick enthusiastically applied his expertise and experience to the challenge. The resulting surveys have been widely acknowledged as very successful. A state-of-the-art data management system has been implemented to ensure the effective data delivery to customers and a range of value-added products are currently under development as well as a long list of research projects.

MEDICAL GEOLOGY

Dr. Pat O'Connor, Principal Geologist

At first glance, Geology may seem far removed from human and animal health. However, rocks and minerals and the soils derived from them contain all of the naturally occurring major and trace elements that are critical to our well-being. Most of these chemical elements are taken into the human body via food, water and air. Unless the concentrations of these chemical elements remain within specified ranges, then humans and animals experience detrimental effects that in the most severe cases can be fatal.

The emerging discipline of Medical Geology is the science dealing with the relationship between natural geological factors and health in humans and animals and with understanding the influence of ordinary environmental factors on the spatial (geographical) distribution of such problems.

Paracelsus (1493 – 1541) enunciated a fundamental of toxicology when he wrote:
All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy.

Thus, intake of too much of any given chemical element, as too little can have equally deleterious biological effects. There are many documented examples. The spatial correlation of iodine deficient rocks and soils with areas of endemic goitre is well known, particularly in Ireland. Selenium deficiency leads to endemic heart disease (Keshan disease) and to endemic bone ossification (Kashin-Beck disease) in China; selenium toxicity is seen in cattle in parts of Ireland, as is molybdenosis. Arsenic toxicity in groundwaters has received serious attention in Argentina, China, Hungary and Bangladesh and elevated radon concentrations in waters and air are widely reported from many countries and may be correlated with local geology. Other metals that have given rise to toxic responses in humans and animals include mercury, cadmium, chromium, lead, thallium, and beryllium.

Medical Geology is also concerned with topics such as airborne mineral dusts and human health, the ecology of soil-borne human pathogens, aspects of environmental toxicology and

pathology to name but a few. In 2000, UNESCO established the International Geological Correlation Programme (IGCP) project 454 on Medical Geology and Earth and Health has been selected as one of the primary themes of the International Year of Planet Earth 2005-2007.

A detailed treatise entitled Essentials of Medical Geology: impacts of the natural environment on Public Health has been published by Elsevier in 2004 edited by Olle Selinus and others. Selinus and some of his co-authors will present a Short Course on Medical Geology at the Geological Survey of Ireland on 24 and 25 October 2005. Registration details can be found on the GSI website at www.gsi.ie This will represent the first Irish attempt at raising public awareness about Medical Geology and at bringing geoscientists and public health professionals together to discuss some of the issues in an Irish context.