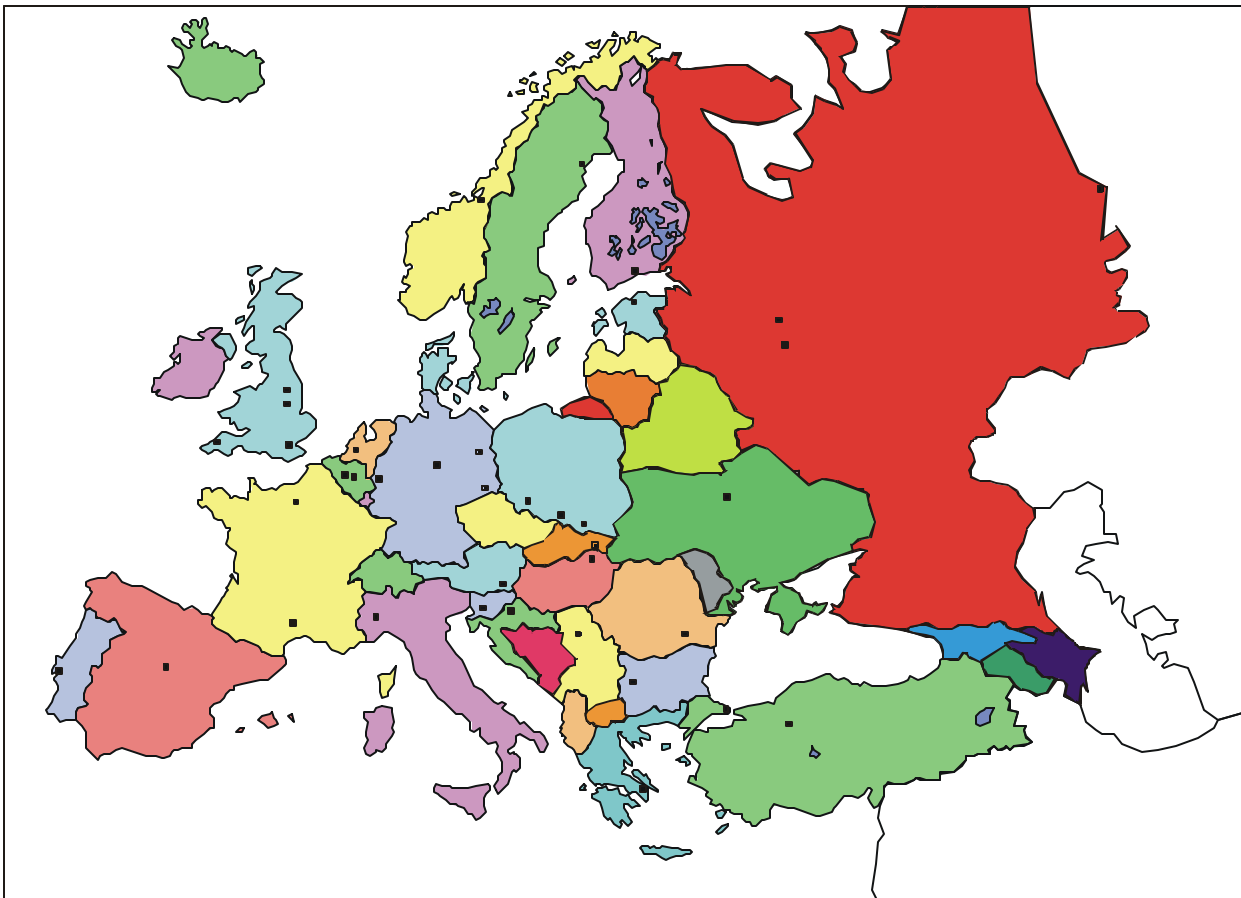


NEWSLETTER

**SOCIETY OF MINING PROFESSORS**



**SOCIETÄT DER BERGBAU KUNDE**



Number 22

August 2003



This is the newsletter which reports on the very successful Annual General Meeting which was held on the island of Milos in Greece in May this year. The host universities for this event were the Technical University of Crete, The Technical University of Athens, Virginia Polytechnic Institute and State University and the Rheinische-Westphalische Universität, Aachen. Professor Karmis from Virginia Tech was the president for the year, and most of the organization was done by him, Prof. Agioutantis, Prof Martens and Prof Panagiotou.

After some minor problems, such as the fact that many of the members, wishing to book early, found this difficult as neither the airlines nor the ferry companies had their timetables available early, making reserving access to the island somewhat of a problem.

As can be seen from the minutes this was an excellent meeting at which a lot of work was accomplished. In particular the Declaration of Milos was completed. This important document was developed as a result of the discussions at the ordinary general meeting in Madrid last December.

This statement follows this editorial in this Newsletter. It is probably the most important achievement of the meeting in Milos.

The next meeting of the Society will take place in Freiberg in Germany on the 14-15 June, 2004. This will immediately be followed by the Central Scientific Conference on the 16-18 June

### **Contribution of the Minerals Professional Community to Sustainable Development**

**Who we are:** *The minerals professional community comprises engineers, scientists, technical experts, and academics who work in, consult for, educate, study, or are in some other manner associated with the minerals industry.*

Society's transition towards a sustainable future cannot be achieved without the application of the professional principles, scientific knowledge, technical skills, educational and research capabilities, and democratic processes practiced by our community. Our members share a mutual responsibility with all individuals to ensure that our actions meet the needs of today without compromising the ability of future generations to satisfy their own needs.

What we believe: **We believe minerals are essential to meeting the needs of the present while contributing to a sustainable future.**

The process of civilization is one of advancing intellectual, social, and cultural development for all of humankind. An important aspect of the history of civilization is the scientific discoveries and technological advancements that transform raw materials into resources, thus providing the means for increased human well-being. The benefits and services derived from minerals, metals, and fuels can contribute to the achievement of a sustainable future because the inherent characteristics of these resources make productivity and consumption gains possible.

***Achieving a balance among economic prosperity, environmental health, and social equity will require significant changes in business strategies, operating technologies, personal behaviours, and public policies. Minerals professionals can engage with communities of interest in the process of improving quality of life by helping to balance the need for minerals, metals, and fuels against the need to protect the environment and society from unnecessary adverse impacts.***

**Our vision for the future:** Our minerals community will contribute to a sustainable future through the use of our scientific, technical, educational, and research skills in minerals, metals, and fuels.

**What needs to be done to achieve our vision:**

**Professional Responsibility:**

Employ science, engineering, and technology as resources to people, catalysts for learning, providers of increased quality of life, and protectors of the environment, human health, and safety.

Encourage the development, transfer, and application of technologies that support sustainable actions throughout the product and mine life cycles.

Give high priority to identifying solutions for pressing environmental and developmental challenges as related to sustainable development.

Address social equity, poverty reduction, and other societal needs as issues that are integral to minerals and mining related endeavors.

Participate in the global dialog on sustainable development. Engage in all stages of the decision-making process, not only in the project execution phase.

**Education, Training, and Development:**

Attract the best people to the fields of mining and minerals by encouraging, facilitating, and rewarding excellence.

Build up and maintain a critical mass of engineering, technical, scientific, and academic capacity through improved education and training.

Promote the teaching of sustainability principles in all engineering programs at all academic levels.

Support and commit funding to the infrastructure that enables nations to provide mineral education, professional training, information, and research.

Prevent the loss of core competencies.

Encourage a global exchange in academic training, as well as apprenticeship and internships programs.

**Communication:**

Support professional growth and interaction through books, articles, symposia, short courses, and conferences on minerals and mining in sustainable development.

Share and disseminate to the public sound information, knowledge, and technology, including information on every aspect of minerals and mining, through print, electronic, and other appropriate media.

Disseminate technical information on sustainable development and the role of the minerals, metals, and fuels in sustainable development, including information on the role of minerals in maintaining a high quality of life.

Promote the achievements and capabilities of mineral community professionals to managers and executives, policy makers, and the general public.

**Signatories to this statement are:**

**The Australasian Institute of Mining and Metallurgy**

**The Canadian Institute of Mining, Metallurgy and Petroleum**

**The European Federation of Geologists**

**The Iberoamerican Association of Mining Education  
(The Asociación Iberoamericana de Enseñanza Superior de la Minería)**

**The Institute of Geologists of Ireland**

**The Peruvian Institute of Mining Engineers  
(Peruvian El Instituto de Ingenieros de Minas del Peru)**

**The Society for Mining, Metallurgy and Exploration**

**The Society for Mining, Metallurgy, Resource and Environmental Technology  
(Gesellschaft fuer Bergbau, Metallurgie, Rohstoff- und Umwelttechnik e.V.)**

**The Society of Mining Professors  
(Societät der Bergbaukunde)**

**The South African Institute of Mining and Metallurgy**

**The Spanish Association of Mining Engineers  
(Consejo Superior de Colegios de Ingenieros de Minas)**



**MINUTES OF THE  
14<sup>th</sup> ANNUAL GENERAL MEETING  
OF  
THE SOCIETY OF MINING PROFESSORS/  
SOCIETÄT DER BERGBAUKUNDE**

**MAY 18-21, 2003, MILOS, GREECE**

The 14<sup>th</sup> meeting of the Society took place in Greece, on the Island of Milos, at the George Eliopoulos Conference Centre from the 18<sup>th</sup> to the 21<sup>st</sup> May, 2003.

Those attending the meeting were Profs. Y. Agafonov, Z. Agioutantis, J. Archibald, G. Badino, U. Bajzelj, N. Dima, C. Drebenstedt, B. Drzezla, M. Duchene, G. Fettweis, D. Fodor, M. Georgescu, M. Hardygora, W. Hennies, N. Ilias, M. Karmis, V. Kharchenko, Y. Kuzmin, W. Lukas, P. Martens, R. Matikainen, P. Mousset-Jones, K. Nielsen, Ch. Nieman-Delius, J. Palarski, G. Panagiotou, A. Pasamehmetoglu, V. Pavlovic, H. Phillips, P. Ramirez, J.J. de Ruiter, P. Särkkä, M. Scoble, T. Shaw, I. Valgma, L. Wilke

(21 countries were represented - Austria, Brazil, Canada, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Romania, Russia, Slovenia, South Africa, Spain, Turkey, United Kingdom, USA, Yugoslavia.)

#### The Weekend of Arrival

This meeting was planned such that it was better to arrive on the Sunday before it started, rather than the Saturday as in previous meetings. So, that is what most people did. The route in was via Athens, and a large group of us first met and got together on the ferry from Piraeus to Milos. At Milos we were in a variety of hotels. Many others had arrived earlier, or were flying in at various times. There was a reception at the Conference Centre in the evening of Sunday 18<sup>th</sup> and most of us completed registration formalities at that time.

#### Monday May 19<sup>th</sup>

The meeting began with a plenary session in the morning of Monday at 9.00 a.m. It was opened by Prof. Karmis, our President, who welcomed all the delegates to Greece, Milos and the conference centre.

Mr. Gouvralis then welcomed us on behalf of the Conference centre pointing out that it was designed as a good centre for conferences in science and technology.

Following this Mr. E. Vidalis, CEO of Silver& Barytes Ores Mining Co. gave us an introduction to his company, the main mining company on Milos. It was a small but expanding company, which took a multidisciplinary approach but was tied to their markets.

That talk was followed by a talk by one from Mr. V. Nikoletopoulos, of Grecian Magnesite SA and Secretary General of the Greek Mining Enterprises Association. This was a talk giving us an overview of the Greek extractive industry. This

was an interesting talk, and was presented using Power Point. The power point presentation is presented later in this Newsletter.

Prof. G. Panagiotou followed with his paper on the educational system for mining education in Greece. This paper is presented later in this Newsletter.

After a break the next session of the meeting was the:

#### Session on **Education**

Prof Shaw opened with an indication of the state his data base of mining engineering teaching institutions had reached, and also the work he had been doing on the curricula of the various institutions. This work will continue and will be updated from time to time on the Society's website.

Mr. de Ruiter updated the Society again on the present position with regard to the European mining course, pointing out its success.

There was then much discussion of the crisis in mining education generally. Points made were that there needs to be a definition of the uniqueness of mining engineering as a discipline, that the Society needs to be involved in the accreditation of mining engineering courses, that the relationship with such courses as Geoscience, Engineering Science, Rock Engineering and so on needs to be clarified, and use needs to be made of these disciplines.

After a break for lunch the afternoon session started with the session on Global Issues led by Prof Kuzmin.

This was followed by a very interesting paper on the Mining History of Milos by Mr. G. Xydous, the Vice President of Euromines. The delegates were then taken for a visit to the mining museum of Milos and the day ended with a very pleasant dinner in Plaka.

#### Tuesday May 20<sup>th</sup>.

The morning started with the session on Research.

First there was a presentation by Prof. Martens on European Mining Research. The material is available on the web at [www.nesmi.net](http://www.nesmi.net). This was followed by Prof Palarski who gave a Polish perspective on the mineral sector and sustainable development.

After that Professor Bajzelj gave a paper on Mining in Slovenia. The floor was then thrown open to discussion.

Co-operation in research within the EU was discussed, but it was agreed that though there had been some exchanges in the past the current situation was not very active, particularly with regard to the new members of the EU.



Prof Martens mentioned Emirec, which was a lobbying organisation and at present it was not possible for it to do the job of encouraging such co-operation.

Pro. Mousset-Jones suggested there should be scope for more co-operation between the USA and Europe possibly funded by NATO.

It was agreed that the Society should be used as a conduit for spreading knowledge of the research activities of its members. Possibly members could enter their interests on the web site.

There was much more wide ranging discussion. Prof Karmis summed up by suggesting that there should be a follow-up session on research interest of the members of the Society.

This research session was followed by the AGM

### The Annual General Meeting

The annual business meeting of the Society followed and was opened by the president, Prof. Karmis at 10.25

**Apologies.** The Secretary General recorded the apologies that had been received namely from Professors; A. Adamson, J. Antoniak, B. Barchanski, C. Buhrow, V. Byzov, I. Dementiev, P. Dowd, S. Durucan, J. Galvin, H. Gerhardt, T. Golosinski, B. Hebblewhite, A. Khokriakov, W. Knissel, U. Kumar, E. Lechner, P-A. Lindqvist, P. Moser, C. Pelley, D. Potts, L. Puchkov, E. Reinsalu, B. Smart, R. Stoll, K. Strzodka, N. Terezopoulos, K. Uchino, A. Vervoort, S. Vujec, H. Wagner and, B. White

**Minutes of the Previous Meeting.** The minutes of the previous meeting had been published in newsletter 20. These were accepted as a true record as there were no alterations suggested.

**Matters arising from the minutes:** A suggestion was made that the Society should co-operate with Aisemin. This matter was discussed. It was noted that Prof. Cedron (Peru) had become a member of the Society. More members of Aisemin has shown interest in the Society and might still join. This was in line with our policy of trying to get members from big mining countries.

**New members:** Since last meeting the following had been accepted as members or associate members: Professors I. Andras, M.F. Cedron, J. Dvoracek, B. Hebblewhite, O. Langefeld, S.K. Mangush, I. Valgma.

The Secretary General welcomed the new members, particularly those who were present at the meeting.

**Milos declaration:** Professor Karmis then gave the background to the Milos Declaration. Following up on the meeting the Society had organised in Dusseldorf in 1999 it had been decided at the Ordinary General Meeting in Madrid that a new declaration on Mining should be prepared. It was in-

tended to try to develop a statement to show the world that mining is important.

Sustainable development has become more and more important. At the Toronto Sustainable Development Meeting in 2001 such a declaration by companies was signed. Profs. Martens and Karmis decided to organise a conference on Sustainable Development Indicators in the Minerals Industry. That meeting, which would immediately follow this Annual General Meeting here in Milos 2003 was planned.

The idea was also to prepare a "Milos Declaration". At the meeting in Madrid a committee was set up to develop the declaration. Drafts was sent to various professional organizations. Despite the short time, it was possible to get the endorsements. Only the IMM did not have sufficient time.

The first page of the Declaration consists really of the headlines, while the second page fills in the detail. The statement represents the scientific and professional point of view, not that of companies or trade organizations. It is a broad philosophy on sustainable development and the contribution of mining towards this.

This document will need to be updated from time to time to include more organizations such as the SPE, metallurgical societies, etc. The SME will maintain this document (which will also be posted on the Society website). Local societies may be added. At present it represents over 38,000 members.

Prof. Fettweis remarked that it is an excellent document, a great step on the road for better recognition of mining. However, the full name of Society (including the German name Societät der Bergbaukunde) should be used. It should be emphasized that the Milos Declaration was important for mining.

Prof. Karmis agreed that this would be done when the document was being printed.

Prof. Mousset Jones asked what difference it was thought that the declaration would make in the future.

Prof Karmis replied that it would highlight the fact that sustainable development needs sustainable infrastructure.

The members accepted the draft document and congratulated the committee that prepared it.

### Revision of the constitution of the Society

Prof. Shaw tabled a draft for such a revision. He highlighted the following changes:

- Officers of the Society.  
The President,  
The Secretary General, the assistant Secretary General. He pointed out that at present the Secretary general was also the treasurer and proposed that a



separate post of Treasurer should be created. was also treasurer.

The President elect should also become an officer.

- An address for the Society should be chosen.
- It was proposed that though originally a European Society with some friends outside as members, It should now have membership completely open, but based in Europe.
- Membership ordinary members and associate members.

Prof Karmis said that structural changes are easy. But the world is becoming smaller, universities are forming more coalitions. Did we want to become more international? Did we want to be broader (interdisciplinary). Finally should there be younger people as members? This meeting should give some direction.

Malcolm: CIM, SME, etc. get into problems. May be SOMP should become Worldwide SOMP, with chapters. Next year AGM should include more representatives from other regions.

Wilke: One side likes to open up, other side likes to keep EU base. Wilke: likes to maintain a European organization for unified EU. But open to everybody. Will be difficult to fully globalize.

Prof. Karmis the suggested that the Society stay a European society, but nevertheless actively recruited member from elsewhere.

Prof. Fettweis then gave some of the history of the founding of the society. Pointing out the idea was to make a society for our profession, which is worldwide and help to get people together. Looking for professionals from different universities, rather than looking for professional background. Policy so far: keep the Society restricted to Mining Engineering. If we open it up to other disciplines – albeit within the field of mineral production - the number will grow and the discussions will also grow.

Prof Karmis then pointed out that Europe and North America do not have a big future for mining. So the best idea was to make it a worldwide society based in Europe and this seems to be the general consensus.

Prof. Mousset Jones indicated that it should not happen that the members from outside Europe feel that they are not full members of the Society.

Professor Scoble mentioned that at Phoenix (SME 2002) it was decided to look at a North American group of mining professors. He therefore proposed to take our initiative overseas.

There was significant further discussion goin around these points without it being obvious that the discussion was heading for a final conclusion so Prof. Karmis suggested that a group be formed to discuss this along with the new constitution. This groupd would meet in December of January and would report to the next meeting. Volunteers were called for

in addition to the normal committee and a loose group was identified. Prof Karmis agreed to head up this initiative and to convene the meeting.

**Election new President:** Prof Drebensted as the convenor of the next Annual Genberal Meeting was voted in as the new president. The next AGM will take place in Freiberg in Germany on the 14-15 June, 2004. This will immediately be followed by the Central Scientific Conference on the 16-18 June already planned for Freiberg Arrival would be on the 12<sup>th</sup>. Sunday 13 trip there will be a trip to Dresden with a boat trip on the Elbe. Monday-Wednesday meeting and visiting mining facilities.

Prof. Z. Agioutantis was elected Treasurer of the Society.

Prof Shaw pointed out that he was coming to the end of his second term as Secretary General and thought that some thought should be given now to his successor. It was agreed that this too would be discussed at the December/January sub-committee meeting.

**The Journal** was then discussed as it had closed due to a lack of enough subscriptions. Only 24 outside the SOMP members. They will not publish the 2003 issue. Have not cancelled completely, but they find it not viable. Implication is that membership dues are not justified any more.

Prof. Karmis agreed to try the SME, CIM, to see if they would take it over, otherwise electronic publication might be a solution.

In the light of the lack of a Journal the Secretary general proposed that fees should be 40 Euro or 40 Dollars for the next year.

**Next meetings were agreed as –**

2004: Freiberg,  
2005 Ankara,  
2006 Belgrade.

Lunch followed this meeting.

In the afternoon there were presentations on the operations of the Silver & Baryte Ores Mining Co. And these talks were followed by a tour of the mining operations on Milos

In the evening there was as usual a very pleasant farewell dinner.

Wednesday May 21<sup>st</sup>

This day was given over to a boat tour round the Island of Milos. This was much appreciated by those who were on this trip.

**Prof. George Panagiotou****Department of Mining Engineering  
National Technical University of Athens**

Mining in this part of the world is a quite old business, as you can realize from the famous Corinthian terracotta (*pinax*) dated circa 550 BC. It was found near the village of Pentaskoufi, Corinth – Peloponnesus, and now is on display at the Berlin Archaeological Museum.

In ancient Greece, mines were worked by slaves, under the supervision of free citizens, which also had the management of the mining operations. On the job training should be regarded as the only mining education scheme available at that time.

The only survived treatise on a mining related subject is the work of Theophrastus “On Stones”, written in the 4<sup>th</sup> century B.C., which is the earliest known work on minerals, their properties and applications.

It is also considered to be fragment of a larger work on minerals, which has not survived. Theophrastus was born in the town of Eresus, Island of Lesbos, in 371BC, was student of Aristotle and succeeded him as the head of the Peripatic School, best known as the Lyceum, in Athens.

Theophrastus certainly proved himself as a first class educator, for not only he did attract some 2000 students, but also he remained in charge of the Lyceum for 34 years.

For those interested in “On Stones”, three English translations are available:

-Sir John Hill “Theophrastus’ History of Stones”, London, 1774.

-E.R. Caley & J.F.C. Richards “Theophrastus on Stones”, The Ohio State University, Columbus, 1956.

-D.E. Eichholz “Theophrastus, De Lapidibus”, Oxford University Press, 1965.

The lack of more texts on mining related topics written by Greek classic authors, can be explained by the fact that mining and metallurgy were considered in ancient Greece as “rude” arts, compared to the “fine” arts like philosophy, history, mathematics, medicine or (even) pottery, which were certainly more popular.

Moving some 2300 years ahead, the rest of my talk will deal with the mining engineering education in contemporary Greece.

To start with, I will present some current statistics on Greek Higher Education:

In Greece (2002 data) there are 19 Universities (and an Open University), with 237 Departments or Schools.



In 2002, 40,000 students were admitted in the 1<sup>st</sup> year of these Departments.

There are 233 Postgraduate Programmes with 12,000 post-graduate students.

Academic Staff (of various levels): 9,200.

For comparison reasons the population of Greece is 10.5 millions.

Mining Engineering Courses are offered in two Universities:

- National Technical University of Athens
- Technical University of Crete, in the town of Chania

The National Technical University of Athens was established by a Royal Decree in 1836 and up to the '50s, it was the only University in Greece offering programs on engineering topics.

In 1946 two new Schools were founded at the University:

- School of Mining Engineering and
  - School of Metallurgical Engineering,
- as parts of the Faculty of Chemical Engineering.

The first Mining Engineering program was offered in the academic year 1945-46.

Before that, mining related courses, such as Mineralogy, Geology and Mining Works were included, since 1878, in the curriculum of the School of Civil Engineering.

In 1948 the merging of the School of Mining Engineering and the School of Metallurgical Engineering was decided, and the new School of Mining Engineering & Metallurgy continue to operate under the Faculty of Chemical Engineering till 1975.

That year the School split from the Faculty of Chemical Engineering and since then it operates as one of the 9 Schools of the University:

(listed in chronological order of establishment)

1. Civil Engineering
2. Mechanical Engineering
3. Electrical and Computer Engineering
4. Architecture
5. Chemical Engineering
6. Rural and Surveying Engineering
7. Mining Engineering and Metallurgy
8. Naval Architecture and Marine Engineering
9. Applied Mathematics and Physics

In 1993 the School of Mining Engineering & Metallurgy moved from the down-town Campus to a new 3-story building, which is located in the centre of a 10-hectare Campus in the outskirts of Athens.

In the case of the Technical University of Crete, the situation is less complicated.



The University was founded in 1977, and the Department of Mineral Resources Engineering, one of its five Departments (listed below), accepted the first students in 1984.

1. Electronic and Computer Engineering
2. Mineral Resources Engineering
3. Production Engineering and Management
4. Environmental Engineering
5. Sciences

The Department is housed in a complex of 5 buildings with a total covered area of 10,000 sq.meters, in the University's 30-hectare Campus, which is located 7 Km NE of the town of Chania.

Both Universities grant diploma degrees in engineering, following a five-year course of studies, as well as the postgraduate degrees of M.Sc. and Ph.D.

From the organizational point of view, the School of Mining Engineering & Metallurgy consists of 3 Departments:

- Mining Engineering
- Metallurgy & Materials Technology
- Geological Sciences

Each Department in order to carry out its assigned teaching and research activities is supported by Laboratories:

#### **Dept. of Mining Engineering: Labs**

- Mining Research & Mine Exploitation
- Mining & Environmental Technology
- Applied Geophysics
- Tunneling Technology

#### **Dept. of Metallurgy & Materials Technology: Labs**

- Mineral Processing
- Metallurgy
- Physical Metallurgy
- Environmental Protection Science & Engineering in Metallurgy & Materials Technology
- Computer-Aided Materials Processing, Rheology & Design

#### **Dept. of Geological Sciences: Labs**

- General & Applied Geology
- Engineering Geology & Hydrogeology
- Mineralogy, Petrology & Economic Geology

Similarly, the Department of Mineral Resources Engineering in Chania consists of 3 Divisions:

- Exploration and Positioning
- Mining Technology
- Mineral Exploitation

#### **Division of Exploration and Positioning: Labs**

- Inorganic and Organic Geochemistry and Organic Petrography
- Applied Geophysics

- Petrology and Economic Geology
- Geodesy and Geomatics
- 

#### **Division of Mining Technology: Labs**

- Applied Geology
- Rock Mechanics
- PVT and Core Analysis
- Mine Design

#### **Division of Mineral Exploitation: Labs**

- Applied Mineralogy
- Ceramics and Glass Technology
- Coal Gasification
- Ore Processing

In addition to these labs, both the School of Mining Engineering & Metallurgy and the Department of Mineral Resources Engineering are supporting their undergraduate and graduate programs with state-of-the-art computing and network facilities, and PC Labs.

Students are admitted into the Departments of the Greek Universities (all of them are State Universities) according to their performance in the nation-wide admission exams that take place at the end of May each year and are administrated by the Ministry of National Education and Religious Affairs. The same Ministry also decides the number of entrants for each Department each year.

For the coming academic year 2003-4, the School of Mining Engineering & Metallurgy will accept 80 students (last year 85), while the Department of Mineral Resources Engineering will accept 75 students (last year 80).

Based on statistics over the last 10 years, 15-20% of the students admitted in the School of Mining Engineering & Metallurgy, discontinue their studies in the 2<sup>nd</sup> or 3<sup>d</sup> year, usually because they manage to gain admission to another Department.

The academic year begins the 1<sup>st</sup> of September and ends the 31<sup>st</sup> of August the next year. Each academic year is divided into two semesters (fall & spring semester). Each semester lasts 18 weeks: 13 weeks of classes, a two-week break (Christmas holidays in the fall semester and Easter holidays in the spring semester), and three weeks, at the end of the semester, for exams. There is also a one-week break between the fall and the spring semesters.

The Engineering Departments in Greece are offering programs which last 10 semesters (5 years). During the first 9 semesters students are registered to a certain number of mandatory and elective courses of the respective semester curriculum. All courses offered have a duration of one-semester. The 10th semester is devoted to the preparation of the diploma thesis.

The diploma thesis plays an important role in the program and it is accordingly weighed. At the National Technical University of Athens, the grade assigned to the graduating stu-



dents is calculated by adding together the average of the grades the student received in all courses, multiplied by a coefficient of 4/5, and the grade of the diploma thesis, multiplied by a coefficient of 1/5.

The School of Mining Engineering & Metallurgy offers an undergraduate program that leads to the Diploma of Mining Engineering & Metallurgy. Therefore, its curriculum includes courses that provide both the theoretical and technological background needed in order its graduates to undertake professional assignments in the respective industries.

In 1999 a major project, under the name "Theophrastus" (recall that Theophrastus was an educator...), supported by EU funds, led to the restructure of the program's curriculum and the improvement of the educational materials and facilities.

Following that, since the academic year 2000-2001 the curriculum is based on the following principles:

- | Semester     | Curriculum             |
|--------------|------------------------|
| 1 – 7        | Core-Courses           |
| 8 – 9        | Specialization Courses |
| Summer 6 / 7 | Field Training         |
| Summer 8 / 9 | Field Training         |
| 10           | Diploma Thesis         |
- Core-Courses (extend over the first 7 semesters and include 48 courses). The goal of these core-courses is to provide students with:
    - Strong Theoretical Background: in Mathematics, Physics, Chemistry, Geology, Mechanics, Thermodynamics, Economics,...
    - Basic knowledge on topics related to Mining and Metallurgy (courses on Excavation Engineering, Minerals Exploration, Mine Exploitation, Ore Processing, Metallurgy, Physical Metallurgy, Environment)
    - Adequate knowledge and skills on Computing (3 courses)
  - Specialization Courses (8<sup>th</sup> and 9<sup>th</sup> semester – 11 courses)

Students registering in the 8<sup>th</sup> semester have to select one of the following Directions of Studies:

- Mining Technology
- Geotechnology
- Metallurgical Processes
- Material Science and Technology
- Environmental Engineering & Geo-environment

and take the appropriate courses from those available in each Direction. In addition to that, there is a pool of courses, which is available for students attending any Direction.

- During the summer holidays between the 6<sup>th</sup> and 7<sup>th</sup> semester the students visit mines and metallurgical plants around the country. During the summer holidays between the 8<sup>th</sup> and 9<sup>th</sup> semester, students have to spend one month (25 working days) working in a mine or plant and then write an extended report, which receives a grade that counts as a course grade. The latter type of field training can be carried out either in Greece or overseas, through IAESTE, and is partially supported by EU funds.

#### 4. Diploma Thesis

The School of Mining Engineering & Metallurgy offers a graduate program leading to the degree of Ph.D. Admitted students have to register in two semesters and attend 8 courses (from a pool of courses) depending upon the specific subject of their Ph.D. thesis. Following that, then they start working on their thesis.

The School also participates in seven Inter-Departmental Postgraduate Programs (leading to the M.Sc. degree) in co-operation with other Schools of the National Technical University of Athens:

- Water Resources Science & Technology
- Design & Analysis of Structures
- Automation Systems
- Materials Science & Technology
- Environment & Development
- Geoinformatics
- Design & Construction of Underground Works

The School coordinates the last Inter-Departmental Postgraduate Program.

The Department of Mineral Resources Engineering at the Technical University of Crete offers an undergraduate program that leads to the Diploma of Mineral Resources Engineering. The principles on which the curriculum of the program is based are:

Semester	Curriculum
1 – 7	Core-Courses
8 – 9	Specialization Courses
Summer 8 / 9	Field Training
10	Diploma Thesis

Students registering in the 8<sup>th</sup> semester have to select one of the following Directions of Studies and the appropriate courses:

- Exploration and Positioning
- Mine Exploitation
- Industrial Minerals

The Department offers also a graduate program leading to the degree of Ph.D. and a graduate program on "Geotechnology and the Environment" leading to the degree of M.Sc.



The M.Sc. program is carried out with the cooperation of overseas institutions, such as the:

- Department of Mining and Minerals Engineering, Virginia Polytechnic Institute (USA),
- School of Geomatic Engineering, University of New South Wales (Australia),
- Space Geodesy Branch, NASA (USA),
- WH Bryan Mining Geology Research Center, University of Queensland (Australia),
- Division of Geology and Economic Geology, University of Leoben (Austria)