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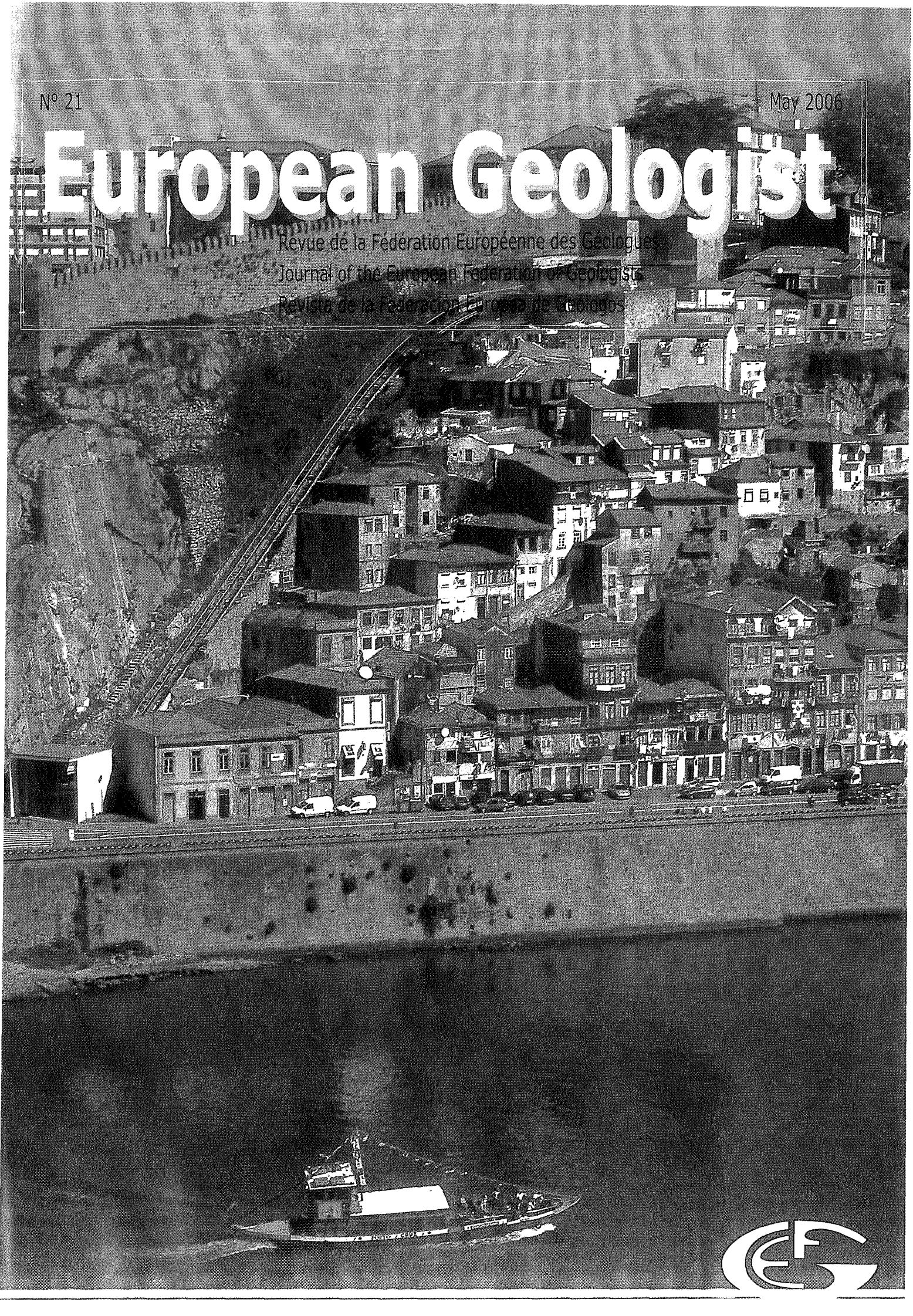

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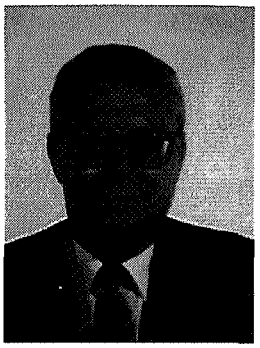
Foreword

Think digital, work analog

by EurGeol. Prof. Dr. István Bérczi, President



Dear Readers,

In the President's column in the last issue of the Magazine, the balance of rights and responsibilities was discussed, highlighting this theme in the principles and professional actions of the European Federation of Geologists. It has been emphasized how important the EFG is as a non – governmental organization of responsible professionals active in earth science and engineering, cultivating professional excellence as certified by the EurGeol. title. It has been stated, that the personal commitment of the title holders to create value through their professional activity has been a tool for establishing dialogue across political/ideological boundaries when and where politicians are unable to achieve this.

To be able to prolong this positive role, EFG should continue to operate as a strong civil organization. However, this role sets special responsibilities to the whole hierarchy of the EFG from the level of the Board, through Council and the National Associations down to present and future EurGeols. Recent agreement between the EFG and the South African Council for Natural Scientific Professions about a mutual recognition of each organization's members as Competent Persons is a positive indication that long and systematic efforts will bear fruit.

Really, a strong civil organization demands far more from its members, than what I call a "digital" work style: a participation in Council meeting(s) or other Brussels-organized meetings with good proposals/ideas about what to do in the future but with no follow-up/subsequent activity till the next meeting. On the contrary, efforts to strengthen the position of the EFG demands continuous, uninterrupted effort not only by the Board, but also of the Council Members and members of the NAs as follows:

- Assist the permanent dialogue developed and cultivated by the Board and the Brussels Office with fellow European/global organizations active in the field of earth science and engineering (Eurogeosurveys, Euromines) as well as DGs of the EC and Committees of the EP
- Assist the Board/Brussels Office with revising, commenting on electronically distributed documents timely and professionally
- Participate/assist in the implementation of action plans nominating responsible persons and deadlines
- Assist the Editor of the Magazine with recruiting articles, advertisers, sponsors, and publicizing the new issues
- Assist the Electronic Communication Manager in distributing, publicizing EU documents, EFG documents, e-newsletters in the respective countries
- Participate/assist in identifying additional financial sources for EFG.

Without progress on these points in Europe, it is questionable how we can achieve our global goals jointly defined by the AIPG as the main topics of the 3rd IPGC, in 2008, Arizona, USA:

- Global recognition and portability of our professional credentials.
- Professional ethics in the practice of the geoscience profession across international boundaries.
- Expanding our international influence and reach.

As the old poetic Latin proverb says:

"Gutta cavat lapidem nec vi sed saepe cadendo"

"Even drops of water can excavate a hole in a hard rock, however not with their strength but by impacting it frequently and consistently."

To be a strong civil organization, EFG desperately needs such a frequent and consistent impact of their members from all levels of the organization. Let's start it right after the imminent Council Meeting in Porto, 19-21 May 20.

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Oporto: the granite, the city and the river (Photo: Narciso Ferreira)

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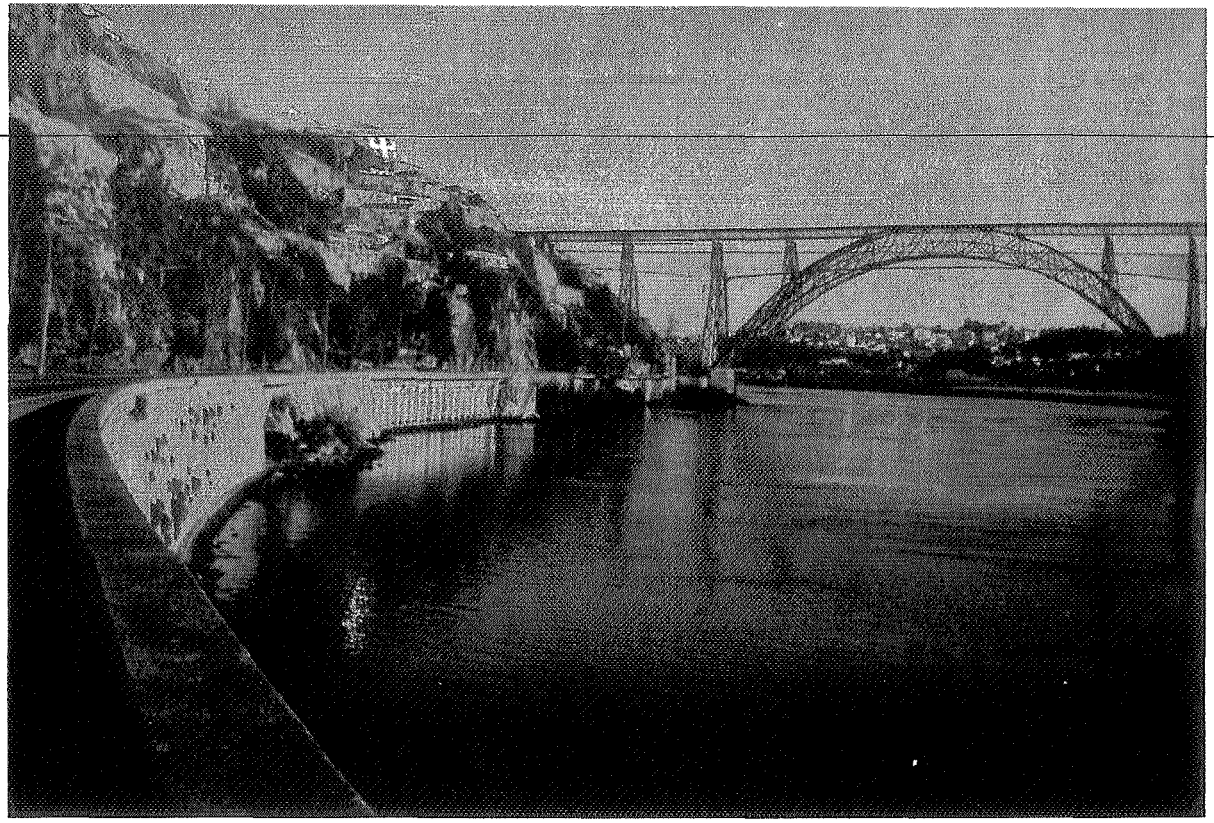

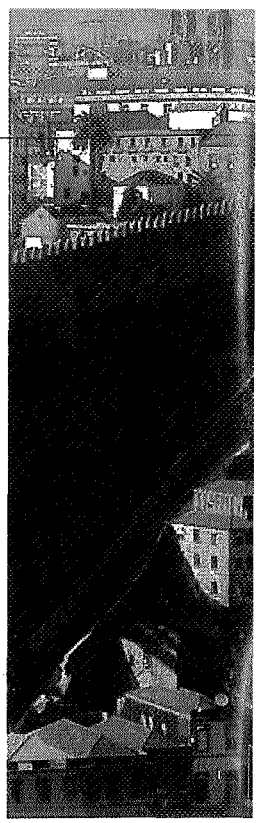

Photos above, left to right. Granite escarpment on the right bank of the River Dou

Geology and the urban landscape:

by Ang

Oporto is an old, austere, magnificent city, rising above a granite substratum. Its monumental heritage goes back to Roman times and the profile has been developed by the presence of granite in many aspects: the old city wall, the medieval and baroque churches, the neoclassic houses, the humble homes, the typical granite cubes paving the streets, the surprising escarpments that support the six bridges that link Oporto to another old granite town, Gaia. Sites within the historical centre have been selected to show the extremely important role of granite in the character of the city.

Le Porto est une vieille ville, austère, magnifique, qui s'élève d'un substrat de granite. Son héritage monumental retourne aux temps romains et le profil a été développé par la présence du granite, dans tous ses aspects: la vieille muraille, les églises médiévales et baroques, les maisons néoclassiques, les humbles maisons, les cubes typiques tapissant les rues et les pavements, les escarpements étonnants qui soutiennent les six ponts qui relient Porto à Gaia, une autre ancestrale ville de granite. Sites dans le centre historique ont été choisis pour montrer le rôle extrêmement important du granite dans le caractère de la ville.

El Porto es una ciudad antigua, austera, magnífica, que se eleva de un substrato de granito. Su patrimonio monumental vuelve a tiempos romanos y su perfil ha sido desarrollado por la presencia del granito en todos sus aspectos: la vieja muralla, las iglesias medievales y barrocas, las casas neoclásicas, las casas humildes, los típicos cubos que revesten las calles, las escarpas sorprendentes que apoyan los seis puentes que unen Oporto a Gaia, una otra vieja ciudad de granito. En el centro histórico han sido seleccionados sítios de observación mostrando la extrema importancia del granito en el carácter de la ciudad.

The importance of the role of Geology in society and in education is being increasingly recognized. A great diversity of activities has recently been developed, especially as far as environmental issues and the preservation of the geological heritage are concerned. To promote knowledge, interest and the engagement of the public in general, relative to the geological materials that are used in the buildings of a city, it is necessary to start with examples that are the most representative of the local geology.

Urban geology is becoming of utmost importance and an increasing number of papers are being published to show to what extent natural stone provides a remarkable resource for geological and architectural heritage education (e.g. Feely, 2002; MacFadyen, 2004). The urban landscape can be considered a natural museum where the geological history of a region is displayed in the topographic features, in the built heritage and even in natural outcrops of the local rock, still accessible for observation in many towns.

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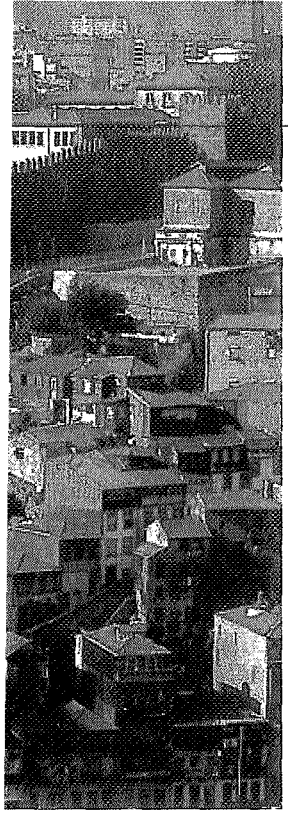

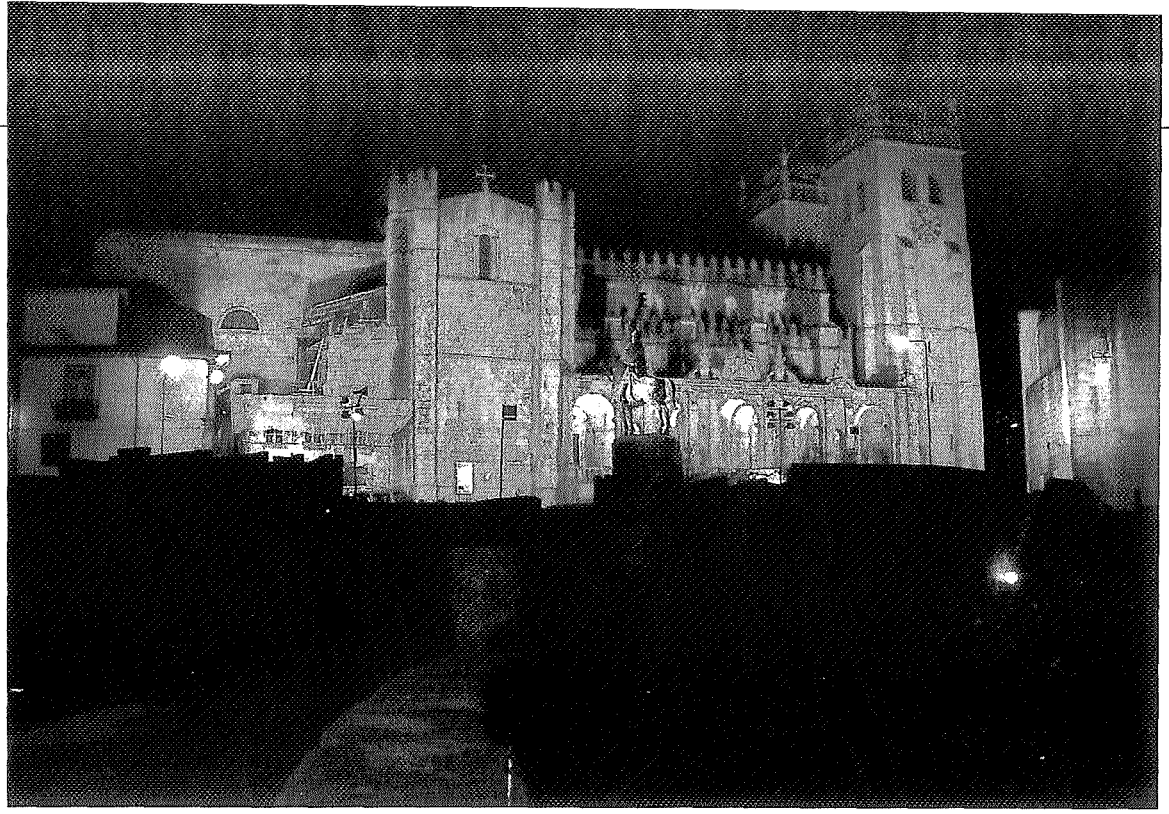

ntly subjected to geotechnical reinforcement; XIV century City Wall; the Cathedral

he granite in Oporto, NW Portugal

meida

In a city, the monuments and the building stones show an excellent articulation between the natural heritage and the built heritage and, therefore, can be used as important tools to stimulate the knowledge of Geology through the identification of the stones with the rock present in neighbouring quarries. Hopefully, this knowledge leads to a further interest in the geological features beyond the city limits, towards a broader knowledge of the geological processes and rock properties in a natural landscape. It may also stimulate an awareness of problems related to the preservation and management of the natural and built heritage, under the scope of sustainable urban development.

The geology in Oporto city

Several attempts have been made to stimulate a public interest in geology, using the natural stone that builds up the urban landscape and making the link to the geological resource, the so-called *Oporto granite*. Academic theses, guided tours and activities for children give an image of the granite as the main building material in the city (*e.g.* Begonha, 2001; Oliveira, 2001; Vieira, 2004).

The city of Oporto is situated in the North of Portugal, facing the Atlantic Ocean and on the right bank of the river Douro. It has an E-W elongated shape, occupying an area of about 41 km^2. The city rises above granite hills with flattened tops, evidence of a wide erosion platform that spreads northwards. Southwards, the deep valley of the River Douro abruptly cuts the natural extension of the platform and gives an imposing view of the granite escarpments.

Oporto is an old city, with origins in the name of Portugal. A stroll within the historical centre of the city, World Heritage Site since 1996, is proposed in order to help people recognize the stone their city, their streets and their homes are made of as well as to establish the relationship between architectural and environmental features and the underlying rock.

Tectonic and geological setting

Oporto is located in the Central Iberian Zone, close to the limit with the Ossa Morena Zone (Julivert et al.,1974) (Fig.1). Three main geological formations can be observed: (1) surface sediments of Quaternary age, (2) two metamorphic formations: the metamorphic complex of Foz do Douro and the Schist-Greywacke complex (respectively in the western and eastern part of the city) and (3) igneous rocks, composed primarily of granites of Variscan age. The Cambrian Foz do Douro complex consists of metasediments and gneissic rocks whose age ranges between 606 and 567 Ma representing probably the oldest magmatism in Portugal (Geotechnical Map of Oporto, 2003).

Since the granite is the most abundant and representative rock type in the city, a summary of its geotectonic, petrographical, geochemical and geochronological characteristics is presented. Using the classification of Ferreira *et al.* (1987) two groups of granites can be distinguished in the city area, biotite granites with calcic plagioclase and two-mica granites. Based on the time relation between these granites and the third tectonic deformation phase of the Hercynian orogeny, D3, it is possible to distinguish two series within the biotite granite group: an earlier series composed of early- to syn-tectonic deformed granites and a late- to post-tectonic series. The two-mica granites are classified as syn-tectonic relative to D3. They are particularly important as they represent the most extensive granite group underlying the city and constitute the essential building material in the historical centre. This two-mica granite is

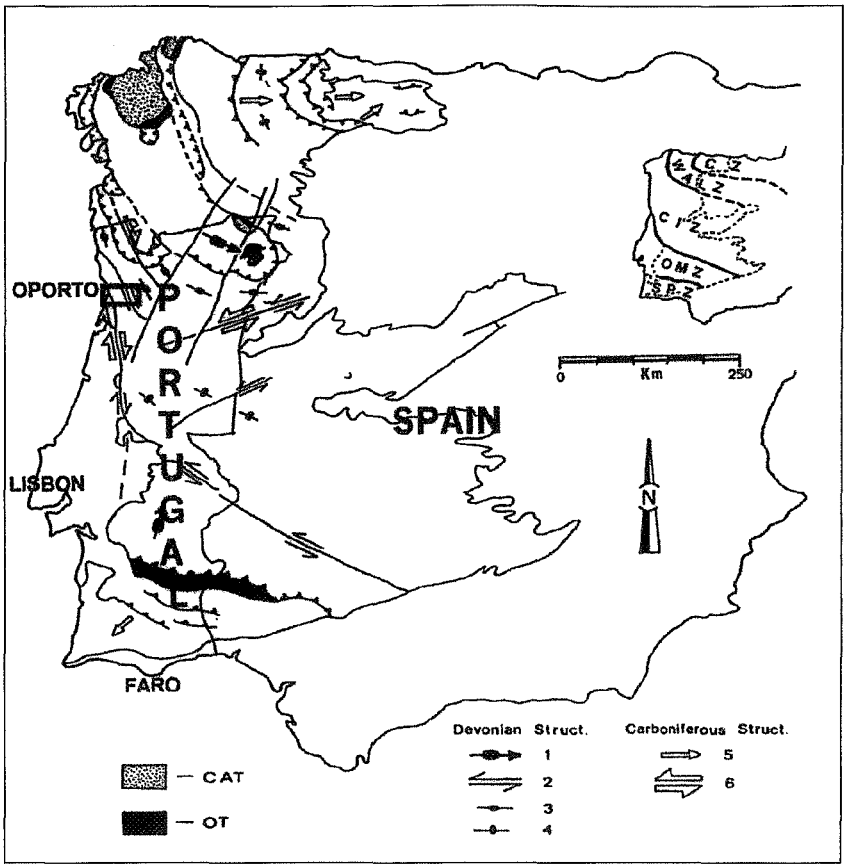

Figure 1. Major Variscan structures in the Iberian Peninsula: CZ-Cantabrian Zone, WALZ- West Asturian-Leonese Zone, CIZ- Central Iberian Zone, OMZ- Ossa Morena Zone, SPZ- South Portuguese Zone, CAT – Continental Alloctonous Terrane, OT- Northern and Southern Ophiolitic Terranes, 1- Devonian shear sense, 2- Devonian shear zone, 3- Stretching in b, 4- Stretching in a, 5- Carboniferous shear sense, 6- Carboniferous shear zone. Note the frame that borders the city of Oporto

classified as a medium to coarse-grained leucogranite. It is currently known as the *Granite of Oporto*. Petrographical studies show that it consists of a predominantly non-porphyritic granite, with hypidiomorphic granular texture and a mineral association including quartz, orthoclase, microcline, muscovite, biotite and apatite. Scarce opaque minerals, tourmaline and garnet are occasionally observed.

Selected geochemical parameters obtained in bulk rock analyses indicate high values of SiO_2 and total alkalis, respectively in the range of 71-74% and around 8%, low ferromagnesian contents and a strong peraluminous character (A/KCN molar ratio ranging between 1.3 and 1.5) probably related to the presence of primary muscovite (Almeida, 2001).

A U-Pb geochronological study using zircon and monazite yielded the minimum emplacement age of 318 ±2 Ma (Almeida, 2001), an age that is in good agreement with the geological and tectonic setting and with the petrographic and the geochemical data.

The granite occurs pervasively weathered, to various extents, by late- to post-magmatic alteration phenomena. The potassic feldspar is intensely kaolinized which led to an important kaolin exploitation in the past. Access to the quarry is no longer possible.

The granite and the history of the city

The two-mica granite massif has supplied the stone for the construction of the city up until the beginning of the XX century. The built heritage goes back to Roman times and there is evidence that the oldest granite monuments are probably of Suevi age, still observed in the remnants of a gate of the primitive city wall. The Medieval period building phase can be observed in the XIV century defensive wall, in architectural features still observed in the Cathedral and its surrounding buildings (Photo. Page 4), whereas the Baroque is profusely exposed in many churches and reaches its splendour in the Tower of the Clerigos Church. The granite of Oporto is still present in neoclassical buildings dating from the XIX century. However, since the beginning of the XX century the granite has been less and less used, mainly due to the exhaustion of most of the city quarries and to an increasing use of other varieties of Portuguese and foreign granites, as well as other types of building and ornamental stone.

An itinerary in the centre of Oporto

The historical centre of Oporto city provides several alternatives for geological and cultural itineraries, with a duration of approximately three hours each. As a whole, and whatever the chosen itinerary might be, participants are attracted by a singular and unexpected harmony that results from the match between the roughness of the granite outcrops and the aesthetics of the buildings, monuments, fountains or statues that have been carved and sculptured from the very same granite.

The following itinerary describes the granite of Oporto outcrops within the city, the evolution of the use of this granite in accordance with architectural movements, the topographic irregularities and their relation to urban development, the instability of the escarpments due to the intense granite fracturing and the observation of several types of deterioration in the stone of buildings and monuments as a result of pollution and environmental agents commonly found in an urban setting.

The following sites have been selected for particular attention: the Faculty of Sciences; the Baroque Carmo and Carmelitas churches; the Saint Antonio Hospital; the Clerigos Tower; the granite outcrops in the Afonso Henriques avenue; the Cathedral and the front square; the Church of Saint Francisco; the City Wall and the escarpments of the river Douro banks.

The walk starts from the building of the Faculty of Sciences of Oporto University (Fig. 2). The Faculty has recently been the object of a detailed study on various deterioration processes, both on the exterior and in the interior, mainly caused by pollution and other environmental agents (Oliveira, 2001).

Just in front of the Faculty, in the Carmo Square, two flourishing granite Baroque churches, the Church of Carmo and the Church of Carmelitas, must be admired, including the wonderful tiles of the eastern façade (Fig. 3).

On the western side of Carmo Square stands the Hospital of Saint Antonio, an imposing granite construction of the XIX century (Fig. 4). This huge project, of Neopalladian style, was constructed on a local river valley and was subjected to

many rebuilding phases. It is the Portuguese building exhibiting the largest granite façade. The stone consists of big blocks of two-mica Oporto granite, collected from nearby quarries. Begonha (2001) presented an exhaustive study of this building, whose style has influenced other architectural projects in the city, with particular attention to the dramatic stone decay. As we walk through the garden of the Martires da Patria Field we are confronted by the splendid view of the Tower of Clerigos that dominates the urban landscape (Fig. 5). This tower is one of the most impressive Iberian Baroque granite monuments of the XVIII century. It is undoubtedly the landmark of Oporto. It is 75 m high and sits directly on the granite. The astonishing stone work was possible due to the softer nature of the two-mica granite of Oporto. Like other granite monuments in the city the tower exhibits several aspects of stone decay and has been subjected to periodical cleaning.

One of the best outcrops of the Oporto granite has been exposed by the opening of an avenue leading to the Cathedral and of the tunnel through which the metro line runs towards the iron bridge of D. Luis I. A stop has been selected around this area so that the participants may have the opportunity to compare the bedrock and its macroscopic features with the stone used in buildings and monuments

The Cathedral and its surroundings constitute a paradigmatic site showing the use of the granite of Oporto in various aspects: evidence of the original medieval construction, the overlapping of architectonic styles as a result of at least 41 successive transformations since its foundation, among which the northern *loggia* built by Nicolau Nasoni in the XVIII century is one of the most remarkable (Photo. Page 4). The use of stone as similar as possible to the original granite, in the restoration of the balustrade is noteworthy.

This tour may comprise one more example of an emblematic monument constructed with the two-mica granite of Oporto, the Church of Saint Francisco (Fig. 6). It has the structure of a Gothic temple, with reminiscent Romanesque style, being partly rebuilt in the XVII-XVIII century in the Baroque style. The interior is coated with gilt carvings of the same period. Despite important architectural restoration in the interior of the monument, the granite façades exhibit almost every type of stone decay that are found variously in all the other monuments: granular desintegration, plates, flakes, black crusts, thin black layers, efflorescences and biological colonization.

Figure 2. Faculty of Sciences of Oporto University (South façade)

Figure 3. Carmelitas and Carmo Baroque churches. Geological excursion, Summer 2005

At the end of the walk a reflection is proposed in order to be aware of the environmental problems that affect our cities and menace the conservation of an invaluable heritage.

Conclusions

The stops that have been suggested are included in a pedestrian itinerary within the historical centre of the city of Oporto. Between each stop attention is also drawn to the surrounding landscape, particularly the traces of the medieval city wall and the escarpments that slope towards the river Douro, which have recently been reinforced using geotechnical methods (Photo. Page 4).

Every granite monument that has been selected exhibits different aspects of stone decay, as a consequence of pollution and other environmental problems. A better knowledge of the phenomena that cause this deterioration should encourage an interest in conservation in order to preserve the cultural heritage and, above all, to recognize that the beauty behind the urban heritage is the expression of an adequate management of geological resources.

The symbiosis of the human and natural aspects of Oporto is eloquently summarized

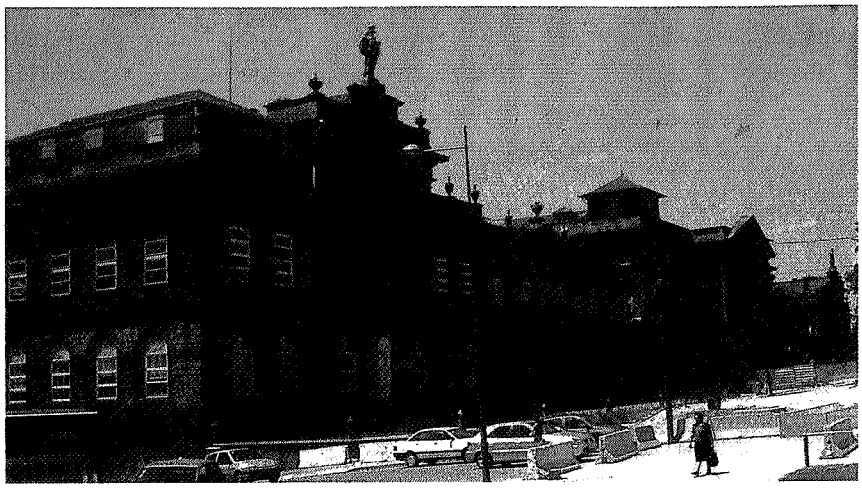

Figure 4. Hospital of Saint Antonio (main frontal)

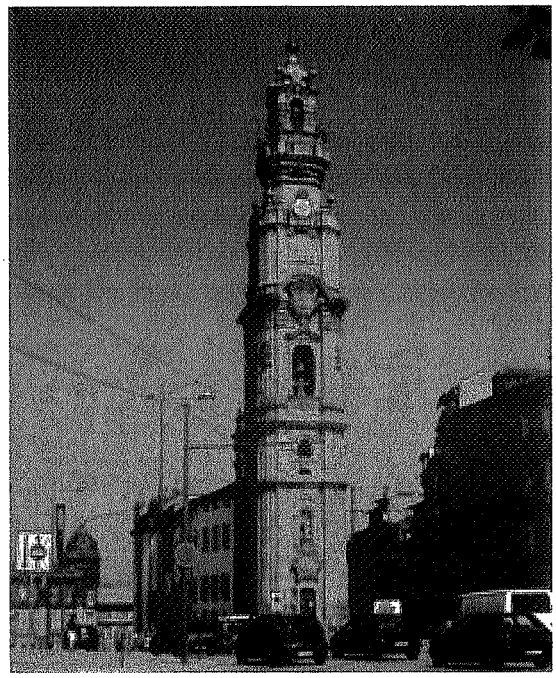

Figure 5. The Tower of Clerigos, the landmark of Oporto

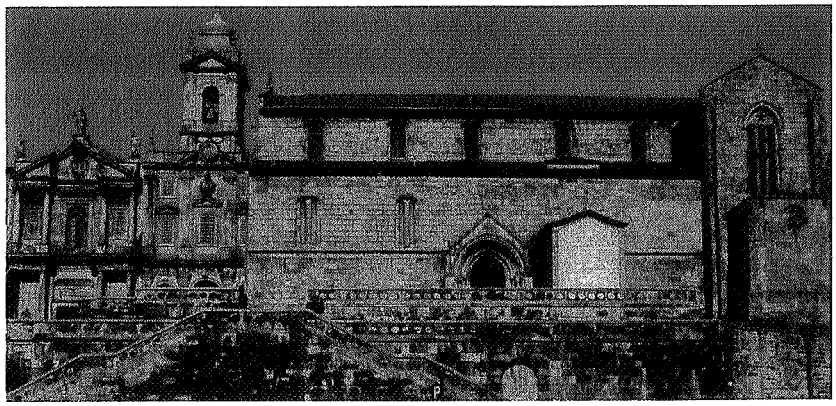

Figure 6. The Church of Saint Francisco

in the words of an anonymous poet:

"*Oporto is one of those places where memory and senses are renewed and the whispering granite tells us about the past, a history that persists in the present time, carved in stone and in the eyes of its people...*"

Acknowledgements

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How to plug the Energy Gap

by Ted Nield[1]

In a lively two-day discussion meeting in October 2005, 150 scientific and other specialists convened at The Geological Society of London to try to thrash out a practical workable solution to the UK's looming energy gap. A report arising out of these discussions, and based on reports from each of the session chairs, was subsequently written by Dr John Loughhead, Executive Director of the UK Energy Research Centre. This report was greeted with a blaze of multimedia publicity on the day of its public unveiling, 10 November 2005, at a meeting in the Royal Society. (To see all the documents associated with the conference, go to *http://www.geolsoc.org.uk/template.cfm?name=PR60.*

The morning meeting was chaired by Lord Oxburgh, former President of the Society. The Report had concluded that if the UK is to reduce carbon dioxide emissions, energy will inevitably become less available, and therefore more expensive than it has been in the recent past. The report stressed that this change will be permanent.

[1]Edits www.geolsoc.org and sub-edits *Geoscientist*. He is also chair of the Association of British Science Writers.

Adapting to this scenario while maintaining current standards of living would require fundamental changes in the way the UK produces and uses energy. An integrated approach, addressing energy supply from all sources (including fossil fuels, nuclear and renewables) combined with reducing energy demand, was needed, the report said.

The following factors were taken as given:

- Global warming due to human activity is a scientifically accepted fact, although the consequences of this warming are less well understood
- The requirement to reduce carbon dioxide emissions from our energy consumption
- The need for leadership to create the regulatory and fiscal frameworks to encourage appropriate behaviour from both suppliers and consumers.

The Royal Society meeting agreed that:

- the current regulatory environment is contradictory, inconsistent and hinders effective energy use
- the long term nature of the problem transcends not only political terms of office but even whole generations
- tradeoffs required in the energy mix are complex, requiring an analytical approach to strategic choices that will have long term trans-generational consequences
- societal engagement and education, including boosting take-up of energy-related science and technology courses in universities to address a growing skills gap, is critical to effect the required changes in energy usage.

The long term nature of the energy problem combined with the sensitive nature of the decisions that need to be taken, transcend both political terms of office and the political parties.

The Royal Society meeting recommended that a permanent independent cross-party energy commission be established charged with managing the UK's energy and emissions budget. This commission should have the power to recommend – and even set – regulatory, planning and fiscal policy to the government of the day. The commission would also represent the UK in the global energy debate and thus contribute to forming the international regulatory environment.

EFG celebrates 25 years in business

by David Norbury[1]

In 2005 the EFG celebrated its 25th anniversary and 50 th Council Meeting. Since formation in 1980 the number of members (National Associations) has grown to 19, elections to the European Geologist title have passed 660, a Medal of merit award has been instigated to recognize meritorious service, and the EFG has become the sought-after source of consultation on geological matters in the corridors of the European Commission in Brussels. This paper summarizes the anniversary celebrations and the current position of the Federation.

En el año 2005, la FEG celebró su 25 aniversario y su 50º Consejo. Desde su creación, en el año 1980, el número de miembros (Asociaciones Nacionales) ha crecido hasta alcanzar los 19, se han otorgado 660 títulos de Geólogo Europeo, se ha instituido la Medalla al Merito para reconocer los servicios prestados y la FEG se ha convertido en una fuente de consulta en temas geológicos muy demandada por los pasillos de la Comisión Europea en Bruselas. Este artículo resume las celebraciones del citado aniversario y la actual posición de la Federación.

En 2005, la FEG a célébré son 25 ème anniversaire ainsi que sa 50 ème réunion du Conseil. Depuis sa création en 1980, le nombre de membres (Associations nationales) a atteint le chiffre de 19, le titre de Géologue Européen a été décerné à plus de 660 candidats, la médaille du Mérite a été créée pour la reconnaissance de services exceptionnels et la Fédération est devenue un moteur de recherche et de consultation en matière géologique pour les Services de la Commission européenne à Bruxelles. L'article résume ces fêtes anniversaires et la position actuelle de la Fédération.

It may seem difficult to believe, but the EFG has now been going for 25 years. This anniversary was marked with presentations by Past Presidents at the Council Meeting in Prague in June 2005, and by a reception at the 50th Council meeting in Brussels in December.

The key members of the EFG are the National Associations, representatives of whom attend the biannual Council Meetings. The national membership as at the end of 2005 is shown in Figure 1. The EFG continues to encourage new member associations to join, and those currently with whom active discussion are in hand include Russia, Lithuania, Romania and Serbia and Montenegro.

Prague Council Meeting

In Prague, the Council was joined by the available Past Presidents, Richard Fox, Gunnar Hultqvist, Manuel Regueiro and Gareth Jones. These Past Presidents gave brief personal views of the first 25 years of the Federation.

Some highlights they identified include:

- the early development of a European professional geological organization included difficulties which the current Council no longer faces, although a different and no easier set of problems is now present every day
- the growth of the Federation over 25 years has been remarkable with the European Commission now calling on the EFG to provide input and advice to various directives
- the launch and development of the European Geologist (EurGeol.) title has seen over 500 geologists take up the title with its responsibilities
- the significant contribution made by France (UFG) in hosting the EFG office until its transfer to Brussels
- development of an early liaison and agenda with the politicians
- the initiation of the International Professional Geology Conference series (2000 Alicante, 2004 London, 2008 Arizona)
- the importance of a foundation based on sound finances
- establishment of the European Geologist magazine as a high quality means of communication to members and a calling card to politicians and regulators
- the establishment of the web site as a means of communication to the members and to those outside the EFG.

In conclusion, the PPs identified the strength of the EFG as the National Associations. Over the years there has been an ongoing process whereby the presence of the Federation has helped developments at a national level, and similarly the presence of the active membership has underpinned the credibility of the EFG.

There followed an Open Forum discussion which identified some thoughts for the future direction and aims for the EFG:

- continue to provide a pan European coverage for the geological profession
- this vision should also include a wider vision outside Europe
- continue to develop networking with politicians in Brussels and elsewhere at all levels
- continue to develop liaison with other geoscience bodies in Europe, for instance strong relationships are now enjoyed with EuroGeoSurveys and Euromines with coordinated lobbying activities in Brussels
- continue to broaden out the appeal of the EurGeol. title
- maintain a rolling Strategic Plan and use this as a tool to monitor and direct EFG activities
- continue to emphasize the importance of the magazine and its wider distribution
- continue to represent all National Associations.

The Past Presidents Panel identified that they could contribute to EFG by improving communications with National Associations, such as by attending their annual meetings (particularly anniversaries), linking with potential new members, and generally continuing to promote the Federation and the EurGeol. title.

The Past Presidents wished the Federation continued health and good fortune. The contribution of the Past Presidents,

[1]Secretary General, EFG

Figure 1. National members 2005

including those unable to attend the meeting, to the present status of the Federation was acclaimed. The Past Presidents passed on the silver medal presented by CNG to EFG on the occasion of the IGC Florence conference (August 2004).

Brussels Council Meeting

The December Council meeting is normally held in Brussels, and the 2005 meeting was remarkable for being the 50th Council Meeting. Accordingly, a reception was held in the Belgian Geological Survey office (where the EFG office is also located) and representatives of the European Commission and other Brussels organizations attended. A convivial evening was held, and this was enlivened by the now traditional wine tasting. The wines for this event are provided by the National Associations and it is meant to be an evening of contrasting and compareing wines, but the competitive urges of some countries could not be submerged.

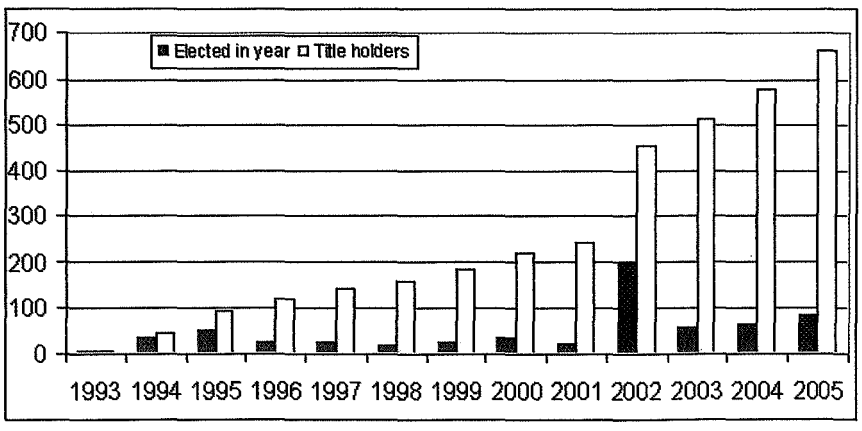


Figure 2. Overall membership numbers

EFG Medal of Merit

The EFG Medal of Merit was established in 2002 to recognize significant and substantial contributions to professional geology in Europe. It has given the Board since that time great pleasure to recognize such inputs by making these awards. Medal of Merit awards to date are:

John Shanklin	UK
Eric Groessens	Belgium
Richard Fox	UK
Renzo Zia (in memoriam)	Italy
Gerald Clement	France
Manuel Regueiro	Spain
Pietro di Paola	Italy

Election of European Geologists

The EurGeol. title was launched at the start of the Federation's life as a means of providing a European professional title. It should be noted that at the time few European countries had even a national professional title for geologists. EurGeol. No 500 was elected in October 2003, namely Kieran Harrington of Ireland, and the IGI marked the event with a special presentation to Kieran. By the end of 2005 the election of title holders up to No 662 was completed, a growth in that year of 85.

Continued growth in numbers has to be offset against the strict operation of the Mandatory CPD rule, introduced in 2002. Under this regulation, all EurGeols are required to submit an annual record (triennial for ILB members at present) of their continuing professional development activities for review. This has resulted in a number being struck off each year since that time. Of the 102 members who are no longer on the register, 58% have been struck off for failing to pay dues or failing to submit a CPD record when required to do so; the remainder have either resigned, retired or died. In my view, to have lost only 15% of holders over 25 years is encouraging. In any case and notwithstanding these losses, there is continuing strong growth in the membership (Fig. 2).

The introduction of the mandatory CPD rule was part of the re-launch of the EurGeol. title in 2002, and this explains the large peak in applications that year, and the ongoing rate of applications. The national distribution of title holders is shown in Figure 3, with the largest single representation being the UK. This membership represents about 15% of the Chartered Geologists in that country, whereas the proportion in Ireland is over 80%. The proportion in other countries remains low. It is the intention of the EFG Board to continue to encourage other individuals to take up

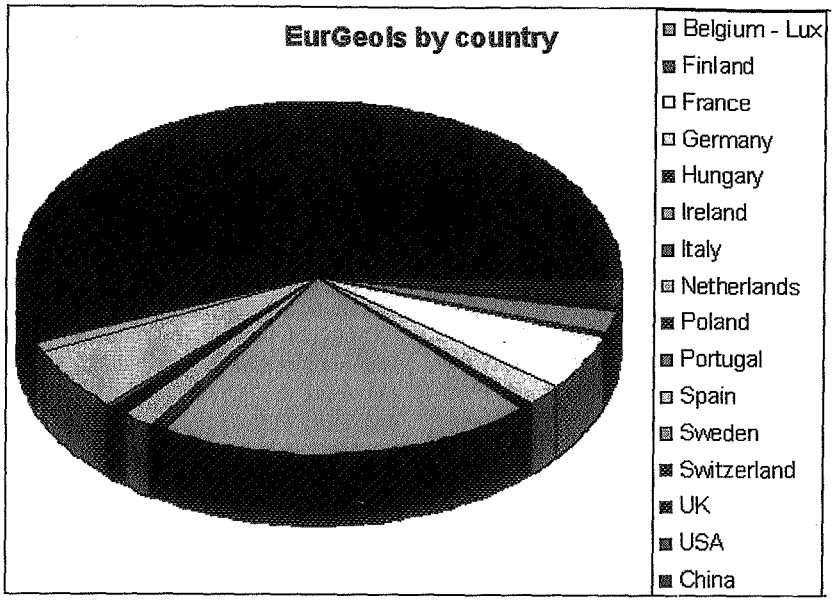


Figure 3. Distribution of EurGeols by country

the title, preferably through national vetting committees and licensed bodies.

Summary

The first 25 years of the EFG has seen enormous progress made from a modest start. The federation is now routinely asked for opinions on matters relating to the geosciences in Brussels, and is established as a major player on the European stage. As we start our second 25 years, the Board and Council are determined to continue this progress and accelerate developments in the direction agreed by Council. On page 15 in this issue of the magazine you will see a call for our members to make more active contributions to the every day work of the EFG, to the benefit of all. We look forward to hearing from you and including you in the Federation activities.

Meetings with the EC on natural hazards issues

by Herald Ligtenberg and Isabel Fernandez Fuentes

EFG office director Isabel Fernandez Fuentes and EU Delegate Herald Ligtenberg (co-ordinator expert panel on natural hazards), have met with different Directorate Generals of the European Commission to discuss issues related to natural hazards.

The EFG expert panel on natural hazards was approached by **DG Research**, Unit Environment and Climate system, with the request to provide input to the **Seventh Framework Programme** (FP7). DG Research would like to know key research needs on a specific hazard level (volcanoes, earthquakes, avalanches, etc), key research needs on a more horizontal level (multi-risk approach, risk mapping, etc) and more technology-related research points.

The expert panel on natural hazards has written a concise document in response to this request for FP7 input, entitled: "Geoscientific recommendations regarding natural hazards to be considered in the Seventh Framework Programme 2007-2013". Emphasis in the document was focussed on specific research in slope stability, in flooding and in land subsidence. The full document can be downloaded from the EFG website (*www.eurogeologists.de*).

In addition to the document, a meeting was scheduled with DG Research, on 10 March. The aim was to present our recommendations, discuss the contents in more detail and possible future work for DG Research. It was our first contact with this unit of DG Research and therefore important to establish a good relationship. Our contribution was very much appreciated and conforms to their expectations, i.e. receiving useful feedback from a geoscientific perspective. They expressed interest in more specific information on cost-benefit analysis of natural disasters and costs for taking preventive and mitigation measures. A general inventory for information and other preparations are now being carried out by the EFG expert panel on natural hazards.

A meeting with **DG Environment**, Unit Civil Protection, was scheduled for the same afternoon. The EFG expert panel on natural hazards has been in close communication with this Unit since 2003 and has always been very much appreciated. Several EFG advice documents, the 'Geoscientific manifesto on civil protection against natural hazards' and, on their request, a presentation at a Public Hearing at the European Parliament were provided in the past.

A meeting with this Unit was requested by the EFG in relation to the **EC proposal, January 2006**, to improve the response of the EU's Civil Protection Mechanism to natural and man-made disasters. The main concern of the EFG was that all actions in this proposal are focussed on response/reaction to disasters, instead of preventive and mitigation actions. Prevention and mitigation of the effects is what we have been emphasizing from the beginning, especially since the cost/benefit : costs of early Geoscientific investigations and hazard/risk mapping are generally less than 1-2% of the reconstruction costs after a natural disaster. We were informed that the focus of the civil protection unit has been reduced and that the issue 'prevention' no longer falls under the civil protection umbrella.

In our geoscientific manifesto on natural hazards (February 2005; see EFG website) we have emphasized the importance of; 1) integration of geology in land use planning to avoid unnecessary risks; 2) education of society to improve the understanding of and response to natural hazards; 3) development and instalation of early warning systems in areas at risk. These issues were discussed in more detail at this meeting.

Land-use planning

No actions are possible at this stage. We discussed the possibility for a directive on land-use planning to take into account geoscientific research before plans are approved, geological maps, etc. The EC fully supports our recommendations, but cannot find any support in the member states. The main reason is that the member states expect immediately a full harmonization of legislation on land-use planning. However, this is not our intention. We would just like to see that geology is officially adopted as an essential element in land-use planning to avoid building in high risk areas, etc. Member states have to be convinced of its importance on a national level and bring this back to Brussels.

Education

The EC pays attention to providing information to society, especially in vulnerable areas. Part of our recommendation also mentions the geoscientific training of local decision/policy makers, disaster management teams and rescue operations to better understand the situation and avoid further escalation of the problems. A better insight into the situation will lead to improved policy-making with respect to adopting the best preventive and mitigation measures against natural hazards. This type of education will be considered in more detail and this type of action is expected to be included in future calls for proposals.

Regarding **early-warning**, this received a lot of attention in the recently launched proposal: "*The Commission will be in a position to play a more important role in developing early warning systems, allowing for more timely intervention. It will be better able to assess and upgrade where necessary existing early warning systems; improve the link between detection systems and alert mechanisms; and make them more accessible to decision-makers.*"

They have also established the **MIC Daily**, a daily internet bulletin which monitors emerging and ongoing natural and manmade disasters around the globe (*http://europa.eu.int/comm/environment/civil/micdaily*). Their control centre was shown and their work was explained to us in more detail.

Discussions in this meeting also pointed to the usefulness of background material on cost-benefit, statistics, etc. A document will be prepared and further contacts will be made with other units of DG Environment on natural hazards-related issues.

The EFG expert panel on natural hazards is also in close communication with DG Environment, Unit Water and Environmental Programmes, in relation to the

formation of a **Floods Directive**. Last autumn we provided recommendations to this Floods Directive and became involved in EC working groups on risk mapping (EXCIMAP) and land-use management. At the end of March we will attend an EC stakeholder meeting on the European Action Programme on Flood Risk Management in Brussels, and plan to attend the European Conference on Flood Risk Management in Vienna, 17-18 May.

Meeting with Euromines on mutual interest and cooperation

by Herald Ligtenberg and David Norbury

On Friday 10 March, the EFG Board met with Euromines to maintain the previous good contacts, and to discuss areas of mutual interest In discussion with Corinne Herbestreit (Director) we jointly determined actions to be supported and carried out by both organizations. Euromines informed us about their education programme on mining-related issues that is sponsored by and operated in close collaboration with the industry. The broad EFG network can assist in promoting these courses to a wider level of universities, and in broadening them out to more geoscience subject areas.

A concern shared by Euromines and EFG is the restrictive view of EU institutions in relation to research in the extraction of minerals and hydrocarbons. According to DG Research, Europe should become a service community. However, this would make Europe completely dependent for its resources on countries outside Europe and would also significantly reduce the currently high knowledge level on mining and petroleum exploration and production. EFG and Euromines agreed to lobby for maintenance of the current research level on these issues in Europe in the context of assuring a sustainable mineral resources policy for Europe. The mining industry, universities and international organizations have established a European Technology Platform on Sustainable Mineral Resources, which is fully supported by EFG and Euromines. However, this Technology Platform is not officially accepted by DG Research. EFG and Euromines will continue to promote this platform on sustainable mineral resources.

Furthermore, we have agreed to collaborate on activities in relation to the United Nations Year of Planet Earth (2008), and this also jointly with EuroGeoSurveys by organizing a Geology Day for the EU and EC to be held in Brussels. Further information on this event will be provided in these pages, and on the websites.

Attention: European Geologists

ARE YOU A EUROPEAN GEOLOGIST ?

DO YOU KNOW ENOUGH ABOUT WHAT IS GOING ON ?

NO ?

DO YOU THINK THIS TITLE WOULD HELP YOU IN YOUR PROFESSIONAL LIFE ?
IF SO, GO TO THE EFG WEB SITE www.eurogeologists.de AND SEE THE BENEFITS, VIEW THE GUIDANCE AND DOWNLOAD THE APPLICATION FORMS. WE LOOK FORWARD TO HEARING FROM YOU.

YES ?

DO YOU WANT TO HEAR MORE ABOUT WHAT IS GOING ON IN EUROPE AND IN THE EFG ?
PLEASE PROVIDE THE BRUSSELS OFFICE WITH YOUR NAME AND E-MAIL ADDRESS, AND WE WILL COPY YOU IN ON NEWS ITEMS. DETAILS TO efgoffice@tiscalinet.be, AND IF YOU COULD ALSO PROVIDE SOME BRIEF PERSONAL DETAILS THAT WOULD ALSO BE HELPFUL (YEARS EXPERIENCE, AREAS OF PROFESSIONAL ACTIVITY OR INTEREST).

DO YOU WANT TO CONTRIBUTE TO THE FORMULATION OF EUROPEAN POLICY ON GEOSCIENTIFIC MATTERS ?
THEN JOIN ONE OF OUR EXPERT WORKING GROUPS WHO ARE PROVIDING INPUT TO THE COMMISSION ON A RANGE OF TOPICS. THE WORKING GROUPS ARE LISTED ON www.eurogeologists.de

WE LOOK FORWARD TO HEARING FROM YOU – THE EFG IS YOUR FEDERATION

Past Presidents meet in Uppsala

by Gareth Ll. Jones PP7 and Christer Åkerman PP8

Four EFG Past Presidents met in Uppsala over the weekend of 10-12 March 2006 to discuss what use could be made of their combined experience and knowledge of EFG affairs. They were PP4 Richard Fox, PP5 Gunnar Hultqvist, PP7 Gareth Jones and PP8 Christer Åkerman. PP1 John Shanklin and PP3 Gerald Clement sent good wishes, as did PP6 Manuel Regueiro who was on business in Bolivia. The absent PPs, however, also sent contributions to the Agenda. A glass was raised to the memory of the late PP2 Renzo Zia.

On this auspicious occasion, the PPs first of all wished to establish themselves as an auxiliary body to be availed of by the EFG Board when necessary. They thought that it was important that they did not duplicate or infringe the work of the Board. They also addressed a number of topics including those of financing the EFG and of the PP group itself, and several avenues of possible funding were explored.

They were impressed by the work done by the Brussels office and thought that the position of Brussels Office Director should become full time when the finances could be arranged. Congratulations were extended to the Director, Isabel Fernandez on starting GEO NEWS, which is an excellent look at funding opportunities in the EC. The PPs thought that in the future, the EFG should aim to develop services at the Brussels office for National Associations and for EurGeols.

On the topic of EFG publicity by National Associations, the PPs considered that EFG delegates should inform their colleagues about the work and ethos of the Federation for a few minutes at national meetings. They believed that EFG posters should be displayed at these meetings and that there should be EFG pamphlets and magazines available for distribution. Also, National Associations should demonstrate their membership of the EFG on their headed notepaper and similar material.

The European Geologist magazine was recognized both as a superb quality publication, and also as the flagship of the Federation. It is essential for use as a calling card, for promotion of the image of the EFG and as a service to members. National Associations are encouraged to support the magazine by contributing to it, by obtaining advertising for it, by buying extra copies, and by getting subscriptions to it.

When the Past Presidents examine the EFG website, as they use it regularly, they are impressed by the amount of work that has gone into its development, both by Detlev Doherr and also by Peer Andersen. Clearly, in order to use it to its full potential to the benefit of the members and the EurGeols, it will be necessary to greatly expand the memory and they supported the proposal to acquire more memory for it.

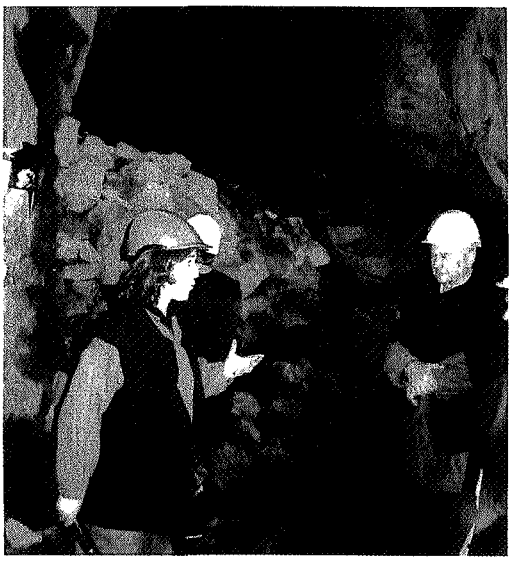
The PPs emphasized the importance of the role of geologists in identifying resources of water, fuel and minerals through the Working Groups. These and other topics from the WGs are brought to politicians and decision-makers of the European Commission through the work of the Brussels office.

The four veteran geologists particularly thought that our European Geologists needed special attention, and welcomed the intention to develop web services for EurGeols and considered that we should also aim to provide other services when it becomes possible.

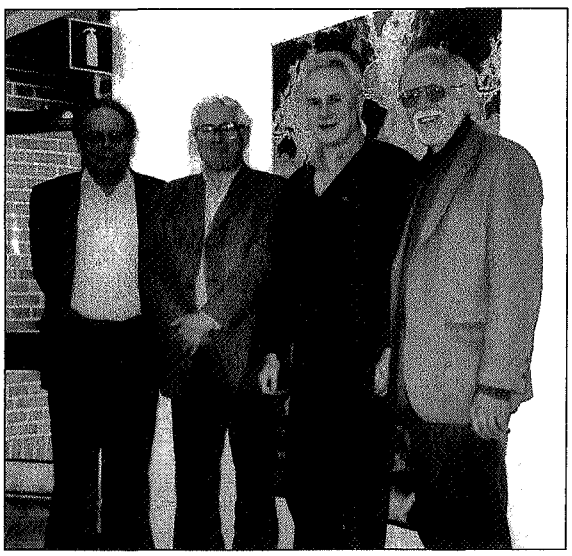
They thanked the SGU for the use of the Opal Room for their meeting. They thought that this was appropriate, indicating that PPs were as precious as opals! They concluded that they were a repository of advice for the EFG Board, to be drawn on when required.

In order to broaden their vision on geological matters, a visit was made to the newly opened 150 m deep level at the Sala silver mine 100 km north-west of Stockholm. After tramping through the snow, they were impressed by the richness of the ore that was mined from the 16th to the 20th centuries and which still attracts exploration companies. They were intrigued by the extent of the use of the fire-setting technique and by the resultant smooth walls and oval passage shapes.

So, a good start was made with the inaugural Past President's meeting and the PPs hope to be able to provide advice and help when required by the EFG Board.



Picture 1. Tour of the Sala silver mine



Picture 2. Past Presidents, left to right: Gunnar Huldqvist, Richard Fox, Christer Åkerman, Gareth Jones

Workshop: training and mobility of professionals in Geology

by Isabel Fernandez[1] and Slavko Solar[2]

The European Federation of Geologists (EFG) in collaboration with the European Commission, arranged a Multi-Country workshop on EU Legislation and Initiatives regarding Training and Mobility of Professionals in the Field of Geology on 26-27 October 2005 in Brussels. This workshop gave the opportunity to geologists coming from twenty countries in Europe to discuss how European Legislation influences the Geology Profession, particularly in regard to Training and Mobility.

La Fédération Européenne des Géologues, en collaboration avec la Commission européenne, a mis en place, à Bruxelles, les 26 et 27 octobre 2005, un atelier international concernant la législation et les initiatives en matière de Formation et de Mobilité des Professionnels de la Géologie.. Cet atelier permet aux géologues venant d'une vingtaine de pays européens de débattre de l'influence des lois européennes sur le métier de géologue dans les domaines de la formation et de la mobilité en Europe.

La Federación Europea de Geólogos en colaboración con la Comisión Europea, Oficina Técnica de Asistencia Extranjera, Dirección General para la Ampliación, celebró el pasado 26-27 de Octubre, 2005, Seminario sobre "Legislación Europea e Iniciativas para la Formación y Movilidad de Profesionales en el campo de la Geología". Dicho seminario dio la oportunidad de discutir con profundidad, a geólogos procedentes de mas de veintes países europeos, sobre los aspectos de la legislación europea que influyen a la profesión de la geología, en particular a la educación y movilidad.

The aim of the workshop was to present the current position on legislation and initiatives at EU-level related to the training and mobility of professionals within the European Union. A substantial discussion amongst representatives of authorities, industry and research professionals and their NGOs was held on the issues particularly associated with Continuous Professional Development, the concept of the Competent Person, and regulatory and voluntary professional titles in the field of geology.

Presentations were made by representatives of the European Commission, members of EFG (Board, Delegates and EFG Office Director), and other organizations.

The participants were mostly geologists and represented more than twenty European countries. During the workshop, EFG had the opportunity to strengthen relationships with some European countries and potential new EFG members such as: Bosnia, Bulgaria, Serbia, Croatia, Cyprus, Lithuania, Latvia, Romania and Turkey.

The workshop was divided into four sessions:

- Education, Mobility and Recognition of Qualification
- Practice for Geologists
- Geology in Society
- Some practical experiences.

[1] Director EFG Office
[2] Geological Survey of Slovenia and EFG Vice-President

An introductory key-note lecture entitled *The Bologna Process of geology in Europe: the Spanish experience* was presented by the Director of the Geological Survey of Spain, José Pedro Calvo Sorando: The lecture summarized the current situation for the Title of Degree in Geology in Spain, in the context of the Bologna Process. Dr Calvo Sorando presented some important aspects of this title: access to the working market would require a Degree (implemented) or a Master title; degree studies would be properly developed by a studies programme lasting 3 years (180 ECTS) and 1 more year (60 ECTS) dealing with a research project and/or professional/ research practice; the core programme (including learning tools and techniques) should not exceed 70% of the total.

Education, mobility and recognition of qualification

The objective of these sessions was to examine existing legislation in Europe for these topics. To present the legislation, European Commission administrators and experts in these topics were invited. In relation to the Education topic we had the following presentations:

EU education and training policies: Bologna Process, and Life Long Learning and its benefits for professionals was presented by Mr Friedrich Wittib, from DG Education and Culture. He talked about the general aspect of this process and the relationship with Life Long Learning for professionals.

Bologna Process in Practice for Geology by Dr. Paul Ryan, from the Tuning Project. TUNING is a project by and for universities. It is the response from Universities to the challenge of the Bologna Process. Geology is one of the 7 specialities involved in this project (*http://europa.eu.int/comm/education/socrates/Tuning-Project).*

European Thematic Network "Geol" – New Approach to a transparent and better Geol. Education as a link between Universities, Students, Science, Profession, Industry, Governments and Society was presented by Uros Herlec from Ljubljana University, Slovenia and past EFG vice-president.

In the context of Life Long Learning, Paul Anciaux from DG Enterprise and Industry made a very interesting presentation on the importance of a skilled workforce for a competitive extractive industry in Europe. The industry policy follows declarations from:

- Lisbon: to make the EU the most competitive and dynamic knowledge-based economy in the world by 2010.
- Gothenburg: Sustainable development;

economic growth, social inclusion and environmental protection should go hand in hand.

Paul Anciaux concluded that a competitive extractive industry in Europe requires skilled human resources to carry out training and research and development programmes.

In the context of Mobility and Recognition of Qualification there were the following presentations:

Mrs Catherine Heldmaier-Regnier from DG Internal Market presented the new Directive on Recognition of professional qualification. The objective of this directive is the consolidation of existing directives and modernization of the system for recognition of qualification. Regarding the last objective, one of the new possibilities for non-harmonized professions is the Professional Platforms. This new legislation provides EFG with the possibility of establishing a Common Platform for Geologists.

David Norbury as EFG Secretary General presented the importance of this platform for Geologists and the link with the Competent Person concepts: *Competent Person concept within Common Platform allows flexibility and imposes potentially more onerous conditions*

The title of European Geologist (EurGeol.) has three main pillars: Qualification, Code of Ethics and Continual Professional Development. To present the Code of Ethics for the EurGeol. title, we had a presentation from Christer Åckerman, EFG Past President. Geology is a science that deals with the composition, structure, resources, history and evolution of the Earth and the application of this science. The practice of geology is a profession for those who possess the necessary qualifications and/or professional experience recognized by their appropriate national body or under the law, and whose living comes essentially from that work.

Regarding Continual Professional Development, John Clifford, former EFG EU Delegate, prepared a presentation that was presented by Ruth Allington, from the Geological Society of London. It clarified that CPD is the systematic maintenance, improvement and broadening of knowledge and skill and the development of personal qualities necessary for the execution of professional and technical duties throughout a practitioner's working life.

Session on geology in society

During this session discussions were held on topics such as: Needs of Society; Reinforcing Geology in European Policy; Expert input into public debate; and Communicating expertise.

Manuel Regueiro, former EFG president and person responsible for the External Affairs of the Geological Survey of Spain, presented *Geology and Meeting the needs of Society*. He identified several areas where Geologists serve society:

- Recording the creation, destruction and movements of the continents. Exploring the movements of the crust
- Discovering where, when and how mineral deposits are formed
- Locating non-renewable energy resources
- Recording physical processes that shape the planet
- Protection of the planet and its resources: studies of the environment
- Studying site location of structures built by man
- Locating and managing water supplies
- Ensuring that our waste products are stored with minimum threat to ecosystems
- Understanding and predicting natural hazards and disasters (earthquakes, landslides, volcanic eruptions, floods, droughts, tsunamis)

A presentation on improving the impact on society, the European Legislative Process and how to participate in this process was made by Isabel Fernandez, EFG Office Director. This presentation established the relationship between this legislative process and the focus and structure of EFG strategy.

Slavko Solar presented on the complex issue of how to make sufficient and adequate input of Earth Science and expertise into public debates, in particular into sustainability policies. Societal needs were compared with the science and expertise outputs in the case of sustainable mineral resource management.

In the conclusions some recommendations were made on how to improve mutual understanding of needs and limitations of the science information transfer. Many very practical communication recommendations were made by Ruth Allington in the next presentation entitled *Communication expertise*. She dealt with basic questions (why, what, who, when and how) with regard to expertise communication, and concluded with a set of communication rules that experts should be aware of, if they want their expertise to have the desired impact.

The activities of geologists have an important link with the needs of the Geological Surveys in Europe. An interesting and important presentation entitled *Skills required from young geologists - A European Geological Survey perspective* was made by Patrice Christmann, Secretary General of Eurogeosurveys. Christmann concluded as an operational paradigm for the 21st Century for Geological Surveys: *"Acquire the data, provide the accessible, interoperable, harmonized geology-derived digital information as well as the knowledge needed to develop policies, legislation, monitor changes, and to address the multiple issues related to Sustainable Development, at local, regional, national, European and global levels"*

Significantly improving our understanding of all geological processes will therefore be of great benefit to European society. Consequently, increasing the availability of researchers in geology is important for Society. A very important contribution on the topic of mobility of researchers, Marie-Curie actions programme, was presented by Inmaculada Peñas Jiménez, from DG Research, European Commission. This presentation focused on an extensive description of the Marie-Curie actions:

- Opportunities for researchers at all stages of their career
- Coherent approach, based on financing international mobility for researchers
- Employ "bottom-up" approach, i.e. all fields of science and technological interest for the European Community (no priority areas)
- Multidisciplinary projects are encouraged. More information is available on the internet.

Marie Curie Actions: *http://europa.eu.int/mariecurie-actions*

Calls for proposals: *http://fp6.cordis.lu/fp6/calls*

Session on practical experiences

The final session of this workshop presented information on projects and activities from some European Countries:

- *European Rules and Legal Aspects on Natural Risks*, EFG /CNG: Umberto Puppini
- *Terrafirma project: ground motion revealed by radar interferometry technique*: EFG, David Norbury and Geological Survey of Belgium, Xavier Devleeschouwer
- *Geosciences in France: relationships between their educational and professional fields*, UFG: Pierre Andrieux

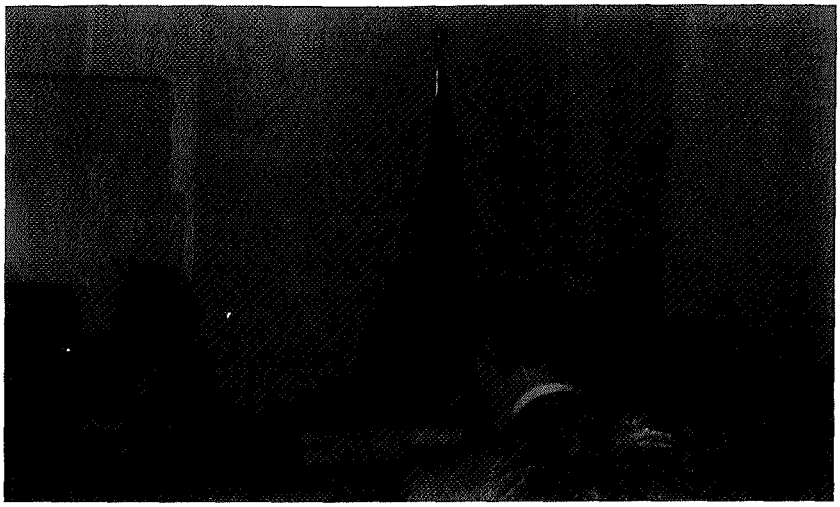
- *Recognition of the geology qualification*, Belgium Geological Survey: Pieter Laga
- *Geology and Environment*, EFG/UBLG: Dirk De Coster

It was an educational experience for participants to become acquainted with experiences from "old" European Union Members in comparison with their domestic situation. A potential for future cooperation among all participants of the workshop became much more realistic when practical experiences were exchanged.

Conclusion

This workshop concluded with an extensive discussion and exchange of national practical experiences in the area of geology and professionals.

EFG has received a very positive response to the event and would like to thank all the participants, speakers, and in particular the European Commission, Technical Assistance Information Exchange Unit in DG Enlargement for facilitating this workshop.



Taiex speakers: from the left Catherine Heldmaier Regnier, European Commission, DG Internal Market; Isabel Fernandez, EFG; Paul Anciaux, European Commission, DG Enterprise and Industry

More information on the workshop can be found on the EFG website *www.eurogeologists.de*. EFG has also released the CD with most of the presentations. If you are interested in obtaining the CD, please contact the EFG Office in Brussels by email: efgbrussels@tiscalinet.be

The Kistelek Declaration

by Tamás Hámor[1]

In spite of its excellent potential in utilization of renewable energy, Hungary is lagging behind in achieving its national indicative target as set in the relevant European Directive. The Hungarian Geological Survey has an eminent role in the management of geothermal resources but little was known about the pan-European practices of the promotion of this resource. In order to exchange information in an efficient way, the Survey, in co-operation with the TAIEX Office of the European Commission, organized an international workshop, the results of which are presented herein.

Malgré ses remarquables capacités dans l'utilisation de l'énergie renouvelable, la Hongrie est en retard dans la réalisation des objectifs de son programme national, pour se conformer aux recommandations européennes en la matière. Le Service Géologique de Hongrie a un rôle éminent dans la gestion des ressources géothermales mais est peu au courant des pratiques utilisées en Europe pour promouvoir cette ressource. Pour un échange efficace des informations sur le sujet, le service Géologique, en collaboration avec le Bureau TAIEX de la Commission Européenne a organisé une réunion de travail au niveau international. Les résultats de cette réunion sont ici présentés

A pesar de su excelente potencial en el uso de las energías renovables, Hungría se está quedando atrás en la consecución de su objetivo nacional de referencia tal y como indica la correspondiente directiva europea. El Servicio Geológico Húngaro tiene un papel eminente en la gestión de los recursos geotérmicos pero se sabía muy poco sobre actividades pan-europeas de promoción de este recurso. Con objeto de intercambiar información de un modo eficiente, el Servicio, en colaboración con la Oficina de TAIEX de la Comisión Europea, organizó una jornada cuyos resultados se presentan en este trabajo.

Geothermal energy is a promising component of the renewable energy mix in the European Union. As set by Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market, the overall EU target is to double the share of renewables to 12% by year 2010 in the gross energy consumption and in particular to achieve a 22.1% indicative share of electricity produced from renewable energy sources, and published reference values for each Member State.

Fifty experts from 14 countries attended the workshop on "Regulatory and Economic Tools Governing the Enhanced Exploitation of Geothermal Energy in the European Union" organized by the European Commission TAIEX Unit and the Hungarian Geological Survey, Kistelek (Hungary), 6-8th April 2005. These represented the European Parliament, the European Commission, and a wide spectrum of government agencies, industrial enterprises, research institutes and professional associations, e.g. European Geothermal Energy Council and EuroGeoSurveys. The presentations addressed:

- an analytical evaluation of relevant Community legislation and R&D programmes
- national figures on exploitation of geothermal energy and development programmes
- national inventory and assessment methodologies of geothermal resources
- relevant regulatory authority and legislation framework
- economic instruments, including fiscal burdens, waivers and financial support tools.

The three thematic working groups discussed:

- regulatory framework and environmental legislation
- economic barriers and supportive instruments
- assesment and national inventory methodologies.

Conclusions and recommendations

As a result, the "KISTELEK DECLARATION" was issued and signed by Tamás Hámor (Hungarian Geological Survey) Burkhard Sanner (EGEC), Patrice Christmann (EuroGeoSurveys), Zsolt Becsey (European Parliament), Franciska H. Karman (IGA), Ladislaus Rybach (IEA). The major conclusions are as follows:

Geothermal energy is a specific natural resource because:

- it is on the border-zone of managing mineral commodities, groundwater reserves and other energy sources by being bound to geological formations and to thermal waters
- it is a fossil heat from radioactive decay and other geological processes; therefore it is a conditionally renewable flow-type resource
- the property rights over geothermal energy are owned by the State but in some countries landowners can exploit shallow subsurface resources for their own use
- the utilization of geothermal energy is still at its infancy on the European scale.

The relevant national legislation is spread throughout the mining, energy, environmental, water management and geological acts, sometimes in a contradicting way, and the licensing authority framework for geothermal facilities is rather complex in most countries. *A Community level communication shall foster Member States to adopt a coherent legislation system and to designate a rational framework of competent authorities in order to ease application for geothermal energy use.*

The definition of geothermal energy is lacking in the *acquis communautaire* and the national practice is diverse (some

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www.mgsz.hu

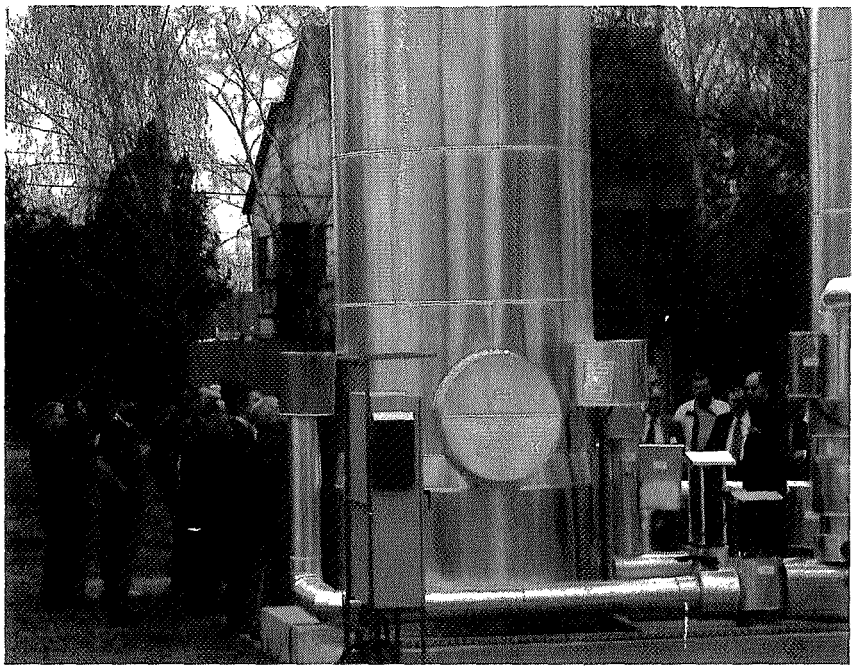

Figure 1. Geothermal well at Kistelek used for district heating and hot spa

Figure 2. The workshop audience

authorities consider it as a type of energy carried by thermal waters exclusively), which hampers the distribution of most up-to-date technologies using shallow depth reserves via heat-pumps or deeper closed-circuit heat-exchanger fluids. *A broad sense legal definition of geothermal energy is needed in a relevant piece of Community legislation, e.g. the heating-cooling legislation in preparation.*

As in the case of other state-owned territorial commodities, low-resolution, static inventories of geothermal resources are available or being prepared by water research institutes or geological services, that are not capable of meeting the requirements of either the investing enterprises or the licensing environment protection and water management authorities. In some countries neither the data access for the competent agency hosting the geoinformation nor the inventory is enforced by law. *The development of national dynamic inventories of geothermal energy resources and reserves designed to be capable of registering annual changes and allowing country-scale modelling is highly recommended. To make such inventories comparable on a pan-European level a common basic methodology shall be elaborated, preferably via the assistance of Community level professional associations, e.g. EuroGeoSurveys.*

The environmental impacts of geothermal installations are limited; it is a green energy source. In terms of environmental sustainability, the maintenance of stable, close-to-original temperature and pressure status of an exploited groundwater reservoir is of prime importance as well as the protection against pollution of surface waters by untreated outflow of saline or used thermal waters. However, the national emission limit values, and re-injection provisions show a certain diversity. *The new Groundwater Directive and its implementing measures shall provide more detailed prescriptions on surface discharge and re-injection criteria of used geothermal waters. This environmental action, together with the need for harmonized inventories, technology development and raising public awareness shall optimally be accompanied by a more definite availability of EU funds for the above objectives.*

There is a wide variety of economic instruments in the studied countries which either support or inhibit the enhanced use of geothermal energy in Europe. There are countries where the financial burden of a fiscal nature (i.e. mining royalty, sewage penalty, groundwater use fee, environmental tax) is multiple, which breaches general taxation law. The arsenal of supporting instruments is colourful too, including tax exemptions, guaranteed take-over prices, green certificates, direct subsidies, to mention a few. The German example shows clearly how much these supportive tools can contribute to the high growth rate of renewables in a country with moderate natural setting. Moreover, there is a relatively low rate of return of investment in geothermal energy and the economic risk is higher as compared to

other energy sources. These economics do not ensure the security of interested stakeholders and lead to a serious distortion of equal and open competition at the European level. It is foreseen that Community institutions and Member States will face a growing number of related legal disputes at the European Court of Justice in the near future. *There is an immediate need to highlight the economic discrepancies on the Community level and to urge Member States to harmonize financial solutions in reaching their indicative targets, and in improving the energy mix for being less dependent on outside sources.*

As a general conclusion and recommendation, all participating experts agreed that under the realm of the IPPC Directive a best available technology reference document on geothermal energy describing state-of-the art geothermal energy exploitation, the up-to-date technologies and their environmental aspects, and the economic instruments could serve as a strong, quasi-legal document which all stakeholders can refer to in their future activities in pursuit of the enhanced, sustainable use of geothermal energy.

Aftermath

The Kistelek Declaration was delivered to responsible personnel of European Union institutions and bodies. It received a very positive feedback from numerous addressees (e.g. directors of DG Environment and DG Research) and the Kistelek Declaration became a basic reference document for lobbyists of geothermal energy in the European political arena. The achievements include, inter alia, that the first draft of a Directive on the promotion of renewable heating and cooling will be out in 2006, district heating will be eligible for a reduced 5.5% VAT, and geothermal energy related RTD will be most likely included in FP7 calls.

The full set of information, including presentations and completed questionnaire table is available on:

http://www.mgsz.hu/english/news/2005/eu_taiex.html and on http://www.egec.org.

Mining goes on...

by Tamás Madarász [1] and János Földessy[1]

A conference was held in Miskolc (Hungary) on Mining - Health, Safety and Regulatory Issues in the European Union, organized by the Hungarian Mining Bureau and the University of Miskolc, Faculty of Earth Science and Engineering on 23-25 November 2005. The event was financed by the European Commission DG Enlargement TAIEX office. The excursion and site visits were sponsored by local companies, such as RWE-MERT, Omya Hungary and Mecsek-Oko. The financial support covered the costs of the event including the participation of invited lecturers and participants.

The event took place at the beautiful location of Miskolc-Tapolca, where 65 registered participants from 15 European and associate countries attended lectures and case study reports on the latest developments of the Mining Waste Directive as well as case studies related to mining waste management.

Keynote speaker

The opening addresses of the event were given by Peter Eszto, head of the Hungarian Mining Bureau and Mihály Dobróka, Vice-Rector of the University of Miskolc (Fig.1). The keynote speaker, Paul Anciaux, articulated, in his presentation, the significant lack of competitiveness of the European Union in comparison to the USA, Japan and the Asian economies, which is partly due to the unfavourable legal environment. This frequently hinders economic development. The other main reason, he argued, is the inefficient use of information technology. This situation cannot be sustained. The goal of the EU is to stabilize European competitiveness by 2010; this should be the most important target of EU policy development. The speaker expressed the significance of the fact that while Europe is not an importer in the area of construction materials, in the field of metallic ores the import dependency is close to 100%, which is also true for mineral energy resources. He spoke of the direct relationship between raw materials and industry. To improve the competitiveness of Europe, a sustainable mining industry must support sustainable development goals. This thought was repeatedly expressed in several other presentations. The speaker described the main competitiveness indicators based on the regular investigation of his office in this field, which are: accessibility to land, level of investment, legal framework, quality of human resources, research and development, market options and, finally, globalization. The mining and extractive industry has to gain back its respect in society, which is viable only through appropriate levels of representation and transparency.

István Bérczi, (Fig.2), President of the EFG, highlighted the importance of creating mineral management strategies and working out long-term views about our mineral resource security, energy supply and education of the next generation of engineers. He predicted an increase in demand for mineral resources, for which there is a complex solution, involving better human resource management, prudent and environmentally acceptable use of existing resources and increasing efforts to discover new occurrences

Other speakers

Péter Kovács, the department head of the Hungarian Ministry of Water and Environmental Protection, reported on the Hungarian participation in EU regulation development that was motivated by major mining-related environmental accidents, such as Aznalcollar and Baia Mare. He highlighted the importance of partnership with neighbouring countries, which is specially true in the case of Hungary, that receives over 95% of its surface waters from neighbouring countries.

Several other speakers such as Professor Christian Bühow (TU Freiberg, Germany) and Eszter Havasné Szilágyi

[1] University of Miskolc

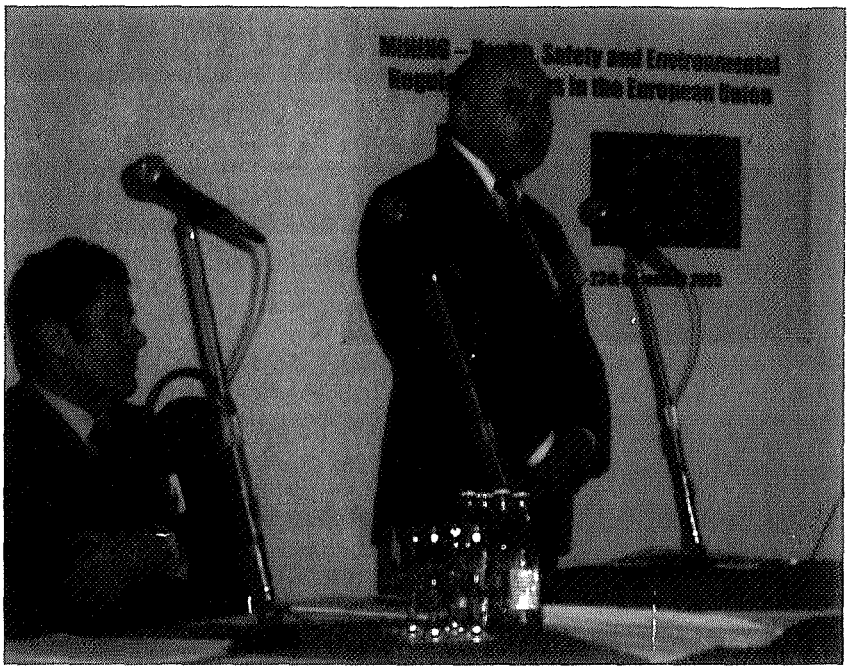

Figure 1. Mihaly Dobroka, the Vice-Rector of the University of Miskolc gives the opening address

Figure 2. EFG President István Bérczi addresses the meeting

Figure 3. Participants on the field trip

(Chief Adviser, Ministry of Environment, Hungary) spoke about health issues as well as the application of the Water Framework Directive in the extractive industries.

The afternoon round table discussion (chaired by Professor János Földessy University of Miskolc) was dedicated to the special issues of mining and environment in Central and Eastern Europe and the Balkan countries.

Second day field trip

The second day was dedicated to a field trip where the participants visited the MERT Mátrai Power Plant Rt. at Gyöngyös Visonta (Fig. 3). Here, Derekas Barnabás, the mining director, talked about the production and environmental activities of the company. In Gyöngyösoroszi, the group visited the abandoned ore mine site that is currently being remediated by the Mecsek-Öko Rt. The site rehabilitation, the treatment of acid mine drainage and the new technological investments were described by László Kulcsár, the senior engineer responsible for the site. The day was closed with a short introduction to OMYA Hungary and a pleasant wine tasting at the Eger wine region.

Third day presentations

The third day presentations were begun by Christophe Sykes (IMA-Europe), Chief Secretary of the non-metallic mining association of Europe, which is taking part in the final negotiations related to the European Mining Waste Directive, in Brussels. Among other speakers of the day were Helmuth Wolff, Professor at the Technical University of Berlin and Tamás Hámor (Geological Survey Hungary).

Gregoire Poisson, the Chief Secretary of UEPG introduced the activity of their association of 19 countries and described how they are able to influence the legislation-forming activity of Brussels in, for example, the field of management of carcinogenic materials and mining wastes.

Ken Swanson, the director of European Mining Regions Network talked about the importance of continuous cooperation between residents of the mining regions, companies, education institutions, and scientific researchers. Further case studies of Hungarian mining waste remediation projects were introduced by Gábor Németh (Mecsek-Öko Rt.) and Tamás Madarász (University of Miskolc).

The event was closed by a round table discussion hosted by the research and development project (EU FP5, FP6, NATO SfP, Interreg, PHARE), leaders of the University of Miskolc, Faculty of Earth Science and Engineering, where participants could get practical advice on EU research project activities and management.

For further information please visit the conference website at: *http://www.taiex.uni-miskolc.hu/* where detailed programmes, presentation materials and background information can be found.

1st cycle Geology programmes in the European Higher Education Area

by A. Mateus[1], C. Andrade[1], J. Munhá[1], F. Noronha[2],

A 1st cycle degree in Geology must rely on internal consistency and diversity of competences to be achieved during the planned courses and on the identification of specific learning outcomes; these should support the criteria to professional certification (quality label). A correct curricula organization can open other scientific fields of interest facilitating mobility at the end of the 1st cycle and helping students who will change direction when moving to subsequent degrees, without weakening the employability goal. On this basis, a 4 year long 1st cycle in Geology (i.e. 240 credits ECTS) is strongly favoured.

Un diplôme de 1er cycle doit se baser dans une cohérence interne et une variété des competences à acquerir pendant les cours planifiés et aussi dans l'identification des résultats de l'apprentissage. Ces objectifs doivent supporter les critères pour la certification professionel (garantie de qualité). Une corrècte organisation curriculaire peut ouvrir autres domaines scientifiques permettrant la mobilité à la fin du 1er cycle, aidant les étudiants qui veulent changé de direction dans les cycles suivants sans affaiblir leurs perspectives de travail. Dans ce contexte est beaucoup plus favorable un 1er cycle en Géologie avec 240 ECTS.

Un diploma de 1er ciclo en Geología deberá basarse en la consistencia interna y diversidad de competencias a adquirir a través de una estructura curricular adecuada y en la identificación de resultados específicos de aprendizaje; estos objetivos fundamentarán los criterios de certificación profesional (garantía de calidad). Una organización curricular adecuada podrá abrir otros horizontes científicos de interés, posibilitando la movilidad al final del 1er ciclo y ayudando a los estudiantes que lo deseen a cambiar de rumbo en ciclos siguientes sin perjudicar expectativas laborales. Bajo esta perspectiva, se privilegia un 1er ciclo en Geología de 4 años (*i.e.* 240 créditos ECTS).

The evolution of the Bologna Process, ratified in the Prague (2001) and Berlin (2003) Summits, shows that the initial and apparently simple proposals of the Bologna Declaration pose a large number of complex questions that have been addressed in many national and international meetings, involving working groups with distinct, although complementary, objectives. The higher education degree structure has opened a comprehensive discussion about competences, levels, qualification descriptors and professional profiles in the contemporary context of employability, bringing also to the debate the dual viewpoint involved in the academic-oriented and professional-oriented *curricula*; these subjects represent, indeed, a fundamental key in science and technology study programmes given:

- the vocational crisis demonstrated by younger generations in Europe regarding these matters (thus demanding an increase of attractiveness and opportunities)
- the major political, educational and economic goals expressed at the Lisbon Conference in 2000.

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Moreover, the need to ensure mutual evaluation criteria and high standards led also to the crucial question of regulation (accreditation). Among the large number of problems, one of the most contentious issues concerns the degree structure and its respective length, particularly for the 1st cycle study programmes. Herein, the main topics concerning the Bologna Paradigm will be reviewed, commenting on its implications to *curricula* design in Geology.

The Bologna Paradigm

From statements in *www.bologna-berlin2003.de/pdf/Communique1.pdf*, the need emerges for a common understanding of competence fields in order to guarantee *comparable and compatible qualifications* in a three-cycle degree structure. A shared measurement framework is also needed *i.e.* a credit system recognized by all, the *European Credit Transfer System* (ECTS). Finally, the statement itself justifies the usefulness of a transparent, self-explanatory Diploma Supplement to promote:

- international comparability of study programmes
- mobility in Europe
- employability of graduates.

In this context, the Bologna Paradigm includes three main changes, as follows:

- from teacher-oriented to student-oriented study programmes (*i.e.* from teaching to learning)
- broadly-based education in the 1st cycle degree, allowing the choice between directly entering a job and specializing at post-graduate level (2nd and 3rd cycles)
- curricula focussing on requirements of employers.

Concurrently, the requested qualifications should be described and organized in terms of different descriptors (workload, level, learning outcomes, competences and profile) facilitating the transition from academic training to the work place and from one country to another. Therefore, the development of a "common normative language" for *curricula* in the European Higher Education Area (EHEA) represents a fundamental task. Work has already been done in this complex field, coherently linking the learning outcomes,

competences and profiles with content (cognitive value) – see, *e.g.*, the Subject Area Group reports from the "Tuning Higher Educational Structures in Europe" (2002). Lifelong learning and qualification increasing (CPD), as recommended in the Lisbon Conference (2000) and further stressed in other summits of the European Ministers responsible for higher education, are two other features of the Bologna Paradigm; these should be flexible, requiring that higher education institutions continually adapt to the challenges posed by the new process.

As a result of the Bologna Process, movements were made to restructure higher education degrees in Europe, involving firstly two cycles, but shortly afterwards considering a three-cycle arrangement, and to study the endorsement of joint degrees, (Stockholm Seminar 2004). However, there is no general consensus on introducing the "3-5-8" model (*i.e.* 3+2+3), the main divergence occurring because of the length of the 1st cycle study programme (3 or 4 years). The "3-5-8" model, very often misunderstood as the Bologna "recommendation", represents only a possible solution to re-organizing the higher education study programmes and its "universal" application raises serious problems in many scientific areas. It may be incompatible with the training needed (mainly in the 1st cycle degree) to perform some professional activities. That is why, at the Helsinki conference (2002), a relatively wide agreement was achieved concerning the 1st cycle extent: 180 to 240 ECTS credits, *i.e.* 3 to 4 years of full-time study.

In accordance with the qualification descriptors of Dublin, the 1st cycle degree represents an important step in any higher education path and its planning has to fulfil a three-fold purpose. The first is the programme that involves *international comparability of study programmes* and promotes *mobility*. The second goal is *employability*; indeed, following the Bologna Declaration the *"degree awarded after the 1st cycle shall also be relevant to the European labour market as an appropriate level of qualification"*. The third concerns *access to 2nd cycle study programmes*, as envisaged by the Lisbon Recognition Convention *www.bologna-berlin2003.de/pdf/Lisbon_convention.pdf*, which should be characterized by greater flexibility, diversity, and increasing specialization. The search for solutions to properly address this three-fold purpose is, therefore, the major challenge in each country committed to the Bologna Paradigm. Different paths are acceptable, allowing convergence to a common objective in a multi-step approach. Thus, accepting that a general consensus can soon be achieved, the 1st cycle *curricula* design cannot ignore differences within education in many European countries. Examination of the best higher study programmes is also needed to fully accomplish the main changes imposed by the Bologna Paradigm. Moreover, the social and economical frameworks in European countries are also distinct and should be addressed in the employability issue. Finally, it is worth noting that the concepts of honours or pass degrees are also quite variable all over Europe, thus not easily transferable but with no major implications to the EHEA consolidation.

Geology first cycle study programmes

Detailed characterization of natural resources (such as water, mineral, soil, fossil and nuclear combustibles, geothermal energy) and natural hazards / risks (including seismic, volcanic, flood, slope mass movements, toxic metal distributions, *etc.*), besides comprehensive studies on the composition, architecture and dynamic of earth systems play a vital role both in the European economy and in the European policies of Land Planning and Management. These are issues intimately associated with the application of geo-scientific knowledge, supporting new lines of interdisciplinary research triggered by emerging complex problems, where a geological background is widely recognized as essential. Therefore, maintaining the present high standard in teaching and research in Geology is of critical importance; particularly, if the EU political goal is indeed to ensure high competitiveness patterns with the most dynamic economies supported by extremely attractive higher study and research programmes. This implies, necessarily:

- the consolidation of the basic fields of scientific knowledge
- a good grounding in fundamental concepts and techniques common to all branches of Geology
- the integration of novel fields of knowledge which are evolving both in Geology and in interface scientific domains

Competences and learning outcomes

Geology is a consolidated domain of knowledge, congregating many specialization fields that are essential for a large number of relevant activities. Therefore, any 1st cycle study programme should provide a qualification based on a broad scientific background in Geology, enabling the development of *competences* required for standard levels of performance in different professional profiles. The 1st cycle should cover all of the above-mentioned areas.

It is important to note, however, that although subject knowledge is one criterion for *employability*, other competences developed during the degree programme are vital to a coherent academic training. It is possible to fulfil the *comparability / mobility* requisites and promote high levels of quality without loosing diversity and preserving the identity of 1st cycle degrees designed for particular country-backgrounds and specific market needs.

Study programmes organization, levels and assessment

As recognized by the Geology Subject Area Group in its 2002 report, the organization of 1st cycle degrees in Geology provided by European institutions are quite varied, the diversity significantly increasing when the wider labelling "Earth Sciences" is considered. This variety reflects either the country-oriented academic and economic cultures or the institutional strategic options taken to face specific problems (e.g. those related to student recruiting and institutional funding). Therefore, the available and upcoming 1st cycle degrees in Geology offered by individual European institutions will logically have their own particular characteristics; the depth in which individual issues are treated will vary with the nature of specific study programmes, so as to give their students good chances in the national and international job market as well as a good starting point of eventual transference to other academic programmes.

Geology requires specific methods of teaching and learning, including theoretical, laboratory and field training. Disciplines included in 1st cycle study programmes can thus be ordered into a gradual and coherent sequence of levels (1 to 4) that follow a given framework.

- Level 1 may be an introduction, assuming no previous knowledge of Geology.
- Level 2 should provide an essential grounding in many fundamental concepts and techniques common to all branches of Geology
- Level 3 must offer a core programme of advanced topics involving complex databases and simple numerical modelling for common problems in Geology

oriented towards the study programme specific objectives

- Level 4 should be designed to favour the consolidation of the professional profile defined for the study programme. Additional courses in Mathematics, Physics, Chemistry and Biology; if appropriate, training in a foreign language and in introductory Informatics may be considered.

Assessment procedures and performance criteria must be adapted in order to satisfy the requirements involved in the Bologna Paradigm; that is, assessment should be planned to cover the following aspects:

- knowledge base
- conceptual understanding
- problem-solving ability
- experimental and related skills
- fieldwork skills
- transferable skills.

One way to reach these goals is through the development of continuous assessment and tutorial work, measuring the student's progress and encompassing formative and summative components; the formative assessment should include a pre-designated number (depending on the course) of self-evaluation forms (lecture programme) and lab assignments; the summative component should involve a pre-designated number of interim tests where students must demonstrate an acceptable level of achievement (≥50%). Alternatively, a final examination might be considered. Some courses require a specific practical examination focusing on field/lab performance.

ECTS credits distribution and study programmes length

Using the ECTS credits as an organizational tool represents a fundamental task in any curricula design compatible with the Bologna Paradigm. The number of credits assigned to fundamental geological subjects (vocational) should be greater than those assigned to generic scientific education which in turn should be greater than those assigned to, for example, a foreign language. A plausible ratio could be:

- 75% to 80 %: 15% to 20%: ≤ 5%

of the total credits assigned to the study programme. As a result, an acceptable distribution of credits between groups of vocational courses planned to satisfy the descriptors mentioned above for successive levels can be settled as:

- 5% to 10% (level 1),
- 20% to 25% (for each level 2, 3 and 4)
- 2.5 to 5% devoted to a curricula designed to introduce students to research (e.g. Undergraduate Project).

Given the above structure, the most appropriate length for a 1st cycle study programme in Geology is 4 years (i.e. 240 credits ECTS). Promoters of more broadly based study (such as Earth Sciences or Earth Sciences and Environment) and 180-credit degrees claim that these study programmes open more fields of interest, facilitate mobility at the end of 1st cycle and help students who will change direction to other knowledge domains when moving to subsequent degrees. However, on a 240-credit base degree, all these issues can be properly assessed with the additional advantage of ensuring a higher standard of training in Geology; therefore, preparing students for a wide range of professional activities that need a solid scientific and technical base can hardly be achieved in a 180-credit training.

The opening of new fields of scientific interest can be achieved through partial or total replacement of vocational level 4 courses by a corresponding number of credits dedicated to other knowledge domains. Therefore, after completion of a 240 credit degree, the student will have a Major in Geology and a Minor in another scientific field.

In order to promote mobility, institutions that offer a 240-credit degree in Geology should promote a 180-credit Mobility Diploma for those students wishing to move to another University after graduation. In this approach, the generic scientific background and the fundamental training corresponding to vocational courses of level 1, 2 and 3 will be ensured.

Institutions offering a 240-credit degree in Geology also have the option to easily expand their 2nd cycle study programmes to professional-oriented degrees (1 year of traineeship in a particular field of applied geology) and to academic-oriented qualifications (1.5 year long training in a specialized field of Geology or in interdisciplinary areas, including research). These 2nd cycle study programmes together with the Mobility Diploma produce two slightly different higher education progressions ("3+1+1" and "3+1+1.5" full-time study) sustained in two-degree structures ("4+1" and "4+1.5" years long) that fully satisfy all the requirements of the Bologna Paradigm.

Quality assurance and professional title

The highest level of qualification (D) in the EU Draft Directive is the level relevant to the professional title of geologist, upon completion of a minimum of three years full-time study at post-secondary level. Considering the arguments reported in section 3, a four-year training in Geology (240 credits ECTS) is strongly favoured.

The higher education system regulation (accreditation) in EHEA should assure high quality standards of learning and assess qualification comparability and compatibility, besides mobility and employability. Therefore, the quality label related to Geology practice must involve national geological societies (wherever possible) and their pan-European counterpart, i.e. the European Federation of Geologists (EFG). For that reason, it is of crucial importance that EFG continue its efforts with the "EurGeol Professional Title – Common Platform", regulating the profession of geologist through the identification of minimum standards for the duration and content of training. Certification of the 1st cycle and Continuous Professional Development will strengthen the intrinsic value of the profession.

Conclusions

The current European high standards of teaching, learning and research in Geology should be reinforced.

Comparability and mobility in EHEA must rely on the recognition of general competences and specific learning outcomes. ECTS credits for core and complementary courses should be evaluated for each study programme considering the particular characteristics of each institution and the precise circumstances and needs of the country.

The character of a 1st cycle degree in Geology must rely on internal consistency of competences achieved during the study programme and on the identification of specific learning outcomes.

A 4 year long 1st cycle study programme in Geology (i.e. 240 credits ECTS) is favoured, and a correct curricula organization can also open other scientific fields of interest, facilitating mobility at the end of 1st cycle and helping students change direction to other knowledge domains when moving to subsequent degrees.

It is of crucial importance that EFG continue its efforts on the "EuroGeol Professional Title - Common Platform", regulating the practice of Geology through the identification of the minimum standards for degree length and content.

Medical Geology – a new future for Geoscience

by Olle Selinus[1], Robert B. Finkelman[2], Jose A. Centeno[3] and Kaj Lax [1]

Medical geology is the science dealing with the influence of geology on the distribution of health problems in humans and animals. This is a complicated subject and interdisciplinary contributions from essentially different scientific fields are required when these problems are to be solved. This paper discusses the background of medical geology with examples from all over the world. All living organisms, are composed of major, minor and trace elements, given by nature and supplied by geology. Medical Geology is a rapidly growing discipline that has the potential of helping medical and public health communities all over the world pursue a wide range of environmental and naturally induced health issues. The paper also describes ongoing and future activities in medical geology.

La géologie médicale est la science qui traite de l'influence de la géologie sur la santé de l'homme et des animaux. Il s'agit d'un sujet complexe et il est indispensable pour résoudre les problèmes posés de faire appel à des sources scientifiques interdisciplinaires, dans des secteurs très différents. L'article expose les fondements de la géologie médicale à partir d'exemples tirés du monde entier. Tous les organismes vivants sont composés d'éléments majeurs, secondaires et sous forme de traces, créés par la nature et livrés par la géologie. La géologie médicale est une discipline en expansion rapide qui a la possibilité d'aider le personnel médical et les organismes de santé, dans le monde entier, à faire face à un grand nombre de problèmes de santé liés à des causes environnementales et naturelles. Cet article décrit aussi les travaux actuels et futurs de la géologie médicale.

La geología médica es la ciencia que trata de la influencia de la geología en la distribución de la salud en humanos y animales. Es un tema complicado y es precisa la contribución interdisciplinar de campos científicos esencialmente diferentes cuando se desea resolver estos problemas. Este trabajo analiza el trasfondo de la geología médica con ejemplos de todo el mundo. Todos los organismos se componen de elementos mayores, menores y traza, aportados por la Naturaleza y proporcionados por la geología. La Geología Médica es una disciplina que crece rápidamente, que tiene el potencial de ayudar a las comunidades médica y de protección de la salud de todo el mundo en un amplio rango de temas ambientales y de salud inducidos naturalmente. El trabajo también describe las actividades en marcha y las futuras de la geología médica.

Medical Geology is a rapidly growing field concerned with the relationship between natural geological factors and human and animal health, as well as with improving our understanding of the influence of environmental factors on the geographical distribution of health problems. Medical Geology brings together geoscientists and medical/public health researchers to address health problems caused, or exacerbated by geological materials (rocks, minerals, atmospheric dust and water) and processes (including volcanic eruptions and earthquakes). Among the environmental health problems that geoscentists are working on in collaboration with the medical and public health community are: exposure to toxic levels of trace essential and non-essential elements such as arsenic and mercury; trace element deficiencies; exposure to natural dusts and to radioactivity; naturally occurring organic compounds in drinking water; volcanic emissions, etc. (Fig. 1). Medical geology also deals with the many health benefits of geologic materials and processes.

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Deficiency, toxixity and bioavailability

Naturally occurring elements are not distributed evenly across the surface of the earth and problems can arise when element abundances are too low (deficiency) or too high (toxicity). The irregular distribution of essential elements in the natural environment can lead to serious health problems particularly for populations who are heavily dependent on the local environment for their food supply. Approximately 25 naturally occurring elements are known to be essential to plant and animal life in trace amounts; these include calcium, magnesium, iron, cobalt, copper, zinc, phosphorus, nitrogen, selenium, iodine and molybdenum. On the other hand, an over-abundance of these elements can cause toxicity problems. Some elements such as arsenic, cadmium, lead, mercury and aluminium have no or limited biological function and are generally toxic to humans in even small exposures.

Most elements are known as trace elements because their natural abundances on Earth are generally very low (mg/kg concentrations in most soils). Trace element deficiencies in crops and animals are therefore commonplace over large areas of the world and mineral supplementation programmes are widely practised in agriculture and in animal husbandry. Trace element deficiencies generally lead to poor crop and animal growth, poor yields, and to reproductive disorders in animals. These

Figure 1. Krafla, Iceland. (Photo: O. Selinus)

problems often have greatest impact on poor populations who can least afford mineral interventions.

In addition to understanding both natural and anthropogenic sources of harmful substances in the environment, it is also important to consider exposure and bioavailability. Bioavailability directly influences exposure and, therefore, the effect on and risk to health. Large quantities of potentially harmful substances may be present in the environment, but if they are in a non-bioavailable form, the risk to health may be minimal. Bioavailability depends not only on the physical and chemical forms in which the element is present, but also on local factors in the environment, for example pH. The bioavailability and mobility of metals such as zinc, lead and cadmium is greatest under acidic conditions, while increased pH reduces bioavailability. Also soil type, for instance clay and sand content, and its physical properties, affects the migration of metals through soils. The organisms present in soils also affect metal solubility, transport, bioavailability, and bioaccessibility

Trace element exposure: deficiency and toxicity

The study of trace elements is one of the most important topics in medical geology. The following examples are just a few that have relevance to Europe.

The connection between geological materials and trace element deficiency can clearly be shown for iodine. Iodine Deficiency Disorders (IDD) include goiter (enlargement of the thyroid gland), cretinism (mental retardation with physical deformities), reduced IQ, miscarriages, and birth defects. Goiter is still a serious disease in many parts of the world. China alone has 425 million people at risk of IDD. In all, more than a billion people, mostly living in the developing countries, but also in Europe are at risk of IDD. In all the places where the risk of IDD is high, the content of iodine in drinking water is very low because of low concentrations of iodine in bedrock (Fuge, 2005).

Another important element is fluorine. The geochemistry of fluorine in ground water and the dental health of communities, particularly those depending on groundwater for their drinking water supplies, is one of the best known relationships between geochemistry and health. Many water supply schemes contain excess fluorine and as such are harmful to dental health. For most trace elements required by humans and other animals, food is the principle source. In the case of fluorine, however, much of the input into the human body is from drinking water and the geochemistry of fluoride in groundwater is therefore of particular significance in the etiology of dental diseases. After, for example, the eruptions of the volcano Hekla on Iceland in 1693, 1766 and 1845, detailed descriptions of fluorosis were presented. Acute poisoning was described. Since World War II Hekla has had eruptions in 1947, 1970 and 1980 and a number of analyses of fluorine have been performed. The volcano delivered huge amounts of fluorine and concentrations as high as 4300 mg/kg in grass have been found.

Selenium is an essential trace element having antioxidant protective functions as well as redox and thyroid hormone regulation properties. However, selenium deficiency (due to soils low in selenium), has been shown to cause severe physiological impairment and organ damage such as a juvenile cardiomyopathy (Keshan disease) and muscular abnormalities in adults (Kaschin-Beck disease) (Fordyce, 2005). Several areas in the world are selenium deficient and among them in Europe are Sweden and Finland.

Arsenic and arsenic-containing compounds are human carcinogens. Exposure to arsenic may occur through several anthropogenic processes, including mining residues, pesticides, pharmaceuticals, glass and microelectronics, but the most prevalent sources of exposure today are natural sources. Exposure to arsenic occurs via the oral route (ingestion), inhalation and dermal contact. Drinking water contaminated by arsenic remains a major public health problem. Acute and chronic arsenic exposure via drinking water has been reported in many countries. The source of arsenic is geological, the element being present in many rock forming minerals. There is growing concern about the toxicity of arsenic and the health effects caused by exposure to elevated concentrations of it in the geochemical environment. The danger to human health due to arsenic poisoning has been recognized by WHO and the provisional guideline value for arsenic in drinking water has been lowered from 50 µg/l to 10 µg/l. Among the countries that have well documented case studies of arsenic poisoning are Bangladesh, India (West Bengal), Taiwan, China, Mexico, Chile and Argentina, but also several countries in Europe such as Hungary, Sweden, UK etc. The common symptoms of chronic arsenic poisoning are depigmentation, keratosis and hyperkeratosis.(Smedley, Kinniburgh, 2005).

Medical geology in Sweden

Human beings are the last link in the food chain, but also earlier links in the chain are evidently influenced by geochemistry. During the second half of the 1980s, a previously unknown disease was reported in the moose population in south-west Sweden. The region is strongly affected

by acid rain and to counteract the negative effects of acidification of lakes and wetlands, liming was intensified during the second half of the 1980s, which corresponded with the outbreak of the disease. Chemical investigations of moose organs collected in connection with regular moose hunts in the affected region, have shown that the hepatic copper concentration decreased by 50 %, and cadmium by about 30% during a period of 10 years. During the same time molybdenum concentration increased significantly by between 22 and 40%. The cause of the moose disease appears to be severe copper deficiency and molybdenosis. In those areas where we have high natural contents of molybdenum bedrock and soils, liming increases the mobility of molybdenum and decreases the mobility of copper, the copper/molybdenum ratio changes and the moose are strongly affected by this change in the environment. This side effect of liming and its harmful consequences for domestic and wild ruminants appears to have been overlooked (Fig. 2).

Figure 2. Moose

Diabetes presents one other example of the use of geochemistry in medical geology. Childhood diabetes is almost exclusively of the insulin-dependent type (type1). A case control study in Sweden was designed comparing zinc contained in biogeochemical samples from different areas. The results showed that a high water concentration of zinc was associated with a significant decrease in risk. This provides evidence that a low groundwater content of zinc, which may reflect long-term exposure through drinking water, may be associated with later development of childhood onset diabetes.

Cardiovascular diseases have also been studied using biogeochemistry. In has been shown that water hardness (calcium + manganese and other minor constituents) and the sulphate and bicarbonate concentrations of drinking water are inversely related to ischaemic heart disease as well as stroke mortality. The variation in the drinking water composition reflects the geological variation of the elements.

Radon – common in many places in Europe

Geology is the most important factor controlling the source and distribution of radon. Relatively high levels of radon emissions are associated with particular types of bedrock and unconsolidated deposits, for example some, but not all, granites, phosphatic rocks, and shales rich in organic materials. The release of radon from rocks and soils is controlled largely by the types of minerals in which uranium and radium occur. Once radon gas is released from minerals, its migration to the surface is controlled by the permeability of the bedrock and soil, the nature of the carrier fluids, (including carbon dioxide gas and groundwater), and meteorological factors such as barometric pressure and rainfall. Geological radon potential maps derived from a range of data including radon measurements in soil and dwellings; soil and rock permeability; uranium concentrations in rocks and soils; and gamma spectrometric data show the relative health hazards from radon. Whereas a geological radon potential map can indicate the relative radon hazard, it cannot predict the radon risk for an individual building. This can only be established by having the building tested.

Naturally occurring organic compounds in drinking water

Balkan endemic nephropathy (BEN) is an irreversible kidney disease of unknown origin, geographically confined to several rural regions of Bosnia, Bulgaria, Croatia, Romania, and Serbia. The disease occurs only in rural areas, in villages located in alluvial valleys of tributaries of the lower Danube River. It is estimated that several thousand people in the affected countries are currently suffering from BEN and that thousands more will be diagnosed in the next few years (Orem *et.al.*, 1999). There is growing evidence that toxic organic compounds present in the drinking water of the endemic areas leached by groundwater from low rank Pliocene lignite deposits and were transported into shallow household wells or village springs. Analysis of well and spring water samples collected from BEN endemic areas contain a greater number of aliphatic and aromatic compounds, and in much higher abundance than water samples from nonendemic sites. Many of the organic compounds found in the endemic area water samples were also observed in water extracts of Pliocene lignites, suggesting a connection between leachable organics from the coal and organics in the water samples. The population of villages in the endemic areas uses almost exclusively well/spring water for drinking and cooking, and is therefore potentially exposed to any toxic organic compounds in the water. The presumably low levels of toxic organic compounds present would favour relatively slow development of the disease over a time interval of 10 to 30 years or more. This disease is now also suspected to occur in the USA, Portugal and Turkey. Collaborative research between geoscientists and medical scientists is now going on in these countries.

Global dust

Dust is a global phenomenon. Dust storms from Africa regularly reach the European Alps, and the Western hemisphere and Asian dust outbreaks can reach California in less than a week, some ultimately crossing the Atlantic and reaching Europe. The ways in which mineral dust impacts upon life and health are wide-ranging. These include changes in the planet's radiative balance, transport of disease bacteria to densely populated regions, dumping of wind-blown sediment on pristine coral reefs, general reduction of air quality, provision of essential nutrients to tropical rainforests and transport of toxic sub-

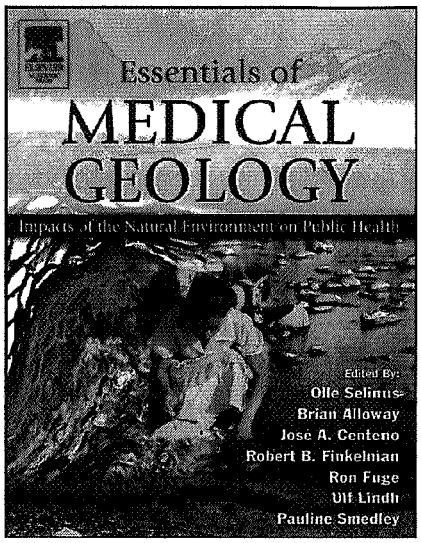

Figure 3. "Essentials of Medical Geology"

stances. Mobilization of dust is both a natural and a humanly triggered process. Changing climatic conditions play a key role as natural changes occur in available moisture and wind speeds. Although vegetation exerts a critical control on dust mobility, vegetation itself is influenced by climate, human activity and other factors. A better understanding of dust, including the processes that control its sources and transport as well as its impacts, is needed if its negative consequences are to be mitigated (Derbyshire, 2005).

International Medical Geology Association (IMGA)

The development of Medical Geology was given a major boost in 1998 following the creation of an International Working Group on Medical Geology within the IUGS Commission on Geological Sciences for Environmental Planning (COGEOENVIRONMENT). The primary aim of the Working Group was to increase awareness of this issue among scientists, medical specialists, and the general public. That Working Group was so successful that in 2000 the IUGS took over the project as a Special Initiative which was subsequently accepted as "IGCP project 454 MEDICAL GEOLOGY". IGCP project 454 was initially designed with a life span of 5 years and in that time Medical Geology expanded rapidly to become a global matter and the acceptance and response has been outstanding. Many courses (more than 30) have been presented around the world since 2001 (Fig. 4); many papers have been published; thousands of people have become deeply involved; many students are now inquiring about pursuing their professional degree in medical geology. The first ever comprehensive book on medical geology *"Essentials of Medical Geology"* was published in 2005 (Selinus et al., 2005). This work of 812 pages, has 31 chapters, written by equal numbers of geoscientists and medical specialists (Fig 3). The book was awarded a prestigious "Highly Commended" title in the Public Health category by the British Medical Association which recognized this as one of the best of all published Public Health books in 2005. It has also received one of the two 2005 Geology/Geography Awards for Excellence from the Professional and Scholarly Publishing (PSP) division of the Association of American Publishers. The PSP awards recognize both editorial standards as well as design and production standards (see book review page 42).

In order to continue the development of this emerging discipline of Medical Geology the managers of the IGCP project, with approval from a special meeting at the International Geological Congress in Florence in 2004, formed, in January 2006, a new association, the International Medical Geology Association (IMGA). The IMGA is planning a significant involvement in the UN proclaimed 2008 (2007-2009) International Year of Planet Earth (Earth Science for Society) the first ever UN Year for the Earth Sciences.

For more information see:

www.medicalgeology.org

Figure 4. Participants at a Medical Geology workshop in Brazil, 2005

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Geology for the archaeologist

by Magnus Hellqvist[1]

Every year numerous archaeological excavations are undertaken. The archaeologists survey and excavate the landscape, but they also expose the geology. Since the cultural layers are situated in sediments of geological origin and people earlier lived in a landscape so different from today, it is obvious that archaeologists need geological consultation in order to understand the landscape situation and environmental history.

Chaque année, de nombreuses fouilles archéologiques sont entreprises. Les archéologues étudient et creusent le terrain et par là, mettent à jour des coupes géologiques. Puisque les horizons culturels sont intercalés dans des sédiments d'origine géologique et que les premières populations vivaient dans un environnement très différent du nôtre, il va de soi que les archéologues ont besoin des conseils du géologue pour comprendre les conditions de vie et l'évolution environnementale.

Cada año se llevan a cabo numerosos excavaciones arqueológicas. Los arqueólogos investigan y excavan el paisaje, pero también ponen de manifiesto la geología. Dado que los estratos culturales están situados en sedimentos de origen geológico y las personas vivieron anteriormente en un paisaje muy diferente del de hoy en día, es evidente que los arqueólogos necesitan asistencia técnica geológica para entender la situación del paisaje y la historia ambiental.

During the last decade, there have been many of archaeological excavations in Sweden, especially in connection with larger road building projects. This increase in archaeological excavations also means an increase in the need for geological consultations. Generally the need for geological consultation from the archaeologists is twofold. Firstly, the geologist may help the archaeologist to understand the geology during the excavation and it is often a question of basic geological knowledge and understanding. Secondly, specialists in geology, like geochemists and palaeoecologists, may analyse material from the excavation to help explain aspects of the former settlement and landscape change.

For the archaeologist, there are several questions of interest, concerning the geological background to the present situation at the excavation site. Of course several questions arise. What is the geological background? How may you connect and understand the deposition of cultural remnants and layers in the geological setting? What processes affect the cultural layers after deposition and how has the landscape changed through time until the present?

Geological knowledge among Swedish archaeologists today is very poor and they learn very little about geology, geological processes or any other earth science in their education. This lack of knowledge of geology means not only that archaeologists have little understanding of geology in the landscape, but it also means that they have an inadequate knowledge of earth science needed to understand much of the geological information and sources in different regions. As a consequence they may be unable to translate it to useful information in archaeological fieldwork and site interpretation.

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Geoarchaeology and environmental archaeology

The field of archaeology was, in the 19th century, a part of geological science but later it moved more into the fields of the humanities and social science. Today we have the science-based field of geoarchaeology, dealing with geology in an archaeological context. It is sometimes connected or compared to what is called environmental archaeology and the fields are very similar in many ways, separated primarily by the definitions of different authors.

During the last few decades the field of geoarchaeology and/or environmental archaeology has grown considerably. By its definition, geoarchaeology deals with a wide span of geological problems and questions within archaeology and the archaeological context. Most geologists probably link this work with palaeoecology and the understanding of the changing environment through methods like pollen analysis, macrofossil analyses etc. But, geoarchaeology also deals with questions about sediments and sediment formation, as well as the processes that have affected people through history, like mass wasting, volcanic eruptions, flooding and so on.

Why do archaeologists need geology?

There is some confusion about the definition and separation of different scientific fields and what a good understanding of geology means to an archaeologist. Often, knowledge of earth science to archaeologists and also some of the geologists who get involved stops at the point of understanding the changing environment in the landscape. Archaeologists take many soil samples for chemical and palaeoecological analyses in order to answer questions about the changing landscape and the interaction with human settlement.

The results, of environmental and climatic history, are today usually discussed and developed within the field of environmental archaeology and are essential in the archaeological interpretation of a landscape and former settlements. It is also important to understand the geological setting in the landscape and to understand the economic activities of people during prehistoric and historic times.

It is also very important to understand how sediments are deposited and the processes in the soil where the cultural layers are deposited. The underlying geology provides consequences for the chemical and physical processes in the soil and therefore also affects the preservation of any archaeological finds. The geological situation may also carry information on basic resource situations in the landscape, especially the groundwater situation. Groundwater and

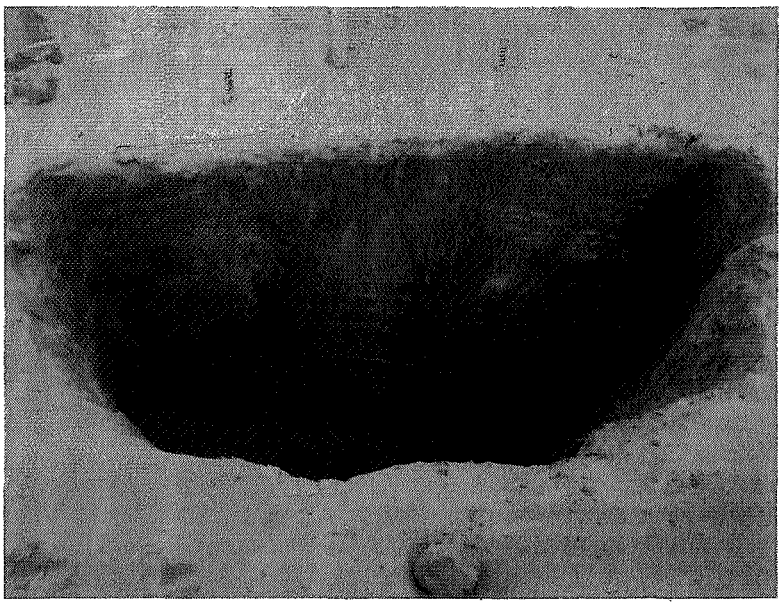


Figure 1. Water may create special features in sand, which can cause confusion during interpretation of human remains. From an archaeological excavation west of the town of Örebro in south-central Sweden 2005

other water resources have had a profound impact on people in historic and prehistoric times, as well as today, and it is usually through investigation of the geology that interpretation of former water resources, lacking today, can be made.

In the field

In Sweden a geologist is often called onto an archaeological excavation for consultation. This consultation may concern questions about the sediments and the processes that can affect the cultural layers and artefacts in these sediments. Different situations will affect the deposited human remains and artefacts in several ways. Some geological conditions have a very severe effect on the preservation of bone or other organic remains. In sandy sediments in particular, where both air and water pass freely through the ground, organic material is broken down and removed.

The transport of water in the sediments may also create features in the ground that sometimes can be difficult to separate from human deposits (Fig. 1). This can be seen, for example, at sites where there earlier have been peat deposits and this may sometimes create dark-coloured features in the sediments that can look similar to human deposits. If the archaeologist suspects this, it is sometimes necessary to have geological consultation to understand the situation. Sampling and soil analysis may be needed to confirm if the deposit is of natural or human origin.

Similarly, it is may be difficult to tell the difference between natural shell beds or mounds and middens created when humans have eaten shellfish and discarded the shells.

It is also possible to experience similar situations, when studying a landscape surface with a lot of natural deposits of geological origin. In Sweden the deposits from the last ice sheet (Weichsel) have created many features, such as smaller moraines and similar, that may be interpreted as grave mounds. The archaeologists are usually very professional in separating these natural landscape features from cultural ones, but sometimes there is doubt about the origin of, for example, a mound. Geological deposits may also sometimes have been used by people. A good example of this is when the height of a grave mound was increased by building it on an esker, at the same time using the glaciofluvial sediments to build up the grave mound.

The best results occur if the geologist visits the site before the excavation starts and then again at a later stage of the excavation. The normal case, however, is that the geologist comes to the excavation when it has been going on for a while and archaeologists need help with problematic features or phenomena. Sometimes the geologist is only involved in the project at the writing-up stage when the fieldwork is over, where the archaeologist may be facing difficult interpretations.

Geology: part of the human environment

Another question for geological consultation concerns sampling during the archaeological excavation. During an excavation a lot of soil samples are taken for later analyses, such as chemical analyses or the analysis of organic remains, like macrofossils (Fig. 2). The results from these analyses are used in the interpretation of the local or surrounding landscape.

There is also a clear connection between the geological situation on a site and the preservation of organic material that can be used for analyses. Normally this is not only a question of the present situation in the geology. It is also connected to geological development and the kind of processes that have been going on at the site until it is exposed during an excavation.

Typical in many places but special for Sweden are the sandy deposits appearing in many places in the landscape. It is common that there are settlement remnants from several periods of human history on these sandy deposits. In southern Sweden especially, sandy deposits are often connected with settlement remnants from Stone Age, Bronze Age and sometimes the early Iron Age.

The geological processes behind these sandy sites are either glaciofluvial processes during the melting of the last ice sheet or from wave action processes during the land uplift that has been going on for approximately the last 10 000 years. These places have always attracted settlement, because the position of the sand at that time was often near the sea shore and close to the advantages the sea had to offer.

Sand is of course very troublesome for the preservation of any organic material and there are a lot of features created in the ground by water transport in the sand. It may also, as mentioned above, be connected to a very typical environmental situation by the sea shore. It is possible to find several very crucial factors concerning the geology and how the geologist may help the archaeologist.

There are of course similar problems with the interpretation of human settlements when excavating human remains in till, clay and organic sediments. The main point is that, to understand the landscape history and to understand people as agents in it as well as to understand what is left to be found in the archaeological excavation it is important to understand even basic geology.

I experienced an example of this in the autumn of 2005. During excavations

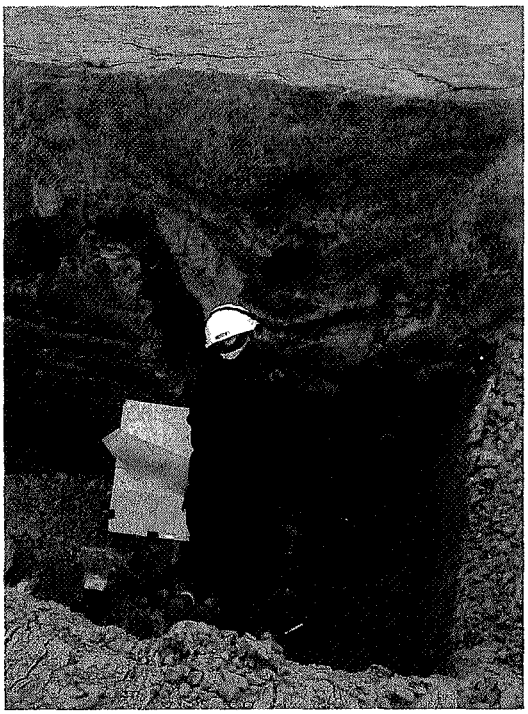


Figure 2. A lot of samples are taken during an archaeological excavation for different analyses, in this case from a former well deposit. From an archaeological excavation outside the town of Uppsala in south-east Sweden 2003

outside the town of Örebro, south-central Sweden, archaeologists opened up a large settlement area from the Roman Iron Age (0-400 AD), during a road building project. The settlement was situated on a till, but the till was partly built up of pebbles of limestone and there were even larger boulders of limestone. Questions arose about whether the till and the presence of limestone fragments were a result of human activity and the possibility of agriculture in the area and I was asked to visit the excavation for consultation.

Close to the excavated settlement area there was limestone in the bedrock. This had been eroded during the last ice sheet and finally incorporated into the till in the area. The problem with the limestone and the characteristics of the till was easily solved, with combinations of existing geological information and the understanding of the former geological processes.

In the example above I was asked to come out to the excavation when archaeologists where still working in the field. This was a big advantage! I have also had the experience of being asked about geological consultations when the excavation is over and the road is already built. This can be very difficult and the result in those cases relies much on earlier geological work in the area and personal geological experience.

There are also important connections between the geological setting of the landscape and how it may be used for different kinds of land use. The most obvious connection is of course between the expansion of agriculture and the distribution of sediments useful for such activities. In Sweden large areas were below sea level after the latest land ice disappeared. Scandinavia, and especially Sweden, is at present undergoing land uplift and new land is gained from the sea. It is in the parts of the country that have been under water that we find most of the fine-grained deposits, like clay. These match very well the areas where most of the agricultural activity is performed.

In many parts of Sweden the landscape has been more or less reshaped, because of drainage, especially during the 19th and early 20th centuries. The landscape and the sediments building up this landscape that are seen today, do not provide a true and complete picture of how the landscape looked during prehistoric and earlier historic times. It is easy to misinterpret the landscape as an open and flat landscape with few water resources, when actually the contrary was the case. This picture is easily rectified by geological understanding and analyses of geological information and deposits.

This and other examples mean that it is very important to really understand geological processes and landscape history and how these are connected to different settlement periods in human history. The geologist is an important specialist to the archaeologist and there are many good examples of cooperation between the two fields. As a bonus, the geologist gets a lot of opportunities to see and study geology in places that normally would not be exposed (Fig. 3).

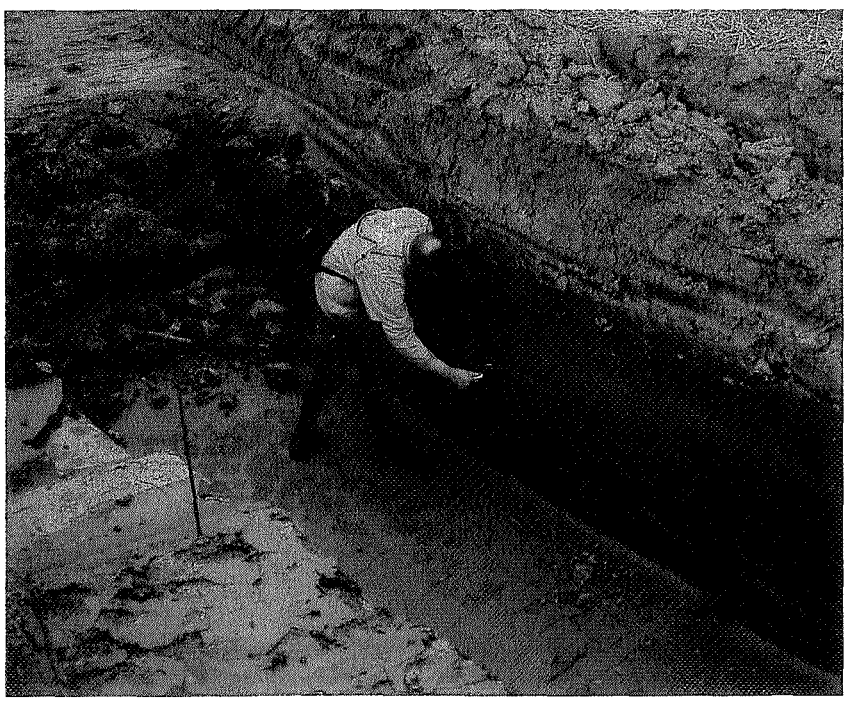


Figure 3. Archaeological excavations do not only open opportunities for archaeologists, but also geologists get many possibilities to study the geology at places that usually are not exposed. From an archaeological excavation outside the town of Uppsala in south-east Sweden 2003

Geological legislation in Spain and geosciences job market trends

by EurGeol. Prof. Manuel Regueiro y González-Barros[1]

The last 10 years in Spain have seen a radical change in the employment of geologists. From a stagnant job market and an excess of recent graduates, the situation has changed to a much better geosciences employment ratio and an abrupt drop in unemployment or abandonment of the professional career to work in other activities. This paper deals with the reasons behind that radical change, the relation between the legislation approved in several geological related industrial activities, the quick reaction to take advantage of such legislation by the professional association and the results in terms of jobs for the geological profession in Spain.

En Espagne, les dix dernières années ont vu un changement radical dans l'emploi des géologues. Partant d'un état stagnant du marché de l'emploi avec trop de jeunes diplômés, la situation s'est améliorée grâce à l'augmentation du taux de l'emploi en géosciences et à une baisse brutale du chômage et de l'abandon de la carrière professionnelle par des géologue partis travailler dans d'autres secteurs. Cet article traite des raisons expliquant ce changement radical, de l'influence de la législation adoptée dans plusieurs secteurs d'activités concernant la géologie, de la réaction rapide des représentants de l'Association Professionnelle pour bénéficier de cette législation et des résultats en terme d'emploi pour les géologues, en Espagne.

Los últimos 10 años han visto un cambio radical del empleo de los geólogos en España. De una situación de estancamiento del empleo geológico y una oferta excesiva de licenciados, la situación ha cambiado a un mayor de empleo en ciencias de la Tierra y a una abrupta caída del paro o del abandono de la carrera profesional para trabajar en otras actividades. En el presente trabajo se analizan las razones para ese cambio radical, la relación entre las legislaciones aprobadas en las diversas actividades industriales relacionadas con la geología, la rápida reacción para aprovechar dicha legislación del Colegio de Geólogos y los resultados en términos de puestos de trabajo para la profesión de geólogo en España.

Besides its function as a services provider for members, the ICOG has a very clear political aim as it is an organization created to defend and represent a collective usually not interested in being defended. The ICOG was created by law so it is a partly official institution to which the State has granted certain responsibilities.

The ICOG represents all Spanish geologists whether associated or not and it is something similar to a union or a political party. Among its duties are face to face consultations with government officials, policy makers, authorities and other professional associations. The association is the only effective way to have an influence on national legislation such as Water Law, Building Law, Land Planning Legislation Mining Law, etc.

The ICOG is also a route to affect international legislation through its membership of the European Federation of Geologists and the Spanish Professional Union.

The ICOG, following its social duties on all fronts, has effectively sponsored the creation and functioning of the NGO: World Geologist

With regard to the ICOG as the voice of geologists in Spain, the ICOG has as an objective to affect public opinion, by continual media presence expressing the opinion of Spanish geologists. Examples of this activity are the press releases with regard to the Aznalcollar disaster, the recent events related to a metro tunnel in Barcelona or the ground problems with the High Speed Train in Saragossa.

But the ICOG is also a service provider for its members. Some of these services are:

- Job Service: In 2003 the ICOG's job service received and circulated 90 posts
- Legal assistance: fiscal and labour. Fees for professional work
- Liability insurance in certificated projects
- Magazines (Tierra y Tecnología, El Geólogo, European Geologist)
- Publications
- Web site (www.icog.es). Electronic Geologist
- Training courses: Continual Professional Development Scheme
- Professional titles: Specialist, European Geologist, Expert Witness
- Other: Medical Insurance, Pension Plan, Accident Insurance
- Nomination of expert witness
- ISO 9000 Certification.

Membership

The number of associated geologists has been growing steadily in the last few years, particularly from 1999 onwards, as shown in the graph (Fig. 1). Although in Spain, in order to practise geology it is compulsory to join the ICOG, membership is related to the national production of geologists which is currently around 400 graduates per year, but also to the advantages seen by recent graduates in belonging to the association.

Figure 2 shows the job offers trend in the last few years and Figure 3, the requested specialties (2003)

Employment trends

One of the most amazing effects of some of the policies adopted by the ICOG has been a considerable reduction in unemployment among geologists in Spain. As can be seen in Figure 4, unemployment has dropped from 22,39% in 1997 to the current 6,3%.

[1]Secretary General, Spanish Official Association of Professional Geologists (ICOG)

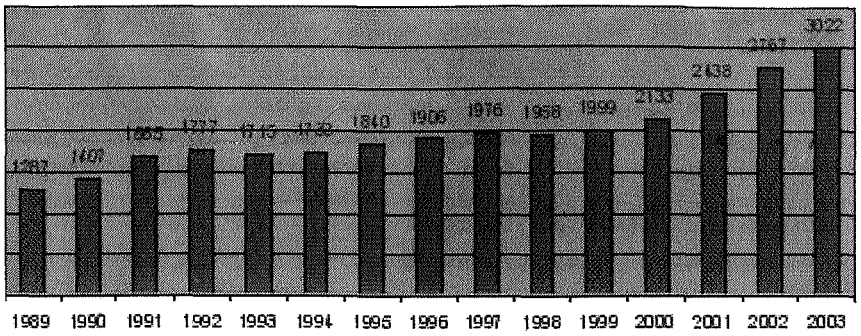


Figure 1. Membership trend: 1989-2003

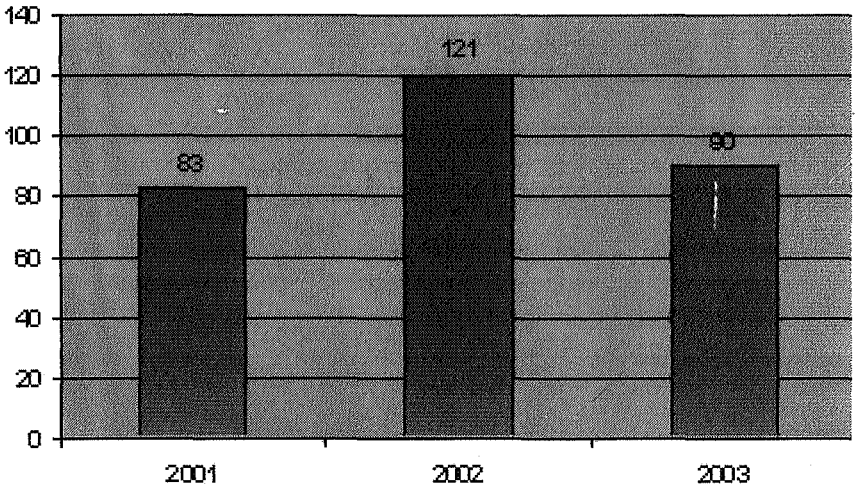


Figure 2. Job offers

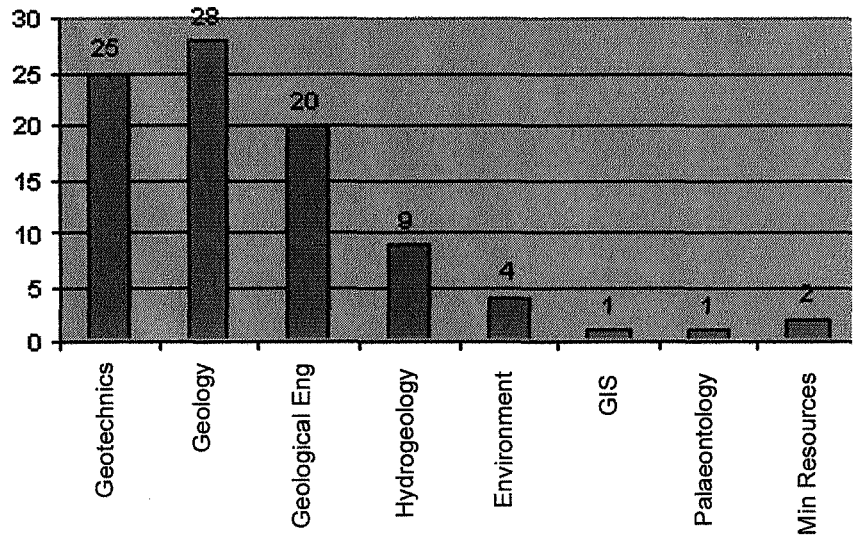


Figure 3. Requested specialties

Another interesting result has been a progressive increase in female geologists employed in Spain (Fig. 5)

In 1997, 70% of unemployed geologists were female, while today the figure is only 48%.

Project certification

In Spain all projects signed by a geologist should be presented to the ICOG so that the project is certified as signed by an authorized geologist. The ICOG has linked project certification to a liability insurance, so that all projects are covered by an insurance of 300 000 € in professional liability.

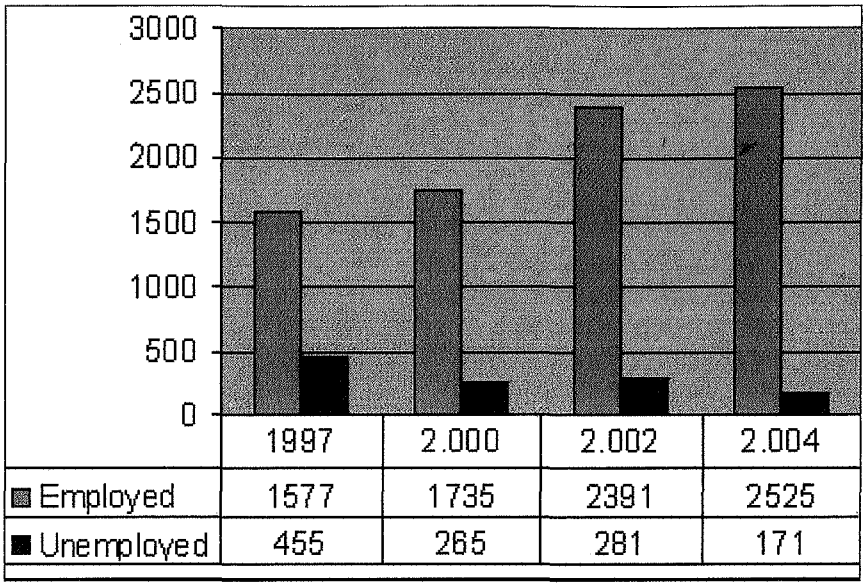
As a result of this action, project certification has increased exponentially in the last few years, with a similar rise in income from the fees charged for this service. The ICOG has signed an insurance contract with a private insurance company that is giving excellent results.

The legal framework

The ICOG has been fighting for the professional competence of geologists (which in Spain can only be geology graduates who are also associated members) in a country were many professions have got legal competence or skills to do particular things that no other professional can do, and where the successive recent Governments are reluctant to legislate new areas of competence. This is one of the reasons why the unofficial motto of Spanish geologists is "*Competence for the competent*". We believe that every geologist should endorse those projects he considers he is competent to do.

But the Spanish geologists do have some professional skills (by law or regulations) in the Spanish legal jungle, such as:

- Mining Law & By-laws (1974): Exploration and research (competence shared with mining engineers). This competences is somehow restricted by the Complementary Technical Instructions which state that the mining engineer is the only professional who can sign projects where safety of staff is at stake
- Water Law (Modif Law 46/1999): The text refers to the competent technician without mentioning any in particular
- Land Law: The text refers to the competent technician not mentioning any in particular. Includes geological hazards.
- Structural concrete instruction (EHE 98): This instruction states that geotechnical studies are compulsory, thus enabling geologists to sign them
- Construction quality law (Madrid Community) Law 38/1999: The text refers to the competent technician not mentioning any in particular, but also states that geotechnical studies are compulsory before permits for construction are granted. The geologist is in this case one of the competent technicians
- Building Planning Law (38/1999): Decennial insurance in buildings and compulsory geotechnical studies
- New Statutes of ICOG (RD 1378/2001):



	1997	2.000	2.002	2.004
Employed	1577	1735	2391	2525
Unemployed	455	265	281	171

Figure 4. Employment trends

These statutes include in Art 21, 40 professional functions

- Compulsory geotechnical studies for building cranes, 2003
- Compulsory geological hazards studies for camping sites, Andalusia Government 2003.

In those cases where the task is not attributed by law to any professional, the academic title provides the corresponding attributions. This of course means that depending on the subjects included in the curricula the professional is able to study and work in certain themes. The ICOG has also been active in this matter in order to achieve the goal that academic studies are oriented to professional practice. In Spain the main need of the academic curriculum is that it should include safety in works and projects design.

Finally, there are some skill areas where certain works are not assigned to any professional body, called De facto skills. Today in Spain environmental studies,

Box. ICOG's reactions to the market

1992	New premises in Madrid.
1993	1st CPD Program established.
	Institution of the Geoforum as an open forum to provide visibility for geologists in Society.
1994	1st publication of the ICOG: Aggregates Manual. Spanish version of the GS book.
1995	Environmental courses in the Madrid Community.
	ICOG member Vice-president of the EFG. 1st issue of the European Geologist magazine.
1996	1st ICOG web page in service.
	CPD reaches 21 courses.
	ICOG member President of the EFG.
1997	Publication of the Spanish version of the Citizen's Guide to Geological Hazards, with a huge media impact.
1998	Land law includes compulsory geological hazards studies.
	New concrete instruction includes compulsory geotechnical studies.
1999	New liability insurance linked to project certification. Up to 300 000 € coverage. Project certification increases 55%.
	Creation of the NGO World Geologists.
	Building quality legislation in Madrid establishes compulsory geotechnical studies. (Law 2/1999).
	National Building Planning law (38/1999) includes decennial insurance and compulsory geotechnical studies.
	Water law (46/1999) regulates underground water and flood hazards.
2000	Electronic Geologist as a new information system in place.
	Geologists start to appear frequently in media.
	1st International Professional Geology Congress. Alicante.
2001	The Government approves ICOG's new statutes which include Art 21 with 40 professional functions of geologist.
	Secretary General of Socialist Party (Mr Rodriguez Zapatero) meets geologists in ICOG's Annual Gala Dinner.
2002	ICOG drafts the chapter on Geotechnical Studies of the National Building Code.
2003	Strong media debate with the Minister of Public Works (Mr Cascos) of the Popular Party over geotechnical problems with the High Speed Train line Madrid-Lleida. More than 500 media insertions in newspapers, television, etc.
	Geologists appear as professionals concerned about social welfare. Media backs geologists and disseminates its activities (Fig. 7).
	Publication of Geology in Images (25 years of ICOG).
	Compulsory geotechnical studies for building cranes.
2004	A geologist, former President of the ICOG, appointed Secretary of State for Science and Education (Dr. Salvador Ordoñez).
	A geologist and member of the ICOG appointed General Director of the Spanish Geological Survey for the first time in its 150 years (Dr José Pedro Calvo Sorando).

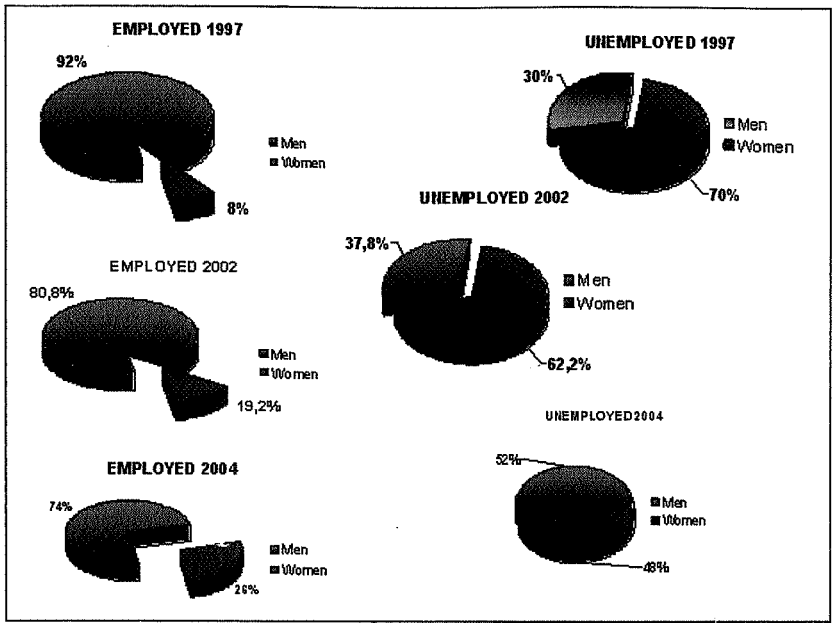


Figure 5. Employment trends

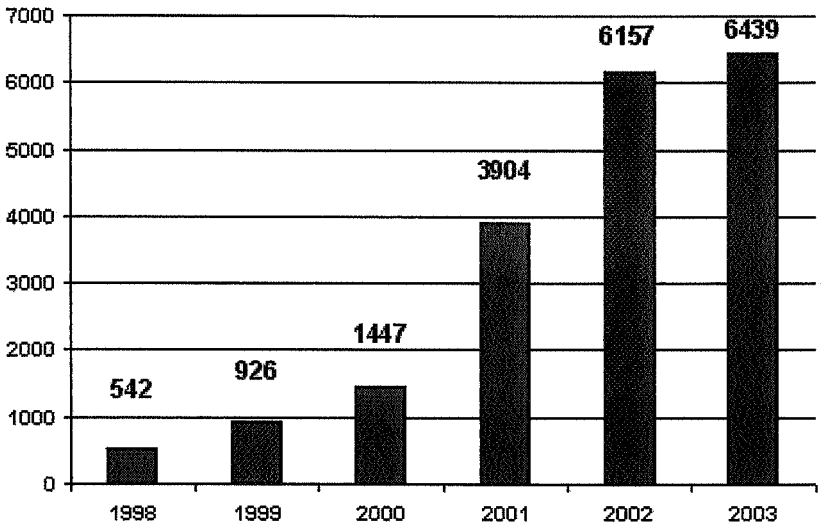


Figure 6. Project certification

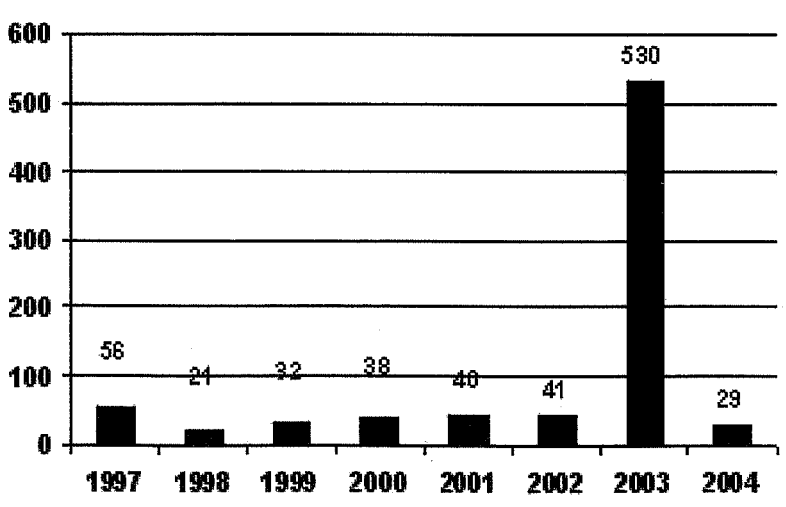


Figure 7. Media impact (geologists appearing in media)

waste disposal sites, geological hazards, contaminated soils, etc. are tasks carried out by geologists because there is no professional body that can claim to have the legal skills.

ICOG's reactions to the market

The ICOG has been carrying out certain political activities to adapt the profession to the market. A non-exhaustive list of those actions can be seen in the box, previous page.

ICOG's route to success: the way forward

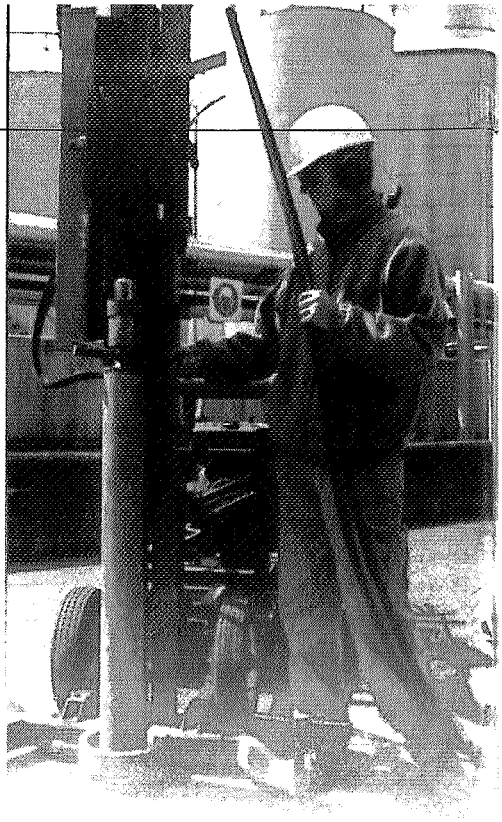
The reasons for ICOG`s success can be summarized as follows:

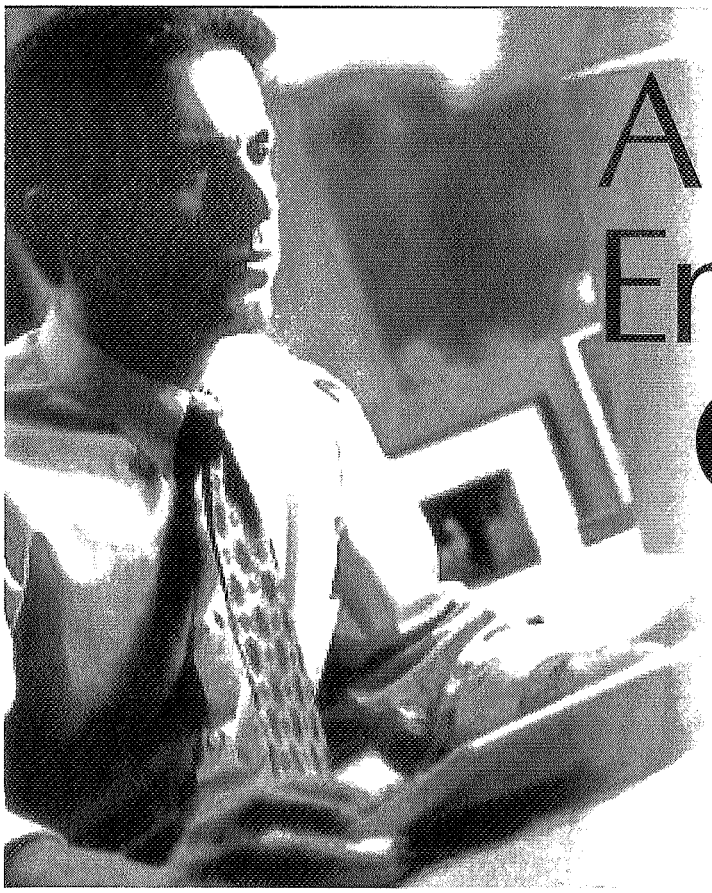
1. Citizens as 1st objective of the Association.
   - The ICOG promotes geologists as the voice of Society, giving the Government a technical view of societal problems and how to solve them
   - The ICOG supported the creation of our own NGO: World Geologists.
2. Quick and professional response to politicians.
   - ICOG has presented more than 20 amendments to national or autonomic laws and documents
   - ICOG new statutes approved
   - International collaboration: The EFG pillar.
3. ICOG adapted its services to the geological market.
   - CPD Training courses: School of Professional Geology
   - ISO 9000 instigated in 2005
   - Liability insurance in certificated projects
   - Collaboration with University
   - Good legal defence for associated members
   - New professional titles.

There is still a lot to do in Spain in the field of professional geology and hopefully the ICOG will be ready to adapt to the ever-demanding needs of a modern and productive society that wants to be an example to Europe.

ENVIRONMENTAL

White
Young
Green





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News and events 2005 -2006

News from EFG

Medal of Merit

Two medals of merit were awarded at the 50th (Golden) Council Meeting of the EFG in Brussels in December 2005 to Manuel Regueiro and Pietro de Paolo (in absentia).

The following is the address by Dr. István BÉRCZI, President of the EFG and the response by the recipient.

"It is the pleasure of the current president to award one of his predecessors, more exactly his great grand father in the chair of the EFG, with the Medal of Merit of the organization. Professor Manuel REGUEIRO y GONZÁLES – BARROS, for us Manuel, for closer friends in Spain simply Manolo, is a very discrete man: I simply did not ever find a mention of his year of birth in his CV. Certainly, it is highly confidential, so to say classified data. What we know is that he graduated in 1979 right on time to witness another birth, the birth of the EFG in 1980. It is very important to mention that his career until now has been related to the professional part of geological prospecting, exploring and explaining minerals and mineral resources. In his active career he has twice crossed boundaries within geology which are usually very difficult to cross, and if you do, later you often come to the conclusion, that you have bought a one way ticket. Less mysteriously, first he moved from conventional ore exploration to uranium prospecting then back to the aggregate industry looking for limestone and marls for the cement industry, then again crossed an "iron curtain" to join Anadrill Schlumberger in oil exploration and shortly afterwards back to engineering geology. However, with this last switch the period of early adventures in his life has ended – for the time being – and since then he has been active in mineral exploration and geological engineering.

Needless to say that such a broad professional carrier has assisted him in being deeply involved in the social life of our profession. In addition to his activity in his homeland, at a very early stage he joined international organizations, including the European Federation of Geologists. As the youngest President of the EFG in office so far and enthusiastically supporting the strategic goals of the Federation (extension of EurGeol. titles and their reputation in many countries, increasing the number of member associations, establishment and maintenance of the Brussels office, establishment of the European Geologist magazine and last but not least the founding father of the traditional wine contest at the Council meetings) he has set milestones in the historical record of the Federation. He has been one of the most devoted guardians of the 'four pillars' (copyright Gareth Jones) of the EurGeol. title. I would however highlight his 'fifth pillar', his excellence in serving, in his words "as a humble geologist", promoting the aims and interests of the Federation, or those of his National Association over his own. In recent times, such characters are less and less frequent in our society and in professional organizations all over the world. I wish that the EFG will follow his example and in this case this Medal of Merit is the least compensation Manuel deserves for the lessons we learned from him. Manuel, I wish you good luck, good health and happiness equally in your professional and private life".

Response

"My first job for the EFG was in 1982, when I was working for a Spanish cement company. Then, I did not realise that I was working for the EFG, but now I know that I had a role to play in those first years when EFG was created in Paris in July 1980 and its Code of Ethics was adopted in 1983. Richard Fox, another of the EFG medallists and former President, asked me if the ICOG had a Code of Conduct and if so, if I could translate it into English for him. I told him that we had something even better, we had a Deontological Code, which obviously being in Latin had to be much better.

Ten years later, in 1992, I had my next contact with the EFG in Salamanca, then as the ICOG's EFG representative.

Three years later I was the EFG Vice-President, and from 1997-1999, I had the honour of being the President of the organization.

These have been some very exciting years of which I am very proud, both for the institutional achievements gained by the EFG and for the extraordinary personal relations I had the opportunity to have with great people from all over Europe.

The EFG celebrates today its 25th Anniversary, and to me the Federation we now have is very far away from the organization I came to know in depth in 1992.

In the past it was hard to make geology visible, but today other much bigger and financially sound organizations are learning from us and asking for stable liaisons for a coordinated input to the EU. The EFG is today the professional geology reference in Europe and I am sure it will continue to be in the future.

But there is still a lot to do. Matters such as a stable financial support for the EFG and the magazine, the continuity and stabilization of the permanent staff in Brussels, the use of the office itself, are all administrative matters that should be looked at carefully because they are the basis for the political action of the organization.

National implemention needs also a thorough review; in Spain for example the EFG is seen as something distant, despite our efforts to promote the EurGeol. title and the diffusion of the EFG via the magazine. As has been the case in France and other countries, once the national representative changes, the relationship with the EFG also changes. National members must be attracted to the EFG by providing some services or by political success which we can boast about.

But maybe today is not the time or the moment to make an in-depth analysis of the future of the EFG but a moment to celebrate these 25 years of undoubted success, if possible with a good Spanish wine such as the one that was a double winner at the last EFG wine contest.

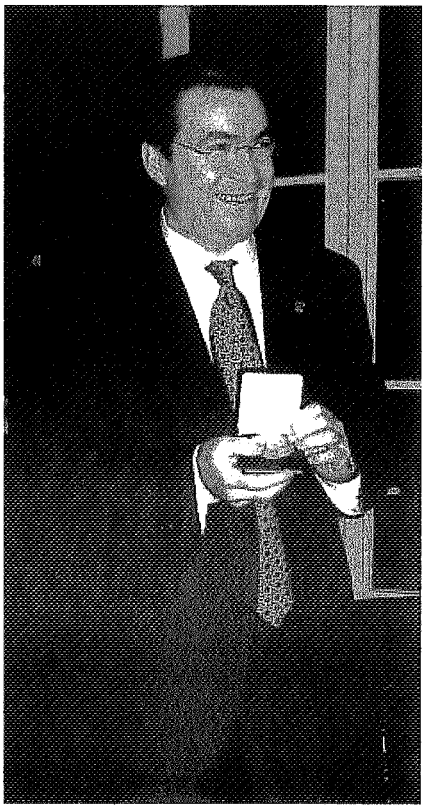
I think that being a geologist gives you a very different personal perspective on life. The EFG has lived through its first quarter of a century and has itself seen the turn of a whole century from the 20th to the 21st. I have escorted that short life for almost all of the way, a small but incredible time for all the achievements of an individual organization and a surprising personal and professional parallelism that makes me at the same time proud and happy.

I am a geologist by vocation and a firm defender of geology and geologists. I hope that as a PP I will be able to provide my help to the EFG and to the Spanish and European Geologists for whatever responsibilities I might have.

I want to thank the Board of the EFG for their generosity in giving me this award which to me is a fantastic honour to receive. I also want to remember the ICOG and particularly Luis Suarez for his support

during all these years of EFG responsibilities. Finally I thank all my friends from the EFG Council for this rewarding moment that I will preserve in my heart all my life.

Thank you very much"



Manuel Regueiro with his medal

The second medal of Merit was awarded to **Pietro de Paola**, in absentia. He is the President of the Consilio Nazionale dei Geologi (CNG) who has guided the transformation of the national organization from its position as Ordinale Nazionale dei Geologi to the present vibrant CNG. The EFG recognized the important work that Pietro has done. The medal was accepted on his behalf by Marino Trimboli.

News from Sweden

Marine and Non-marine Jurassic: Global correlation and major geological events.

International Geological Correlation Programme (IGCP), project 506.

IGCP 506 is a project sponsored by the International Union of Geological Sciences (IUGS) and UNESCO, planned to run 2005-2009. It was initiated by Professor Jingeng Sha at the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences. Project Co-leaders are Professors; N. Morton (France), B. Wimbledon (UK), G. Pieńkowski (Poland), P. E. Olsen (USA), A. G. Riccardi (Argentina) and Y. Wang (China). Prof. A Hallam (UK) is project advisor. There are additional national project leaders representing 35 countries. Further information on this, and other, IGCP projects can be obtained from the website: *http://www.unesco.org*

The principal goals of IGCP Project 506: Marine/Non-marine Correlation are as follows:

1. Correlate marine and non-marine Jurassic sequences providing a robust global stratigraphy for the entire Jurassic. This will benefit a broad range of geologists, hydrocarbon exploration companies and research scientists. A detailed correlation is additionally crucial for understanding the evolutionary trends within the biota. Only by identifying, correlating, and investigating the patterns of biotic turnover at extinction horizons such as the Triassic-Jurassic boundary and the Toarcian anoxic event, can we shed light on the causal mechanisms behind these catastrophic events in Earth history.

2. Provide a forum for international cooperation between geo-scientists, interested in discussing and solving questions concerning the Jurassic.

3. Promote and publish a series of research results of benefit to the geocommunity, industry and academics.

4. Contribute to improving public education and general interest in geology with a special focus on the Jurassic. Such public education is to be brought about by publication of popular science articles, interaction with schools and other educational institutions, and by contact with the popular media.

These goals will be achieved by synthesizing the vast amount of existing published data but also by conducting new high resolution biostratigraphic and radiometric investigations of critical time/rock intervals. The project will use integrated multidisciplinary methods, including biostratigraphy, sedimentology, geochemistry, isotopic dating and geophysical methods to solve the inter-related problems of correlation between marine and non-marine Jurassic strata, and clarifying stage boundary positions.

The first annual symposium of IGCP

Professor Jingeng Sha enjoying dinner with international colleagues at the conference dinner of the first annual symposium of IGCP in Nanjing, November, 2005.

News and events 2005 - 2006

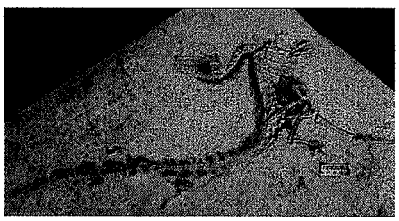
Project 506 "Jurassic Boundary Events" was held in the beautiful city of Nanjing, China, in November 2005. The symposium included key-note talks, fieldtrips, museum visits and social events focussing on recent advances in the studies of marine and non-marine Jurassic strato-boundaries and associated major geological events. The meeting, which was organized by Profs. Sha and Wang, both active at the Nanjing Institute of Geology and Palaeontology, was a great success with over 100 participants representing 14 countries including the UK, France, Poland, Sweden, Romania, Russia, Australia, USA, Japan, Thailand, India, Viet Nam and China. The scientific results presented at this symposium will be guest-edited by Dr. Susan Turner with Profs Sha and Wang, as a special issue of PROGRESS IN NATURAL SCIENCE, a multidisciplinary science journal published monthly by Taylor & Francis Ltd and Science in China Press.

The meeting was financially supported by UNESCO-IUGS, National Natural Science Foundation of China, China Committee of International Geoscience Program, Nanjing Institute of Geology and Palaeontology, CAS, State Key Laboratory of Palaeontology and Stratigraphy, and Bureau of National Land and Resources of Shehong County, Sichuan Province.

The next meeting of IGCP Project 506, will be held in Krakow Poland, 11-14th of September 2006, in conjunction with the The 7th International Congress on the Jurassic System (7th ICJS). The meeting will be organized by Co-leader Dr Grzegorz Pieńkowski active at the Polish Geological Institute in Warsaw Further details of this meeting can be found at *http://www.ing.pan.pl/jura/program.html*

The forthcoming meeting in Warsaw provides an excellent opportunity for European geologists to participate and contribute to this important international project. The organizers and national representatives of IGCP 506 look forward to seeing you there!

Vivi Vajda, Associate Professor at the Department of Geology, Geobiosphere Science Centre, Lund University, Sweden and the Swedish representative of EFG and of IGCP project 506.



One of the highlights of the visit to the Nanjing Institute of Geology and Palaeontology: Sinosauropteryx prima *" Chinese winged lizard" is the first dinosaur fossil ever encountered with the fossilized impressions of feathers. It was a small predator belonging to the family Compsognathidae, which occurred in Europe and China in the Late Jurassic to Early Cretaceous. The finding of the species is important because it had feather-like structures, yet was not very closely related to true birds.*

News from France

Research Workshop September 2006

First announcement and call for papers:the European Association of Geoscientists and Engineers (EAGE) is holding a research workshop entitled "From Seismic Interpretation to Stratigraphic and Basin Modelling - Present and Future" in Grenoble France, 25 - 27 Sept. 2006.

Convenors: Marie-Christine Cacas, Inst. Francais de Petrole and Herald Ligtenberg, dGB Earth Sciences.

Please note that a limited number of registrations can be accepted for this workshop.

Deadline for abstracts: 28 April 2006

For further details and registration, see *www.eage.org*

News from UK

Applied Petrography Group Seminar, November 2006

A one day seminar entitled 'Buildings under the microscope: petrographic solutions for Engineers, Surveyors and Architects' will be held in London, Piccadilly on 6 November 2006.

The Applied Petrography Group have organized this seminar to describe the modern petrographic methods that are in current use. The application of petrography and its cost-effectiveness will be illustrated with a wide variety of practical case study examples taken from the construction industry. The topics will cover a broad selection of practical petrographic investigations which relate to specifications and to the solution of particular problems with stone, concrete, mortars, slate, marbles and other materials when used in buildings.

Registration fee: Delegates £60; Students £30; Geological Society Fellows £30.

Contact: Dr. A.B. Poole, Secretary to the APG, Parks House, 1D Norham Gardens, Oxford OX2 6PS, UK.

e-mail: abpoole@btinternet.com

Conference, June 2006

Extractive Industry Geology is renowned as a series of highly successful biennial conferences providing a unique scientific and technical shop window for the non-petroleum extractive industry. For the first time in its long and distinguished history the conference will be held in Scotland, plenary sessions and accommodation will be based in the outstanding Edinburgh University's Pollock Halls, in the shadow of Arthur's Seat, the city's famous extinct volcano, appropriately in Edinburgh which through the legacy of James Hutton can be considered to be the cradle of modern geology. The conference is a must for all geologists/earth scientists with an interest in the extractive industry, particularly if you wish to keep abreast of sustainable and environmentally acceptable development. EIG 2006 will maintain the traditional emphasis on aggregate and industrial minerals.

The conference provides an enjoyable way to gain valuable CPD and visit some interesting quarrying and opencast mining operations in Scotland. The last conference was supported by the Mineral Industry Research Organization (MIRO) and was used as a showcase for many of the Mineral Industry Sustainable Technology Programme projects (MIST), projects financed by the Aggregate Levy Sustainability Fund (ALSF). The proceedings of EIG 2004 were published by MIRO in September 2005. For further information about EIG 2006 and registration log on to www.eigconference.org or email graham@caplaw.demon.co.uk.

Jeremy Evans BSc (Hons), MIQ, CGeol, EurGeol., EIG Organizing Committee Member

The Earth Doctors' diagnosis

Book Review by David Harper[1]

Essentials of Medical Geology. Impacts of the Natural Environment on Public Health.
Edited by Selinus, O., Alloway, B., Centeno, J.A., Finkelman, R.B., Fuge, R., Lindh, U. and Smedley, P.

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The ancient Greeks recognized the links between environment, geography and certain types of diseases; moreover mineral potions have been routinely used for the treatment of diseases and medical conditions throughout historic times. Nevertheless the discipline of Medical Geology, however obvious, is relatively new. In short, Medical Geology investigates the effects, both negative and positive, of geological materials and processes on human, animal and plant health. Apart from raising awareness in our environment and its proper stewardship, Medical Geology involves cross-disciplinary networking between earth scientists together with agricultural, biological, environmental, medical, public health and veterinary researchers. 'Essentials of Medical Geology' brings together in some 800 pages, 31 articles on many aspects of this rapidly emerging science. The book was conceived initially through a number of short courses associated with IGCP project 454 'Medical Geology' (http://www.iugs.org/iugs/news/medical.htm) and aims to bring to a wider public of undergraduate and graduate students together with scientists working in the area, current activity and advances in this field. The authors hope that 'Essentials' can act as both a work of reference and a textbook.

Coverage is wide and comprehensive, with sections on 'Environmental Biology', 'Pathways and Exposures', 'Environmental Toxicology, Pathology, and Medical Geology' and finally 'Techniques and Tools'. A clear theme in the book is the relationship between diseases and medical conditions, and geological deposits and processes based on demonstrable scientific rather than anecdotal evidence. Thus health problems can occur from a range of volcanic processes other than from direct contact with eruptive products; inhalation of radon gas has contributed to fatalities through lung cancer; arsenic, nitrate and selenium poisoning through drinking water is a real phenomenon in many parts of the world; and bone loss or retention is related to calcium mineral dynamics and the presence of fluorine, to name but a few. There are, however, a range of new investigative techniques emerging. For example, Geographic Information Systems (GIS) can help now establish regional and global databases for the distribution of health problems together with their geological settings, whereas a range of traditional and newer innovative geochemical techniques can help further resolve the mineral complexes that both directly and indirectly control human health.

This book is beautifully produced with clear illustrations and, generally, a readable text. It has a comprehensive glossary, an annotated list of important websites and a good index. The short introductions to each of the four sections are particularly useful. There is no doubt this will be the standard reference for some years to come but there is still a niche for a cheaper, simpler, textbook version of this giant tome.

See book cover, page 30.

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Submission of articles to European Geologist Magazine

The EFG calls for quality articles for future issues of European Geologist. Submissions should be in English and between 1000 and 3000 words, although longer articles may be considered. An abstract of between 100 and 120 words should be included in English, French and Spanish. Articles should be sent via e-mail to the Editor at Harper-mccorry@tele2adsl.dk or on disc to Vordingborgvej 63, 4600 Køge, Denmark. Photographs or graphics are very welcome and should be sent to the Editor as tif or jpg files in CYMG colour. Further details may be found on the EFG website: www.eurogeologists.de

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European Federation of Geologists (EFG)

The European Federation of Geologists was established in Paris in 1980 during the 26th International Congress of Geology. In the same year the Statutes were presented to the European Economic Community in Brussels.

The Council of the EFG is composed of the representatives of the national associations of geologists of Belgium-Luxembourg (UBLG), Czech Republic (CAEG), Finland (YKL), France (UFG), Germany (BDG), Hungary (MFT), Iceland (GSI), Ireland (IGI), Italy (CNG and ANGI), Netherlands (KNGMG), Poland (PTG), Portugal (APG), Slovakia (SGS), Slovenia (SGD), Spain (ICOG), Sweden (N), Switzerland (CHGEOL), United Kingdom (GS), whilst the American Institute of Professional Geologists (AIPG) is an Associate Member. The EFG currently represents about 40,000 geologists across Europe.

Mission

To promote the profession and practice of geology and its relevance.

Objectives

1. To promote and facilitate the establishment and implementation of national arrangements for recognizing geologists who, through academic training and appropriate periods of relevant experience in the profession and practice of geology, are qualified to be designated as EurGeol.
2. To organize meetings and conferences to discuss issues related to the profession and practice of geology.
3. To co-ordinate the activities of member national organisations in preparing briefing papers on geological issues and presenting these to European bodies, national governments and other relevant organisations.
4. To maintain contact with the European Commission and respond in timely manner to requests for information.
5. To communicate, through meetings and other means, the relevance of geology to the resolution of issues of concern to society.
6. To promote the establishment of best practice for training of geologists.
7. To safeguard and promote the present and future interests of the geological profession in Europe, including:

- to guarantee the free movement of geologists in Europe, with the mutual recognition of their academic and professional qualifications by the adoption of the title of European Geologist (EurGeol.).
- to promote the harmonisation of education and training.
- to define and protect the title of geologist and related professional titles.
- to promote the code of professional ethics of the EFG.
- to provide advice and assistance to constituent member National Associations.