



IAEG news

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Brief report of IAEG Executive Committee's and Council's meetings in 2001

Compte-rendu sommaire des réunions 2001 du comité exécutif et du conseil de l'AIGI

by Dr Michel Deveughèle, IAEG Secretary General

Le comité exécutif et le conseil de l'AIGI se sont réunis à Helsinki (Finlande) les 4 et 5 août 2001. Dix des onze membres du comité exécutif étaient présents. Avec 38 délégués présents ou représentés (sur 75 délégués ayant droit de vote), le quorum de 25 % étant atteint, le conseil a pu valablement délibérer. Un compte rendu complet de la réunion a été communiqué aux membres du conseil. Seuls les principaux points soumis à discussion et les décisions prises par le conseil sont présentés ci-après.

IAEG Executive Committee and Council gathered in Helsinki (Finland) on 4th and 5th August 2001. Ten out of the eleven members of the Executive Committee were present. With 38 delegates present or represented (out of 75 delegates having the right to vote), the quorum of 25 % was reached and the Council was fully able to discuss. A complete report of the meeting has been circulated to Council's members. Only main items submitted to discussion and decisions taken by the Council are presented here.

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***Membres – Groupes nationaux**

En juin 2001, l'IAEG comptait officiellement 5.208 membres dont 3.257 recevant le *Bulletin of engineering geology and the environment*, journal officiel de l'association édité par Springer-Verlag. Ces chiffres sont stables depuis plusieurs années. L'essentiel des membres (99 %) appartiennent à l'un des 59 groupes nationaux que compte l'IAEG. Le conseil a eu à déplorer la diminution du nombre de groupes nationaux, suite à la radiation de six d'entre eux, inactifs depuis plusieurs années. La représentation de l'IAEG dans certaines zones géographiques est devenue, de ce fait, préoccupante, en Afrique et en Amérique du Sud notamment.

*** Finances**

Le conseil a approuvé à l'unanimité le rapport financier du trésorier et a noté avec satisfaction la bonne santé financière de l'association.

***Members - National groups**

In June 2001, IAEG officially had 5,208 members, 3,257 out of them receiving the *Bulletin of Engineering Geology and the Environment*, the official publication of the association edited by Springer-Verlag. These numbers are the same for many years. Most members (99 %) belong to one of the 59 IAEG national groups. Nevertheless, the Council regrets the decrease of the number of national groups further to the dismissal of six of them, in abeyance for several years. Then, the representation of IAEG in some geographical zones is preoccupying, especially as for Africa and South America.

*** Financial situation**

The Council unanimously approved the financial report of the treasurer and has noted the wealthy financial state of the association.

À partir de 2002, les cotisations seront payables en euros (EUR ou €). Ce changement a provoqué une très légère baisse de la plupart de ces cotisations.

* **Commissions et groupes de travail**

Un examen détaillé du travail des commissions sera fait en 2002 et leurs objectifs redéfinis pour les prochaines quatre années.

Le conseil a examiné une proposition d'Ibrahim Komoo de création d'une nouvelle commission sur le thème "*Rôle de la géologie de l'ingénieur dans le développement durable*". Il a demandé à Ibrahim Komoo de préparer un programme de travail et décidé de lancer un appel à participation.

* **Site internet de l'AIGI**

Le secrétaire général a annoncé l'ouverture du nouveau site web de l'association consultable à l'adresse suivante : <http://www-cgi.ensmp.fr/iaeg>

* **Conférences régionales**

Le conseil a approuvé à l'unanimité les modifications apportées aux statuts et au règlement intérieur de l'association visant à officialiser l'organisation de conférences régionales de l'AIGI.

* **Congrès International de l'AIGI**

Le 9^{ème} congrès international de l'AIGI se tiendra à Durban (Afrique du Sud) du 16 au 20 septembre 2002. L'accent y sera mis sur le thème "*La géologie de l'ingénieur pour les pays en voie de développement*". Le conseil a également examiné l'unique proposition reçue pour organiser le congrès suivant, en 2006. Elle a été faite par le groupe de l'AIGI du Royaume Uni qui propose Londres. Un vote devra intervenir lors de la réunion du conseil de Durban en 2002.

* **Autres réunions parrainées ou co-parrainées par l'AIGI**

Le conseil a accordé le parrainage de l'AIGI à un certain nombre de manifestations. Il a été rappelé qu'il

From 2002, fees are to be paid in euros (EUR or €). This change of currency has led to a very slight decrease of most fees.

* **Commissions and working groups**

A detailed examination of the work of commissions will be made in 2002 and their objectives re-precised for the four coming years.

The Council has examined a proposal made by Ibrahim Komoo : to create a new commission on the further topic : "*Role of engineering geology in the sustainable development*". It asked him to prepare a working plan and decided to circulate a call to participation.

* **IAEG web site**

The Secretary General has informed of the opening of IAEG new web site, which address is :

<http://www-cgi.ensmp.fr/iaeg>

* **Regional conferences**

The Council unanimously approved the modifications made in the statutes and the by-laws of the association to officialize the organisation of IAEG regional conferences.

* **IAEG International Congress**

The 9th international congress of IAEG will be held in Durban (South Africa) from 16th to 20th September 2002. Emphasis will be put on the topic "*Engineering geology for developing countries*". The Council has also examined the only proposal received as for the organisation of the next congress. It has been made by IAEG national group of United Kingdom, which suggests London. A vote will occur on Council's meeting in Durban in 2002.

* **Other meetings sponsored or co-sponsored by IAEG**

The Council has granted IAEG sponsorship to some meetings. It has been reminded the necessity to distinguish meetings organised by national groups of the

faut bien distinguer les réunions organisées par les groupes nationaux de l'association et auxquelles l'association accorde son parrainage, qui constituent pour l'AIGI des événements majeurs, et les réunions auxquelles l'AIGI accorde simplement un co-parrainage.

La liste suivante de manifestations a été approuvée par le Conseil :

association IAEG gives its sponsorship to (being then major events for IAEG), from meetings IAEG simply grants its sponsorship to.

The further list of events has been approved by the Council :

- 24th-26th April 2002, Louvain-la-Neuve (Belgium) : *Colloque national "Réhabilitation des zones polluées, inventaire, gestion et assainissement"* (organised by the Belgian Committee for Engineering Geology, co-sponsored by IAEG)
- 12th-14th May 2002, Napoli (Italy) : *International Workshop Flows 2002 ; International Conference on Fast Slope Movements* (co-sponsored by IAEG)
- 20th-23rd May 2002, Ventor, Isle of Wight (Great-Britain) : *International Conference on Instability, Planning and Management* (co-sponsored by IAEG)
- 24th-26th June 2002, Prague (Czech Republic) : *1st European Conference on Landslides* (organised by IAEG national groups of the Czech Republic, Austria and Slovak Republic, sponsored by IAEG)
- 16th-20th September 2002, Durban (South Africa) : *9th IAEG International Congress, "Engineering Geology for Developing Countries"*
- 15th-18th September 2002, Istanbul (Turkey) : *International Symposium on Industrial Minerals and Building Stones* (organised by IAEG national group of Turkey, sponsored by IAEG)
- 22nd-26th September 2003, Ljubljana (Slovenia) : *Groundwater in Geological Engineering* (co-sponsored by IAEG and IAH)
- 2003, Hong Kong (P.R. of China) : *Asian IAEG Meeting "Engineering Geology of the Tropics"* (sponsored by IAEG)
- 2003, Karlsruhe (Germany) : *6th International Symposium for Field Measurements in Geomechanics* (co-sponsored by IAEG)
- 21st-24th June 2004, Calgary (Alberta, Canada) : *GeoEng 2004, "Geo-Engineering for Resource Development"* (co-sponsored by IAEG, ISRM and ISSMGE)
- 22nd-28th August 2004, Florence (Italy) : *32nd International Geological Congress, "From the Mediterranean toward a Global Renaissance - Geology, Natural Hazards and Cultural Heritage"*
- 2004, Liège (Belgium) : *1st European Regional Conference of IAEG* (organised by IAEG national groups of Belgium, Germany and the Netherlands ; sponsored by IAEG)

- 2004, Rio de Janeiro (Brazil) : *9th International Symposium on Landslides* (co-sponsored by IAEG)

* **Médaille Hans Cloos et Prix Richard Wolters**

À la suite de l'appel à nominations lancé par le secrétaire général, quatre nominations ont été reçues pour la médaille Hans Cloos et trois pour le prix Richard Wolters.

Les quatre nominations pour la **médaille Hans Cloos** étaient :

- Dr Karlo Richard Braun, proposé par le groupe national croate ;
- Sir John Knill, proposé par le groupe national du Royaume Uni et le président sortant ;
- Prof. Emery Zoltan Lajtai, proposé par le groupe national canadien ;
- Dr Robert L. Schuster, proposé par le vice-président pour l'Amérique du Nord.

Conformément au règlement intérieur, le comité exécutif, constitué en jury, a examiné les quatre candidatures qu'il a jugé toutes excellentes. Le vainqueur a été désigné le 4 août 2001 par un vote à bulletin secret, au second tour : **Sir John Knill**. La médaille Hans Cloos lui sera remise à Durban où il lui a été demandé de prononcer la première conférence Hans Cloos.

Le comité exécutif a examiné de la même manière les trois candidatures pour le **Prix Richard Wolters**. Il a désigné comme vainqueur le **Dr Atiye Tugrul**, présentée par le groupe national turc. Comme le règlement le lui autorise, il a, compte tenu des excellents dossiers présentés par les deux autres candidats accordé une **mention d'honneur** au **Dr Réjean Couture**, présenté par le groupe canadien, et au **Dr Filipe Temo Jeremias**, présenté par le groupe portugais. Le prix Richard Wolters sera remis au Dr Atiye Tugrul à Durban, lors de l'assemblée générale de l'association.

* **Hans-Cloos Medal and Richard-Wolters Prize**

Further to the call for nominations circulated by the Secretary General, four nominations have been received for Hans-Cloos Medal and three ones for Richard-Wolters Prize.

The four nominations for **Hans-Cloos Medal** were :

- Dr Karlo Richard Braun, presented by the national group of Croatia ;
- Sir John Knill, presented by the national group of United Kingdom and the immediate past president ;
- Prof. Emery Zoltan Lajtai, presented by the national group of Canada ;
- Dr Robert L. Schuster, presented by the vice-president for North America.

According to the by-law, the Executive Committee has examined the four candidatures, all considered excellent. The winner has been designed on 4th August 2001 by a secret vote, on the second vote ; it is **Sir John Knill**. Hans-Cloos Medal will be awarded to him in Durban where it has been asked to him to give the first Hans-Cloos conference.

The Executive Committee has in the same way examined the three nominations for **Richard-Wolters Prize**. The winner is **Dr Atiye Tugrul**, presented by the national group of Turkey. As the by-law allows, the Executive Committee, taking into account the excellent files submitted by both other candidates, has granted a **honourary mention** to **Dr Réjean Couture**, presented by the national group of Canada, and to **Dr Filipe Temo Jeremias**, presented the national group of Portugal. Richard-Wolters Prize will be awarded to Dr Atiye Tugrul in Durban, on the general assembly of the association.

* **Honourary members**

The modification of statutes of the association in 2000

* Membres d'honneur

La modification des statuts de l'association intervenue en 2000 a introduit une nouvelle catégorie de membres : les membres d'honneur désignés par le conseil en raison des services exceptionnels qu'ils ont rendu à l'association. Le Conseil a approuvé par applaudissement la proposition du comité exécutif d'attribuer la qualité de membre d'honneur à :

- **Dr. Louis Primel**, de France, secrétaire général de l'AIGI de 1981 à 1998 ;
- **Prof Milan Matula**, de Slovaquie, qui participa activement aux activités de l'AIGI dès 1968, au travers de ses commissions et réunions internationales.

* Relations avec les autres associations

Les discussions du conseil ont porté sur l'ampleur à donner à la participation de l'AIGI au congrès géologique international de Florence en 2004, d'une part, et sur les actions engagées dans le cadre de la coopération avec les sociétés sœurs, ISRM et ISSMGE, d'autre part.

À la suite de la réunion GeoEng 2000 de Melbourne, il a été décidé que les trois associations, AIGI SIMR et SIMSG co-parraineraient en 2004 une conférence à Calgary (Canada) sur le thème "*Geo-engineering for Resource Development*". Elles envisageraient aussi aux moyens à mettre en œuvre pour mieux coordonner les travaux de leur commissions sur des thèmes d'intérêt commun. Enfin, un groupe de travail a été constitué pour réfléchir sur la forme que pourrait prendre une union internationale de géotechnique : structure légère de coordination des trois associations ou structure plus lourde et plus indépendante avec des groupes nationaux affiliés. L'AIGI y est représentée par Paul Marinos et Ricardo Oliveira, anciens présidents de l'AIGI.

* Prochaines réunions du comité exécutif et du conseil

has introduced a new category of members : honorary members nominated by the Council on grounds of exceptional services to the association. The Council has approved the proposal of the Executive Committee to award the quality of honorary member to :

- **Dr Louis Primel**, from France, IAEG Secretary General from 1981 to 1998 ;
- **Prof. Milan Matula**, from Slovak Republic, who actively took part in IAEG activities from 1968, through its commissions and international meetings.

* Relations with other associations

Council's discussions have dealt with IAEG participation in Firenze international geological congress in 2004, on one hand, and on the other hand with actions in the frame of the cooperation with sister societies, ISRM and ISSMGE.

Further to GeoEng 2000 meeting in Melbourne, it has been decided that the three associations, IAEG, ISMR and SIMSG would co-sponsor in 2004 a conference in Calgary (Canada) on the further topic : "*Geo-Engineering for Resource Development*". They are also thinking about the means to implement to ensure a better coordination of the works of their commissions on topics of common interest. In the end, a task group has been constituted to think about what could be a Geotechnical International Union and a light structure of coordination of the three associations, or a heavier and more independent structure with national groups affiliated. IAEG is represented in this task group by Paul Marinos and Ricardo Oliveira, IAEG past presidents.

* Next Executive Committee's and Council's meetings

Place : Durban (South Africa), on the opportunity of

Lieu : Durban (Afrique du Sud), à l'occasion du 9^{ème} congrès international de l'AIGI

Dates : comité exécutif : samedi 14 septembre 2002 ; conseil : dimanche 15 septembre 2002

Une assemblée générale des membres de l'association sera organisée le mardi 17 septembre 2002.

the 9th international congress of IAEG

Dates : Executive Committee's meeting : Saturday 14th September 2002 ; Council's meeting : Sunday 15th September 2002.

A general assembly of the members of the association will be organised on Tuesday 17th September 2002.

General meeting of IAEG members - Durban, Tuesday 17th September 2002

Réunion générale des membres de l'AIGI - Durban, mardi 17 septembre 2002

The members of the International Association of Engineering Geology and the Environment are invited to take part in the general assembly of their association. It will take place in Durban (South Africa) on Tuesday 17th September 2002, from 15h30 to 17h30, during 9th IAEG international congress. The exact place of the meeting will be indicated later.

Agenda

- General information on IAEG
- Activity report by the president for the period 1999-2002 ; main decisions taken by IAEG Council
- Award of the Prize and the Medal
- Presentation of the Executive Committee elected for the period 2003-2006
- Presentation of IAEG 10th international congress, 2006

Les membres de l'Association Internationale de Géologie de l'Ingénieur et de l'Environnement sont invités à participer à l'assemblée générale de leur association. Elle se tiendra à Durban (Afrique du Sud) le mardi 17 septembre 2002, de 15h30 à 17h30, pendant le 9^{ème} congrès international de l'AIGI. La salle où se déroulera cette réunion sera indiquée par voie d'affichage.

Ordre du jour

- Informations générales sur l'AIGI
- Rapport d'activité par le président pour 1999-2002 ; principales décisions prises par le conseil de l'AIGI
- Remise de récompenses
- Présentation du comité exécutif élu pour la période 2003-2006
- Présentation du 10^{ème} congrès international de l'AIGI de 2006

Obituary / *Nécrologie* - David J. Varnes

David J. Varnes, an internationally renowned geologist, passed away on Sunday, 3 February, 2002. Dave's long and distinguished career began with the U.S. Geological Survey in 1941. Early in his career Dave studied mineral deposits in the Silverton District of Colorado where he became interested in the mechanics of rock failure, leading to a remarkable analysis of plastic deformation in regional tectonic deformation. He conducted the engineering geologic assessment of the future site of the United States Air Force Academy in Colorado Springs. His long interest in landslides and engineering geology resulted in his seminal works on landslide classification, the Slumgullion earth flow of Colorado, large-scale gravity-spreading, creep-to-failure phenomena, fractal theory, and the logic of geologic maps. Virtually every project he undertook in a 60-year career became a classic study of its type.



Dave was twice the recipient of the Geological Society of America's Burwell Award, recipient of the Association of Engineering Geologists' Holdredge Award, recipient of the U.S. Department of Interior's Award of Merit, Meritorious Service Award, and Distinguished Service Award, the International Association of Engineering Geology's Hans Cloos Award, and several other international awards. He was knighted by the French Government for his work for UNESCO. He was a fellow of both the Geological Society of America and the Geological Society of London. Dave served as chair or member of numerous international working groups, professional committees, and national advisory boards throughout his career, feeling it was his obligation and responsibility to his

profession. Although Dave retired 6 years ago, he continued to come to the office each day to pursue his science and offer advice and counsel to his colleagues. For the past few months he battled advanced cancer. He recently expressed how very fortunate he felt to be immersed for the past 60 years in scientific discovery at the USGS. His colleagues and friends around the world will miss his wit and wisdom.

Contributed by R.W. Fleming, W.Z. Savage, R.L. Schuster, R. G. Updike

U.S. Geological Survey

Meeting of representatives from European National Groups of IAEG

Helsinki, 5th August, 2001

By Dr Niek Rengers and Dr Antonio Gomes Coelho, IAEG vice-presidents for Europe

The meeting, which was held in Radisson SAS Royal hotel in Helsinki on Sunday morning 5th August, from 09.00 to 11.00 was attended by representatives from 11 national groups (Belgium, Czech Republic, Finland, France, Germany, Greece, the Netherlands, Portugal, Sweden, Turkey, and the United Kingdom).

Although this attendance was not including a majority of the number of national groups in Europe (34), the number of IAEG members represented through the 11 national groups is more than 50% of all IAEG members in Europe. It was decided thus that the meeting could speak in the interest of the European IAEG membership.

The meeting was chaired and minuted by the European vice-presidents of IAEG : Niek Rengers and Antonio Gomes-Coelho.

The following items were discussed:

- **Minutes of the Hanover meeting in October 2000.** These minutes, which were published in the IAEG News Vol 28, no 2, December 2000, were accepted without comments or proposals for modification.
- **European Regional Conference in 2004.** The IAEG Executive Committee (in its meeting of August 4, 2001) had expressed concerns that the year 2004 coincides with the year of the IGC and would prefer 2003 or 2005. After a discussion on this topic the meeting came to the conclusion that the choice for 2004 is not without problems, but 2003 is too early and 2005 coincides with the ISSMGE Conference. The meeting agrees that it will be proposed to the IAEG council meeting to hold the First European Regional Conference of IAEG in the year 2004, but as early as possible in the year and certainly before Easter so as to have a minimum of clashes with other IAEG sponsored activities. The Belgian, Netherlands and German national groups submit a proposal to organize the first European IAEG Conference in Liege, Belgium as a joint activity of the three national groups. There are no other proposals. The meeting accepts with gratitude the proposal and will support it during the IAEG Council Meeting. (The IAEG Council Meeting in the afternoon of August 5th 2001 has accepted the proposal). In October the three national groups will meet in Liege to work out details about data, topics, excursions, and the division of tasks between the three national groups. The results of this meeting will be reported to the IAEG Secretary General and the Vice-president for Europe, who will have to endorse these.
- **Engineering Geology in Europe.** This document, prepared by the European Federation of Geologists (EFG), without consultation of IAEG is rejected by the meeting as the basis for a discussion within IAEG. The meeting supports the importance of a document, but the EFG

document is not suitable for this discussion in the European IAEG community. It is proposed that IAEG contacts ISRM as well as ISSMGE to work out a document between the (European representatives of) the three sister societies which clarifies the relations between and the respective tasks and responsibilities of Engineering Geology, and Soil – and Rock Engineering. The meeting decides that this is a process to be handled both top-down (at level of sister societies) and bottom-up (at level of national groups) in a number of well-defined steps. The two vice presidents will prepare a proposal for the steps to be followed and will contact, after consultation of IAEG Secretary General, the Secretaries General of ISRM and ISSMGE. A working group at European level will be formed after the procedures have been clarified. The EFG will be informed of these decisions and will be offered an observership in the process.

- **Bologna Declaration.** The Bologna declaration (June 1999) of European Ministers of Education, which aims at convergence of University education programs and Degrees at the European level has led to a large amount of confusion in the different countries represented at the meeting. It is recommended that the National Groups of IAEG in the different countries pay much attention to the developments and try to combine the outcome of the discussion on the position of Engineering Geology in Europe (item 3 of the meeting) with the development of engineering geology curricula at the universities and the establishment of degrees, regulations on professional affiliation, etc. The meeting recommends to put issues like this on the program of the European Regional Conferences in the future.

EurEnGeo 2004 - First European Regional IAEG Conference

EurEnGeo 2004 - Première Conférence Régionale Européenne de l'IAEG

Réuni à Helsinki en août 2001, le conseil de l'IAEG a approuvé la proposition des groupes nationaux allemand, belge et néerlandais d'organiser en commun la première Conférence Régionale Européenne de l'IAEG.

EurEnGeo 2004 se tiendra au début de l'année 2004 à Liège (Belgique). La ville de Liège a été retenue car, avec les villes de Aachen (RFA) et Maastricht (NL), elle forme l'Euregio, une entité transfrontalière originale au cœur de l'Europe.

A titre provisoire, le thème suivant a été retenu pour cette conférence : **“Professional Practice and Engineering Geological Methods in European Infra-structural Projects”**

Le comité d'organisation est maintenant en place. Il ne manquera pas d'informer les membres de l'IAEG de l'état d'avancement de ce projet.

At the meeting in Helsinki in August 2001, the Council of the IAEG agreed to the proposal of the national groups of Belgium, Germany and The Netherlands to organize together the First European Regional IAEG Conference.

EurEnGeo 2004 will take place on the first months of 2004 in Liège (Belgium). Located in the hearth of Europe, the city of Liège is associated to the cities of Aachen (D) and Maastricht (NL) into Euregio, an original case of trans-border cooperation.

The proposed theme for the conference is : **“Professional Practice and Engineering Geological Methods in European Infra-structural Projects”**.

The organisation Committee is now in place. The members of the IAEG will of course be kept informed on the preparation of the project.

Minutes of IAEG C-10 Commission Meeting and Workshop

"Building Stones and Ornamental Rocks"

Helsinki (Finland), Tuesday 7th August 2001

By Prof. Asher Shadmon, chairman, and Prof. Raimo Uusinoka, secretary

In connection with the Symposium "Aggregate 2001 - Environment and Economy"

Helsinki, 6th-10th August 2001

Hotel Radisson SAS Royal Runeberginkatu 2, FIN-00101 Helsinki, Finland - Tuesday 7th August 2001, 14h00-18h00

1. The meeting was opened by Asher Shadmon, Chairman C-10 ; he welcomed the attendants, pointing out the special significance of holding a Workshop at the same time.

2. He expressed the hope that this innovation would become standard procedure in future C-10 meetings and extended a special welcome to the invited workshop lecturers .

3. The participants were introduced by presenting themselves :

Asher Shadmon, C-10 Chairman, Israel - Raimo Uusinoka, C-10 Secretary, Finland - Veli Suominen, Finland - Markku Rask, Finland - Antonia Ramsay, Finland - Olavi Senonen, Finland - Paavo Härmä, Finland - Hannu Luodes, Finland - Pekka Jauhiainen, Finland - Erdogan Yuzer, Turkey - Maria Heloisa Frascá, Brazil - Lars Persson, Sweden - Daniel Morfeldt, Sweden - Björn Schouenborg, Sweden - Hyeong-Dong Park, South Korea - Per Richard Neeb, Norway - Bruce Riddolls, New Zealand

4. The Rio de Janeiro C-10 meeting minutes (11th August 2000) were presented by the C-10 Secretary Raimo Uusinoka and approved.

5. The Chairman reported on the activities since the Rio meeting pointing out that the revision of the work of the various IAEG commissions is important. No dissemination arrangements for eventual publications have been regulated. A revised version of aims and objectives of the commission was prepared to be presented to the IAEG council . Efforts were to be continued on the publication of "Stone in the World" issues together with UNESCO. The representation on the various CEN working groups on stone tests and standardization was continued considering the importance of the geological implication of acceptance and performance standards of stone. Similarly a number of workshops under dimension stone were attended to promote C-10.

7. Updates were given by nominated C-10 members, National IAEG Group representatives and new attendants on the dimension stone activities in their respective countries.:

8. The publication of Stone in the Scandinavian Countries was discussed and outlined by Dr. Veli Suominen. A sample of the draft was submitted.

9. As to the other business there was discussion on the fact that considerable feedback could be given by C-10 members to other geological disciplines, notably those concerned with correlation activities, whether stratigraphical or industrial. Stone geologists working on dimension stone quarrying sites and on processed stone have special access to information on the geology of stone quarries. Such knowledge is often left unobserved by other geologists not having the opportunity to visit those sites, or to handle processed samples. A discussion on stone standards which are handled, more often than not, by technical persons not being aware of geological problems, evoked much attention, with re-

quests for further consideration of the subject at a future meeting.

10. The following workshop lectures were read with the aid of audiovisual presentations :

- Professor Asher Shadmon, Chairman of the IAEG C-10 Commission: Dimension Stone Industry. Globalization
- Mr. Pekka Jauhiainen, Managing Director, Finnish Natural Stone Association: Finnish Building Stone Industry and Stone Technology Program
- Dr. Olavi Selonen, Development Manager, Finska Stenindustri AB: Dimension Stone Quarrying and Processing in Finland
- Mr. Hannu Luodes, Project Manager, Geological Survey of Finland: Prospecting of Natural Stones

11. A discussion on the workshop presentations was held and a summation was given by the chairman, pointing out the high professional standard in Finland on the exploration of quarries and the preparation of the industrial use of stone notwithstanding the adverse climatic conditions.

The meeting and workshop was closed by the chairman with thanks to the lecturers and other participants for attending and looking forward to meet again at the next C-10 event.

IAEG sponsored events - Réunions parrainées par l'AIGI

20-23 May 2002, Ventor, Isle of Wight (United Kingdom) : *International Conference on Instability ; Planning and Management* (co-sponsored by IAEG)

Contact : Robin G. McInnes, Centre for the Coastal Environment, Dudley Road, Ventor, Isle of Wight PO3 1EJ, United Kingdom

Tel : + 44.1983.856.896 - Fax : + 44.1983.855.859

E-mail : conference@iwight.gov.uk

<http://www.coastalwight.gov.uk/conference.html>

24-26 June 2002, Prague (Czech Republic) : *1st European Conference on Landslides* (organised by IAEG national groups of the Czech Republic, of Austria and of the Slovak Republic, sponsored by IAEG)

Main themes : Landslide causes, types and mechanics ; Landslides in the Eastern Alps and Western Carpathian regions ; Landslides and engineering structures, prevention and remedial work

Contact : Organising Committee 1st European Conference on Landslides, Institute of Rock Structure and Mechanics, Academy of Sciences of the Czech Republic, V Holešovičkách 41, 182 09 Prague, Czech Republic

Tel : + 420.2.66.00.92.36 - Fax : + 420.2.688.66.45

E-mail : odd330@irms.cas.cz

<http://www.irms.cas.cz/ECL2002>

16-20 September 2002, Durban (South Africa) : *9th IAEG International Congress, "Engineering Geology for Developing Countries"* (co-sponsored by South African Institute of Engineering and Environmental Geologists and South African Council for Geoscience)

Main themes : Engineering geology for developing countries (appropriate technology) - Engineering geology mapping and soil testing - Engineering geology and the environment - Groundwater - Construction materials - Information technology applied to engineering geology - Gondwana rocks and engineering geology - Case histories and new developments

Contact : The organising committee 9th IAEG Congress, P.O. Box 1283, Westville, 3630 South Africa

Tel : + 27.31.260.33.18 - Fax : + 27.31.260.22.80

E-mail : iaeg2002@nu.ac.za

<http://stanfield.und.ac.za/Durban2002/>

15-18 September 2003, Istanbul (Turkey) : Industrial Minerals and Building Stones (IMBS 2003)

Main themes : Industrial Minerals- Cement industry, Ceramics and glass industries, Light weight and isolation materials - ; Building stones - Dimension stones, crushed stones and aggregates, Construction and restoration stones - ; The role of engineering geologists in mineral industry

Contact : Prof. Dr. Erdogan Yüzer, Istanbul Teknik Üniversitesi, Maden Fakültesi, Ayazaga Kampüsü, 80626 Maslak/Istanbul, Turkey

Tel-Fax : + 90.212.285.61.46

E-mail : yuzer@itu.edu.tr

22-26 September 2003, Bled (Slovenia) : 1st International Conference on Groundwater in Geological Engineering (organised by Slovene Committee of IAH, with participation of Croatian National Group of IAH, IAH National Group of Yugoslavia, Slovene Committee of IAEG, Slovene National Group of ISRM)

Scope : Regional or interurban infrastructure ; urban infrastructure ; small scale infrastructure or local facilities ; energy producing infrastructure ; industry and mining ; natural hazards

Themes : groundwater as a risk factor and/or a technical constraint ; groundwater as an environmental constraint ; groundwater as a socio-economic constraint

Contact : Mr Andrej Juren, organising secretary

Tel-Fax : + 386.1.230.24.42

E-mail : andrej.juren@siol.net

<http://www.uni-lj.si/~skiah/>

Book review / *Présentation d'ouvrages*

Edoardo Semenza, *The history of the Vaiont - by the geologist who discovered the landslide* (November 2001)

Tecomproject Editore Multimedial, via Masi 157, 44040 San Bartolomeo in Bosco (Ferrara), Italy
(Tel : + 39.532.72.58.73)

A book by Prof. Edoardo Semenza, son of the designer and contractor of the Vaiont dam, Carlo Semenza, has been published on the big and catastrophic landslide occurred on 9th October 1963. The tragic event, often distorted in the past, is now honestly and rigorously described by the author, who went through this tragedy. On the basis of the author's memories, the book gives account of the geological, engineering, historical and legal aspects.

The Vaiont landslide still arouses interest for the scientific aspects which have to be understood thirty-eight years later. In 1986, the International Association of Engineering Geology (Italian group), for initiative of the writer and with the cooperation of the University of Ferrara, organized a meeting on this subject.

The case of the Vaiont is a point of reference in the world for the design and the safety of the big dams. For its clarity, the text can be read without difficulties, not only by experts.

Prof. Gregorio Melidoro, President of IAEG Italian group

Judith Niechcial, *A particle of clay - The biography of Alec Skempton, Civil Engineer* (April 2002)

Whittles Publishing, Roseleigh House, Latheronwheel, Calthness, KW5 6DW, United Kingdom
(fax : + 44.1593.74.13.60 ; e-mail : info@whittlespublishing.com)

One of the most eminent engineers of the XXth century, both on the national and international stage, Professor Sir Alec Skempton was truly an influential figure in the discipline of soil mechanics. In the late 1940s he was instrumental in developing the subject, and formed the first university department of soil mechanics at Imperial College, London. Over the years the research, papers and books flowed, as did the accolades and recognition. But his is not a book about soil mechanics alone - it relates much more about the man and how he really viewed life, how he approached challenges and how he would be content only with a job well done.

Skempton combined his skills as an engineer advising on immense international projects with his university teaching and research for which he was known the world over. But in addition, he was a world-renowned engineering historian, an accomplished musician - a veritable polymath.

Written by his daughter, the book illustrates Skem's contribution to engineering knowledge, what influences formed him, and how his ideas developed - it reveals the private man behind the public image and in so doing it also sets in context a dynamic age in engineering.

Bulletin of Engineering Geology and the Environment - Volume 60, 2001

Introduction by Dr A. Brian Hawkins, Editor-in-Chief

As Editor of the IAEG Bulletin, I am delighted that this Newsletter is including copies of the abstracts of the papers published in Volume 60 (2001). You will note the spread of topics included and that the contributions are from many parts of the world. The papers include new work and case histories and are a valuable opportunity to keep abreast of colleagues' work in the field of engineering geology.

In addition to the papers published in the Bulletin, more contributions are available on-line, from the time the proofs have been accepted for publication. IAEG members who subscribe to the Bulletin are also able to log in to these papers and so have access to the most up-to-date information. In January this year, there were more than a thousand visits to the abstracts section of the web site and over six thousand hits on whole papers. For easy access to the latest developments, go to **<http://www.spring.de/alert>**

I hope this opportunity to see the abstracts will encourage IAEG members who do not at present take the Bulletin to consider doing so. You will appreciate that the difference in cost of between membership of IAEG and membership with Bulletin is only 22 euros per year. For this small extra cost you will receive hard copies in February, May, August and November - as well as access to all on line material.

Papers and abstracts / Articles et résumés

A. Alivizatos, E. Patelis, F. Nakou (2001)

Geotechnical assessment of the Amalias to Syntagma pilot tunnel, Athens Metro

Bull. Eng. Geol. Env. 60:1-11

From the site investigation data, difficult geotechnical conditions were anticipated for the 9.6-m-diameter tunnel-boring-machine (TBM) drive between the Olympion and Syntagma stations of the Athens Metro. In addition, due to the difficult geological conditions, including zones of highly sheared phyllites and mylonites, it was anticipated that ancient wells and canals would exist at or above tunnel level. To reduce the uncertainties and hence the risk of collapse beneath a busy main road, a decision was made to drive a 208-m-long pilot tunnel, approximately 2.5 m in height and 3 m in width. Extensive face mapping was undertaken as the drive progressed, and, in the light of the information obtained, an RMR* value was produced, from which the temporary lining of the walls was determined. Where appropriate, ground improvement was undertaken. The TBM was successfully driven through the area.

O. Huvaz, M. Vardar (2001)

Assessing the efficiency and applicability of contact grouting in the Istanbul Subway

Bull. Eng. Geol. Env. 60:13-17

Contact grouting is used to fill the cavities between tunnel linings and the host rock and for sealing the joints against water penetration. This paper discusses the modelling of the movement of grout through the Thracian Formation in which the Mecidiyekoy and Gayrettepe stations of the Istanbul Subway were constructed. Water ingress into the tunnel occurred in the strata, which had hitherto been considered relatively impermeable. The model indicated the sections in which grouting was most effective and provided the basis on which more realistic calculations of grout requirements for other sections of the works could be made.

S. Turkmen, E. Ozguler, A. Ertunc (2001)

Engineering properties of the magmatic rocks at the Pamukluk Dam site, Turkey

Bull. Eng. Geol. Env. 60:19-22

The paper discusses the magmatic rocks that form the foundation material for the Pamukluk Dam, Tarsus, Turkey. The area has suffered extensive dyke intrusion and significant tectonic disturbance. The paper reports the results of both in situ tests and laboratory tests on block and borehole core samples. In general, the diorites and microdiorites have suffered little alteration and remained strong. The granophyres and less weathered acidic rocks are moderately strong while the gabbros are the weakest materials. The elastic moduli vary between 830 and more than 3500 MPa. Pressuremeter tests indicated that for a 120 m high dam, the settlement would vary between some 33 and 69 mm.

S. R. Michalski, R. E. Gray (2001)

Ash disposal - mine fires - environment: an Indian dilemma

Bull. Eng. Geol. Env. 60:23-29

The paper discusses the problems of ash disposal from coal combustion in two large coal-mining regions in India. Compared with the United States, India produces some three times the amount of coal ash per million metric tonnes of domestically produced coal, 95% of which is sluiced into gigantic slurry ponds located near urban areas and occupying vast amounts of premium land. The Jharia Coalfield produces some 30 million tonnes/year of ash and contains the world's largest complex of underground coal-mine fires, occupying an aggregate surface area of about 10 km² above which the land surface is extremely degraded. Similarly, the Singrauli Coalfield suffers from the environmental effects of open-cast mining, spoil heaps and an enormous coal combustion ash disposal problem. Ash haulback is proposed as an efficient, cost-effective way of removing significant quantities of ash from the surface/pond disposal and placing it in open-cast and underground mines. In addition to contributing to the control of mine fires and subsidence, it is suggested that this would have numerous beneficial effects in terms of the reclamation of poor-quality/degraded land for sustainable, productive use and the reduction of harmful emissions and substances in populated areas.

R. P. Singh (2001)

Effect of wastewater disposal and extent of industrial pollution in and around Kanpur, Uttar Pradesh, India

Bull. Eng. Geol. Env. 60:31-35

Kanpur City has become a large industrial complex with nearly 800 industries. This has increased the social and economic status of the city, but these industries are also causing severe environmental pollution. In addition to smoke, dust and pollutant gases, water pollution through the discharge of industrial effluents is causing severe problems. The pollutants include As, Cr, Cd, Cu, Fe, Hg, Pb and Zn, which are considered as toxicants. The presence of various ions, such as Fe²⁺, Ca²⁺, Mg²⁺, Cl⁻ and SO₄⁻, significantly changes the water characteristics, including its ability to stain, its hardness and salinity. The presence of some other oxidizing and reducing agents, such as ammonia, nitrite, nitrate and sulphate, causes problems such as depletion of oxygen, foul odour and microbial growth. The extent of pollutants in the wastewater discharge from different types of industries and the hazards of these pollutants in wastewater are discussed.

R. Q. Huang, X. N. Wang, L. S. Chan (2001)

Triaxial unloading test of rocks and its implication for rock burst

Bull. Eng. Geol. Env. 60:37-41

The behaviour of rock deformation and its failure characteristics under loading and unloading conditions are substantially different. In this paper, triaxial unloading tests have been designed to simulate the unloading process during tunnel excavation in three kinds of rock (granite, migmatitic

granite and limestone). The results show that elastic moduli obtained under unloading conditions are generally less than under loading conditions. The strength of the rock samples also decreases with an increasing rate of unloading. This study reveals that rock bursts during tunnelling in a high in-situ stress area could be controlled or reduced by lowering the excavation speed or applying precautionary measures to control the displacement of surrounding rocks.

He Yan, Li Zhiyi, Yang Zhifa, Wang Jianfeng (2001)

Engineering geology study of Lingquansi Cave Temple, People's Republic of China

Bull. Eng. Geol. Env. 60:43-57

The Lingquansi Cave Temple, in the Henan Province of China, is a cultural heritage relic of national importance. Exquisitely cut in the rock mass, the images of Buddhain low relief, the inscriptions and the Buddhist scriptures are all stone carving art treasures of the Sui Dynasty. The cave temple was constructed on intact and compacted crystalline limestone between the fifth and tenth centuries A.R. Heavy geological deterioration and other factors have resulted in various degrees of damage to the temple's grottoes and stone carvings over the centuries such that protection and renovation are urgently required. Dazhu Grotto and the biggest and best stone carvings are the main concerns of the engineering geological study discussed here. Detailed investigations of the nature of deterioration have been carried out and proposals for remedial/preservation works are presented.

H. Wright, J.-M. Le Cléac'h, M. Deveugère (2001)

Altération et rupture d'échantillons d'argilite lors de sollicitations thermomécaniques en conditions humides contrôlées

Bull. Eng. Geol. Env. 60:59-67

L'objectif de ce travail est de réaliser des essais de fluage sur des échantillons d'argilite en faisant une description microtexturale des mécanismes à l'origine de leur endommagement et de leur rupture sous sollicitations thermomécaniques et hygrométriques. Dans cet article on montre le déroulement d'un essai représentatif. Le dispositif expérimental appelé "microcellule CGI" qui est utilisé permet de suivre visuellement et à différentes échelles l'évolution dans le temps de la texture d'un échantillon taillé sous la forme d'une lame épaisse de dimensions 50×40×5 mm. Dans les conditions fixées pour les essais sur des argilites du Callovo-Oxfordien de l'Est de la France, les déformations observées sont des déformations cataclastiques (fissuration) et on met en évidence le rôle essentiel joué par la texture des argilites et par l'altération des pyrites qu'elles contiennent.

International Union of Geological Sciences Working Group on Landslides, Commission on Landslide Remediation (Chairman: M. Popescu) (2001)

A suggested method for reporting landslide remedial measures

Bull. Eng. Geol. Env. 60:69-74

A brief list of landslide remedial measures is presented and a format for reporting landslide remediation is suggested. They make useful additions to the Landslide Report proposed by the

International Union of Geological Sciences Working Group on Landslides (formerly the International Geotechnical Societies' UNESCO Working Party on World Landslide Inventory).

Paul Marinos, Evert Hoek (2001)

Estimating the geotechnical properties of heterogeneous rock masses such as flysch

Bull. Eng. Geol. Env. 60:85-92

The design of tunnels and slopes in heterogeneous rock masses such as flysch presents a major challenge to geologists and engineers. The complex structure of these materials, resulting from their depositional and tectonic history, means that they cannot easily be classified in terms of widely used rock mass classification systems. A methodology for estimating the Geological Strength Index and the rock mass properties for these geological formations is presented in this paper.

A. Shaban, M. Khawlie, R. Bou Kheir, C. Abdallah (2001)

Assessment of road instability along a typical mountainous road using GIS and aerial photos, Lebanon - eastern Mediterranean

Bull. Eng. Geol. Env. 60:93-101

The steeply sloping and mountainous nature of the Lebanese territory gives rise to a spectrum of natural hazards. It is a rugged area cut by a dense network of roads connecting scattered but highly populated cities. The roads experience heavy traffic. They often follow geological formations of weak lithologies and cross fault systems inducing recurrence of mass movements. When the rather poor road construction in Lebanon is added to this, the result is a potential risk to life as well as economic losses. The purpose of this study was to investigate the interactive components determining the hazards affecting the highway between Beirut and Broummana (Mount Lebanon). It specifically aims to show, with the aid of GIS and aerial photographs, the integration of data input from those components for optimizing approaches to highway hazard analysis.

H. Niini, R. Uusinoka, S. Emekeokhale (2001)

Bedrock parameters of natural surfaces differing from those of excavated road cuts

Bull. Eng. Geol. Env. 60:103-108

Engineering geological observations and measurements were carried out in road-cut excavations in a migmatitic Precambrian belt in southern Finland. Both the degree of weathering and the fracture frequency observed on the natural exposed surfaces were less than those observed on the excavated rock faces. The paper draws attention to the necessity for caution when making inferences on the likely fracture spacing and weathering based on rock outcrops.

Ali El-Naqa (2001)

Engineering geology assessment of El-Rabweh landslide, south-east of Amman City, Jordan

Bull. Eng. Geol. Env. 60:109-116

The paper focuses on the geological and geotechnical characteristics of the area of the El-Rabweh landslide, south-east of Amman City. From the topography, geology and climate of the area, it is apparent that the landslide has taken place mainly due to the presence of a quarry, the actual slide occurring during the abnormally wet winter of 1991-1992. The stability of the landslide area has been assessed using limit equilibrium analysis and stereonet. The shear strength parameters were both determined by direct shear measurements and calculated from the RMR and Q values obtained using extensive field data.

Jan Erik Lindqvist, Urban Åkesson (2001)

Image analysis applied to engineering geology, a literature review

Bull. Eng. Geol. Env. 60:117-122

Image analysis is a technique used in a number of subjects, but to date not extensively used in the geological sciences. The paper describes the way image analysis is used in the various disciplines and presents an overview of the methods and its potential uses in geology and particularly engineering geology. Emphasis is placed on the way image analysis can be applied to rock structures and textures. It is hoped that this overview will provide an introduction to the literature, which is published in a variety of related fields.

E. Arel, A. Tugrul (2001)

Weathering and its relation to geomechanical properties of Cavusbasi granitic rocks in northwestern Turkey

Bull. Eng. Geol. Env. 60:123-133

The effect of mainly mechanical weathering on the granodiorites, granites and quartz diorites of the Cavusbasi area of northwest Turkey are described, the samples having been taken from cores and field exposures. The primary characteristics of these rocks are affected by the weathering process which results in a significant constraint on their use in engineering works. The tests undertaken on samples in the various weathering grades included point load and uniaxial compressive strength, slake durability, porosity, loss on ignition, dry and saturated unit weight and water absorption. A tentative correlation between these properties is presented.

Erast G. Gaziev (2001)

Stability analysis of the rock slope in the Zimapan Arch Dam Reservoir, Mexico

Bull. Eng. Geol. Env. 60:135-137

The history case of the rock slide in the reservoir of 200-m-high Zimapan Arch Dam (Mexico) is discussed. The problem required the stability analysis of this rock mass with the evaluation of its volume to estimate the consequences of the rock mass falling into the reservoir. The results of the analysis of the unstable zone with the estimated volume of $14.6 \times 10^6 \text{ m}^3$ are presented. The "Deficit of Stability Method" is described. The analysis consists in the consecutive examination of rock blocks or wedges located on different parts of the polygonal sliding surface, beginning with the upper one.

Å Fransson (2001)

Characterisation of fracture geometry using specific capacities: numerical and experimental study of a fracture replica

Bull. Eng. Geol. Env. 60:139-144

In view of the difficulties in determining the void geometry of a fracture by direct measurements, the present study was undertaken to better understand rock characterisation as related to tunnel sealing by grouting, where data must be obtained and utilised in a short time. A fracture replica ($295 \times 445 \text{ mm}^2$) was constructed and hydraulic tests were performed to evaluate whether the specific capacity (Q/dh) is a robust parameter for estimating the geometry of a fracture. Modelling facilitated the design of the experimental equipment. The study shows that the variations in geometry within the replica were well identified using the specific capacity. Furthermore, the median specific capacity both from the experimental study and from modelling was found to be a fairly good estimation of the effective transmissivity. This was also valid for the hydraulic aperture.

Göran Hellström, Sven Åke Larson (2001)

Seasonal thermal energy storage - the HYDROCK concept

Bull. Eng. Geol. Env. 60:145-156

A method for seasonal storage of heat or cold in the bedrock (the HYDROCK concept) is presented and its thermal performance discussed. It involves the use of a fractured bedrock at shallow depths (ca. 50-250 m), where existing fractures are stimulated or new fractures artificially created and used as flow-paths for a heat/cold carrier (usually water). The fracture surfaces are used as heat exchangers and the bedrock is loaded and unloaded to suit the energy needs. Propants are injected into the fractures to keep them open and reduce the energy needed for pumping water through the system. Field tests confirm that stacked parallel fractures can be produced by hydraulic fracturing. The thermal performance of the store is modelled and compared with a ducted ground heat store. It is shown that the HYDROCK store may yield 10-20% more energy during extraction than a ducted ground heat store for similar amounts of injected energy. This indicates that the HYDROCK concept is competitive as a seasonal energy store and may be of particular importance as an alternative energy source where existing methods cannot be economically justified.

Mathias Jern (2001)

Determination of the damaged zone in quarries, related to aggregate production

Bull. Eng. Geol. Env. 60:157-166

To make quarrying profitable, the blasting should effectively disintegrate the rock mass whilst at the same time minimising damage to the individual rock fragments. The zone of damage around blast holes has been considered in two quarries: in Permian dolerite at Billingsryd and tonalitic gneiss at Angered Quarry. The paper describes the fracture mapping and ultrasonic measurements undertaken.

F. Fiorillo, F. M. Guadagno, S. Aquino, A. De Blasio (2001)

The December 1999 Cervinara landslides: further debris flows in the pyroclastic depositsof Campania (southern Italy)

Bull. Eng. Geol. Env. 60:171-184

In December 1999, numerous landslides similar to those that had previously struck neighbouring parts of the Campania area occurred above the town of Cervinara. One of these landslides reached the town, causing the death of six persons and considerable damage. The landslides involved the 1 to 2 m thick pyroclastic mantle which overlies the carbonate hill slopes and took the form of a debris flow, although in the early stages debris slide/debris avalanche movement occurred along the 39° slope with further debris flows developing along gullies. Hydrological analyses indicated that the landslides were associated with a storm of exceptional characteristics. However, the rains do not satisfactorily explain this event, particularly as the December 1968 storm, which had similar features to that of December 1999, did not trigger similar landslides. The paper discusses the geomorphological and hydrological characteristics of the area and highlights the importance of the trackways cut into the hillsides. It is concluded that the recent landslides of Cervinara - and other similar landslides in the Campania area - may be partly due to man-made changes along the slopes.

P. Budetta, R. de Riso, C. De Luca (2001)

Correlations between jointing and seismic velocities in highly fractured rock masses

Bull. Eng. Geol. Env. 60:185-192

The paper presents the results of a study of heavily fractured calcareous rock masses outcropping in southern Italy based on both the unidimensional joint frequency (NI) and rock quality designation (RQD) of rock cores and seismic velocity data from laboratory and down-hole tests. The in situ longitudinal wave velocities (v) were always very low and were correlated with both NI and RQD. Between 1 and 2 km/s, small increases in velocity were associated with a considerable decrease in NI and significant increase in RQD value. A velocity of 1.22 km/s corresponded to an RQD value of 0. The study indicated that the simple correlation proposed by the International Society for Rock Mechanics to evaluate the RQD from the unidimensional joint frequency can underestimate the results for heavily fractured rock masses, but that good correlations can be obtained between RQD and seismic velocity.

Abbas Aifan Al-Harhi (2001)

A field index to determine the strength characteristics of crushed aggregate

Bull. Eng. Geol. Env. 60:193-200

The suitability of a simple technique to determine the strength characteristics of aggregates is reviewed. The results indicate that the strength characteristics of aggregates - in terms of crushing, impact and abrasion values - can be estimated and predicted from simple and quick tests for rock strength such as the Schmidt hammer and point load. The rocks and aggregates used in this work were of igneous, sedimentary and metamorphic origin and of different types, ages and degrees of weathering. More than 110 rocks and aggregate samples were tested according to British Standard and ASTM. The laboratory tests included the Schmidt hammer and point load for rock material while

the crushing impact and Los Angeles abrasion test were undertaken on the aggregates. Regression analyses were performed and empirical relationships between the strength of rocks (in terms of their compressive strength and point load indices) and aggregates (in terms of their crushing, impact and abrasion values) were developed. Relatively strong relationships were obtained between the compressive strength of the rock and the crushing and impact value of the aggregate, while moderately strong relationships were obtained for the Los Angeles abrasion values.

Anand S. Gupta, K. Seshagiri Rao (2001)

Weathering indices and their applicability for crystalline rocks

Bull. Eng. Geol. Env. 60:201-221

In the recent past, several weathering indices have been proposed to characterize the extent of weathering and weatherability depending upon the nature and requirement of the study. The weathering index provides a quantitative measure of the extent of weathering of rock; hence it can provide input to the prediction models to assess the strength and deformational properties of rocks and classifications of weathered rock material. In the present study some of the important weathering indices, broadly categorized as chemical, (micro) petrographical and engineering weathering indices, are reviewed and studied experimentally for three common rocks of India, namely granite of Malanjkhand, basalt of Nagpur and quartzite of Delhi, along with results of other rocks reported by other researchers. The study reveals that none of the existing chemical weathering indices is valid for genetically different common rock types and useful for engineering purposes. However, loss on ignition (LOI) may provide an approximate estimation of altered minerals (clays and hydroxides) in tested rocks. It has also shown good correlation with petrographic indices and engineering index properties. Among the petrographic indices, crack density (ρ_{cr}) and unsound constituent (an input to the micropetrographic index) indices provide good correlation with engineering index properties. To quantify the extent of weathering in terms of strength degradation due to weathering in rock, an index is suggested - strength ratio (R_s) - which is the percentage of uniaxial compressive strength (σ_c) of weathered rock with respect to σ_c of fresh rock. Its significance is shown statistically through the relationships with other indices for several rock types including sedimentary and metamorphic rocks.

Jan Hansson, Per Svensson (2001)

Stress distribution in unbound aggregate of road structure: influence of surface roughness and particle shape

Bull. Eng. Geol. Env. 60:223-226

Aggregate used for road structures has to meet requirements regarding abrasion, strength and shape. These properties are largely influenced by the crushing operation. To improve these properties the aggregate can be cubicalised in a vertical-shaft impact crusher. During this process, sharp edges will be rounded and the surface will be polished, which can have negative effects on road stability. This paper presents laboratory work on the load distribution by aggregate used in the unbound layers of the road structures. The aggregate used had different surface roughness and particle shape. The equipment used was a ring chamber consisting of 15 steel rings. The chamber's

diameter was 320 mm and the height was 360 mm. Using this equipment, the stability of aggregates was studied with reference to particle shape and surface roughness for six types of aggregates by measuring the horizontal and the vertical stress that appear under a vertical loading. The grain size of the aggregates used was 8-11.2 mm. The aggregate was divided into three grades of surface roughness, depending on the level of cubification. Each level of surface roughness was divided into two groups, one flaky and one more cubic, in order to study the influence of aggregate shape. The laboratory tests showed that aggregate shape had an influence on the aggregate stability. Surface roughness also influenced the stability, but this was not as important as the aggregate shape.

I. Yilmaz(2001)

Gypsum/anhydrite : some engineering problems

Bull. Eng. Geol. Env. 60:227-230

The engineering properties of gypsum/anhydrite change as a consequence of groundwater, pressure and heat. Gypsum and anhydrite may experience dissolution in the near-surface zone and along the discontinuities, creating karst terrain to depths related to present and/or past groundwater levels. This paper reviews the problems of constructing on gypsum/anhydrite and their engineering significance and provides short case histories to illustrate some of the problems encountered.

O. Fouché, R. Cojean, M. Arnould (2001)

Caractérisation géologique et géométrique de la fracturation naturelle d'une formation granitique à partir de carottes de forages

Bull. Eng. Geol. Env. 60:231-240

Un site granitique non affleurant pressenti pour installer un laboratoire souterrain de recherche sur le stockage des déchets radioactifs a été échantillonné par deux forages aux carottes réorientées, l'un vertical, l'autre oblique. Ils ont permis une étude systématique de la fracturation, aspect considéré comme déterminant pour un projet de stockage. On présente ici, dans le contexte structural du site, celui du Seuil du Poitou, une description hiérarchisée des discontinuités, des failles supposées hectométriques aux fissures décimétriques. On propose un classement morphogénétique, préalablement à une répartition en familles directionnelles donnant une image simplifiée mais réaliste de l'organisation structurale de la formation magmatique traversée. Afin de caractériser les classes de fractures définies, on essaie d'apprécier leur rôle hydraulique et leur extension, propriétés inconnues en forage bien qu'essentielles pour une estimation du comportement hydro-mécanique du massif.

Ümit Özer, Isabelle Thénevin, Hans Wackernagel, Mesut Anil, Mustafa Yörükoglu (2001)

Etude géostatistique multivariable de la qualité du lignite d'Afsin-Elbistan, projet de Çöllolar (Turquie)

Bull. Eng. Geol. Env. 60:241-251

Le présent article porte sur l'utilisation de la géostatistique dans le cadre de l'estimation des réserves du bassin de lignite d'Afsin-Elbistan. Comportant 3,4 milliards de tonnes de réserves de lignite, le bassin de lignite d'Afsin-Elbistan, est le plus important de Turquie. Il constitue la moitié des réserves totales de lignite de la Turquie. La production de lignite sert à alimenter une centrale thermique. L'objet de cette étude est l'évaluation statistique et géostatistique (mono et multivariable) de la qualité des réserves de lignite sur un nouveau projet d'exploitation "Çöllolar (secteur B)" compris dans le bassin d'Afsin-Elbistan en relation avec les besoins de la centrale thermique.

Ali El-Naqa (2001)

Application of RMR and Q geomechanical classification systems along the proposed Mujib Tunnel route, central Jordan

Bull. Eng. Geol. Env. 60:257-269

This paper highlights the engineering geological investigations that have been carried out along the proposed Mujib Tunnel. The geomechanical classifications - rock mass rating (RMR) and Q index for tunnelling purposes - have been used to categorize the rock mass along the proposed tunnel. This tunnel will be driven into the Cambrian Sandstones (Um Ishrin Sandstone Formation) which are characterized by two to three sets of structural discontinuities. The geotechnical information obtained from drilled boreholes as well as from surface discontinuity mapping using scanline techniques indicates fractured sandstone along the proposed tunnel. This would be classified as very poor to fair quality material using the Q index and RMR values. An expert system was used to obtain the design parameters of the proposed tunnel and to determine the support requirements.

Bahman Bohloli, Gunnar Gustafson, Bo Ronge (2001)

A laboratory study on reducing the quantity of rock fines at failure: application to rock blasting and crushing

Bull. Eng. Geol. Env. 60:271-276

This paper presents laboratory work to determine whether decreasing the strength of rock through water-saturating the specimens can reduce the amount of generated fines at failure. Three types of rocks were tested using the indirect tensile (Brazilian) test. The samples were randomly divided into two groups of gneiss, diorite and diabase (dolerite), one group of each rock type being tested in dry and the other in saturated conditions. The results indicated that the dry samples produced both higher tensile strength values and more fines than the saturated specimens.

U. Åkesson, J.E. Lindqvist, M. Göransson, J. Stigh (2001)

Relationship between texture and mechanical properties of granites, central Sweden, by use of image-analysing techniques

Bull. Eng. Geol. Env. 60:277-284

Rock texture is of great importance in understanding the mechanical properties of a rock. Los Angeles and studded tyre tests were used to assess the mechanical properties of homogeneous

acidic plutonic and volcanic rocks and these properties were related to the rock texture using image analysis and the more common optical microscopy. The image-analysing technique was based on SEM/BSE images, where the perimeter was measured on each mineral phase in order to numerically quantify a texture parameter. The results demonstrate that rocks with high perimeter values have the best resistance to fragmentation and abrasion. A high perimeter corresponds to fine-grained rocks where the minerals occur as individual grains rather than monomineralic aggregates. An increase in grain size and the formation of mineral aggregates of the same phase have a negative effect on the quality of the rock.

Y. Matsukura (2001)

Rockfall at Toyohama Tunnel, Japan, in 1996: effect of notch growth on instability of a coastal cliff

Bull. Eng. Geol. Env. 60:285-289

This paper discusses the stability analysis undertaken on a 11,000 m³ rockfall at Toyohama Tunnel in 1996. It is considered that this rockfall resulted from slab failure caused by shearing, with the sliding plane passing through the deepest part of the notch formed at the cliff base. The slope stability analysis was carried out using Culmann's analysis and the measured properties of the Middle Miocene hyaloclastic rocks which form the cliff. It is shown that the cliff reaches a critical condition when the depth of the notch is some 2.5 m, corresponding with the approximately 2 m estimated from photographs.

Nabil S. Abderahman, Ala Haaj Darwish (2001)

Geological and geotechnical characteristics of Karameh dam site, north of the Dead Sea, Jordan

Bull. Eng. Geol. Env. 60:291-299

This paper describes a feasibility stage geotechnical evaluation carried out at the Karameh dam site. The 45 m high, 2,150 m long dam will be built across the Wadi Mallaha on Quaternary lacustrine deposits and store fresh water from the King Abdullah Canal. A confined highly saline aquifer was identified at a depth of 25 m, the saline groundwater migrating naturally through the Lisan Formation. Stability analysis of the foundation indicates that the slopes are just stable under dry conditions and may become unstable under wet conditions. The most important problem is the presence of the active main Jordan Valley Fault crossing both the dam body and reservoir.

F. M. Al-Ruwaih (2001)

Hydrochemical investigation on the clastic and carbonate aquifers of Kuwait

Bull. Eng. Geol. Env. 60:301-314

The field pH and contents of basic cations, anions, total alkalinity and other aqueous species have been measured in 89 groundwater samples collected from clastic sediments and carbonate aquifers of Kuwait. The mean molar ratio of Mg²⁺/Ca²⁺ is 0.63 and 0.48 for the carbonate and clastic aquifers respectively, indicating that the groundwater of the carbonate aquifer is in equilibrium with calcite

and dolomite, the calculated mean PCO_2 of the clastic and carbonate aquifers suggesting a deep closed environment system. The clastic aquifer is supersaturated with respect to calcite, aragonite, quartz and chalcedony, undersaturated to near-saturated with dolomite and undersaturated with respect to gypsum, anhydrite and halite, whereas the carbonate aquifer is supersaturated with respect to dolomite, calcite, aragonite and quartz but undersaturated with anhydrite, gypsum and halite. The salinity of both aquifers increases in the direction of flow. The water types are dominantly NaCl and Na_2SO_4 in the clastic aquifer and Na_2SO_4 , $CaSO_4$ and NaCl in the carbonate aquifer.

A. Aydin, I. Egeli (2001)

Stability of slopes cut in metasedimentary saprolites in Hong Kong

Bull. Eng. Geol. Env. 60:315-319

The increasing number of cut slopes in Hong Kong, its rugged topography, high population density and scarcity of land, in addition to the complex nature of the weathered rock masses and adverse climatic conditions, inevitably magnify the potential for cut slope failures. With the extension of residential and infrastructural development into the New Territories in Hong Kong, a large number of slopes are cut in weathered profiles derived from metasedimentary rocks. This paper reviews the engineering properties of the saprolitic soils in these profiles, presents case studies of the field performance of cut slopes, analyses possible mechanisms of instability and provides recommendations on the current local practice of remedial measures.

Saffet Yagiz (2001)

Brief note on the influence of shape and percentage of gravel on the shear strength of sand and gravel mixtures

Bull. Eng. Geol. Env. 60:321-323

The paper records the influence of the shape and the percentage of gravel on the shear strength/frictional angle of sand and gravel mixtures using direct shear tests. The shear strength is mainly derived from the frictional forces developed due to sliding and interlock; they depend on the maximum particle size and shape, the uniformity coefficient, density and the effective normal stress. As the size of material in a mixture is variable, the shear strength also depends upon the ratio of the specimen diameter to the maximum particle size. In this study, two different shapes of limestone were used, angular and rounded, and the maximum gravel size was 6.3 mm in diameter. Air-dried samples were used in the tests. It is concluded that the shape and percentage of gravel have an important influence on the shear strength properties.

R. Hakkou, M. Wahbi, A. Bachnou, K. Elamari, L. Hanich, M. Hibti (2001)

Impact de la décharge publique de Marrakech (Maroc) sur les ressources en eau

Bull. Eng. Geol. Env. 60:325-336

Les lixiviats de la décharge publique de Marrakech, qui ne sont ni collectés ni traités, pourraient constituer une source potentielle de pollution des eaux de la nappe phréatique et de celles de l'oued

Tensift situé près de la décharge. Le but de cette étude est de caractériser ces lixiviats et de déterminer le degré de pollution des eaux à proximité de la décharge. Les analyses physico-chimiques des lixiviats ont montré qu'ils présentent des concentrations élevées en Cl^- , HCO_3^- , Na^+ , K^+ , SO_4^{2-} , Ca^{2+} , Mg^{2+} , NH_4^+ , Cu et Pb. La pollution organique est également importante; la DCO peut atteindre 138.000 mg/l O_2 . Les concentrations en certains polluants sont nettement supérieures à celles généralement rencontrées dans d'autres décharges d'ordures ménagères. Le suivi de la qualité des eaux durant l'année 1999, a montré que les eaux souterraines et celles de l'oued Tensift sont de mauvaise qualité pour les besoins domestiques et pour l'irrigation. L'Analyse en Composantes Principales a montré que la pollution des eaux, par les lixiviats, est essentiellement due à la matière organique, HCO_3^- , NH_4^+ , Na^+ , Ca^{2+} , Mg^{2+} , Cl^- et SO_4^{2-} .

D. J. Hutchinson (2001)

Observations of geological engineering education in Canada

Bull. Eng. Geol. Env. 60:337-344

A review of geological engineering education in Canada was conducted in order to assess the effectiveness of current undergraduate university curricula by e-mailing a survey to geological engineering students and to practising geological engineers across the country. The lists of courses taught by each of the eight universities currently offering geological engineering in Canada were appraised for content and it was found that there are three "pillars" related to earth materials: Soil, Water and Rock. Although only 25% or less of each university's curriculum was focused on these, they were judged by the survey respondents to be the most useful courses and the subject of the top five job categories.

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Editorial enquiries / Renseignements rédactionnels :

Dr Michel Deveughèle - Secrétaire Général de l'AIGI - Centre de Géologie de l'Ingénieur - Université de Marne-la-Vallée - Bâtiment IFI - 2, allée du Promontoire - 93160 Noisy-le-Grand - France

Fax : + 33.1.49.32.91.28 - E-mail : iaeg-sg@cgi.ensmp.fr

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