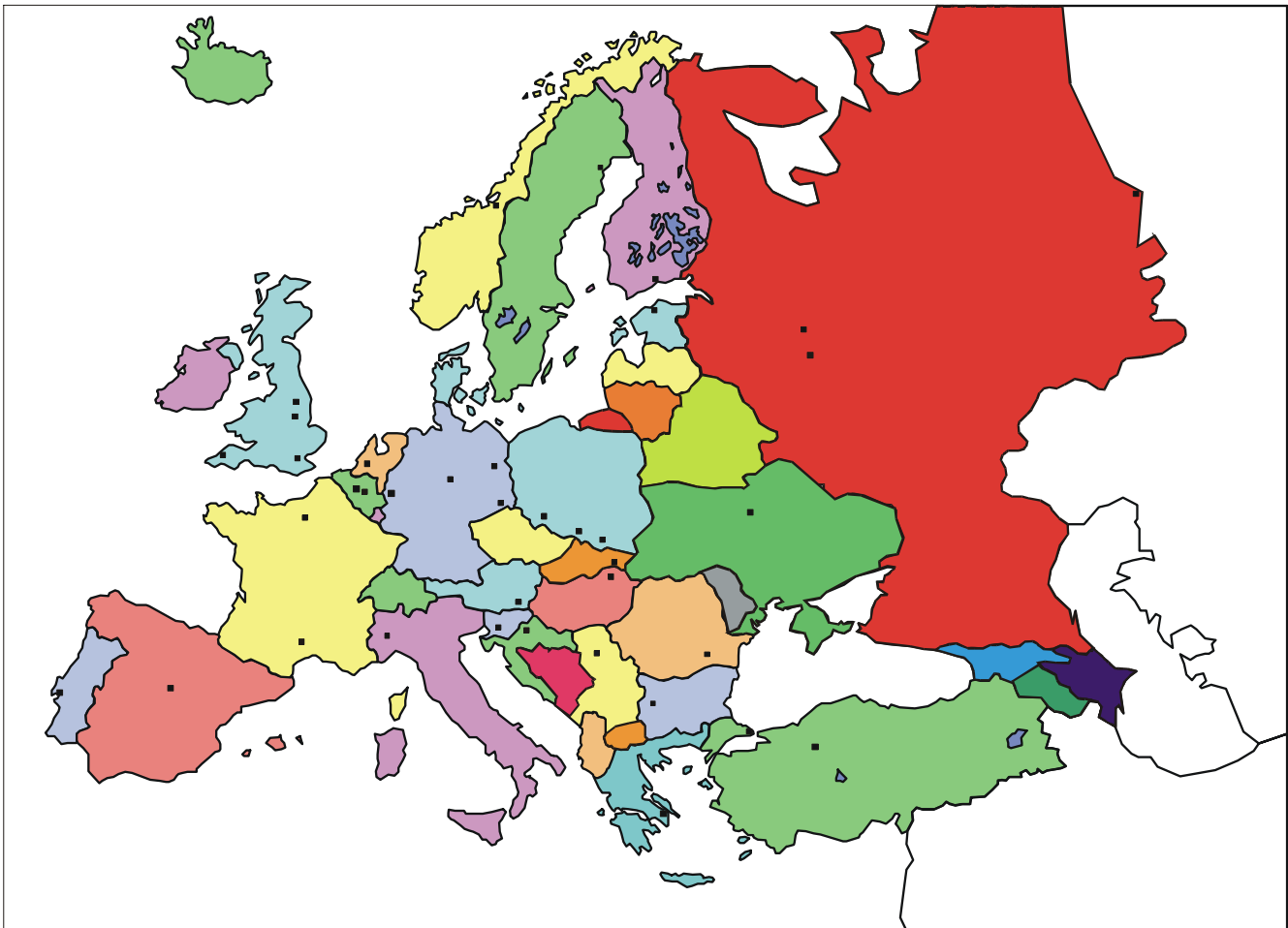


NEWSLETTER

SOCIETY OF MINING PROFESSORS



SOCIETÄT DER BERGBAU KUNDE



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Editorial

At the AGM in Milos it was decided to set up a sub-committee with the task of making proposals generally towards directing the future progress of the Society, the work the Society should undertake and updating its constitution.

Quoting from the minutes of the Milos meeting “Prof. Karmis suggested that a group be formed to discuss this (the future directions of the Society) along with the new constitution. This group would meet in December or 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.”

This meeting was held in Delft on the 13th and 14th Jan 2004. Those present were Profs. Agioutantis, Badino, Drebenstedt, Durucan, Galvin, Karmis, Martens, Palarski, Phillips, de Ruiter, Shaw, and Wagner. Prof. Ramirez sent his apologies.

This Newsletter contains the results of the work of that committee. It is for the members to have a chance to make comments and suggestions before it goes on to a meeting of the council of the Society. If approved there it is proposed that the changes, approved by Council will be announced at the next AGM in Freiberg.

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

Global Minerals Education and the Society of Mining Professors/Societät der Bergbaukunde: A Vision for the Future and a Plan of Action

A Report Submitted to the Society by the Planning Sub- committee

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Martens (Germany),	

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Global Minerals Education and the Society of Mining Professors / Societät der Bergbaukunde: A Vision for the Future and a Plan of Action

1. Objectives

The Society of Mining Professors/Societät der Bergbaukunde (The Society) has been in existence for some fourteen years, functioning primarily as a European society of senior academics in the mining discipline. At 14th Annual General Meeting of the Society, in Milos, Greece, 2003, a decision was made to examine the role of the society in global minerals education, reassess its vision and membership guidelines and develop the future direction of the organisation. A special Planning Subcommittee was formed to undertake this task and to also draft any necessary constitutional changes, with the mandate to present recommendations to the membership at large that can be adopted at the next general meeting of the Society, Frieberg, Germany, June 2004.

The membership of the Planning Subcommittee is comprised of past and future Society Presidents, as well as a number of colleagues with experience in global minerals educational developments and representing all major continents. The subcommittee membership includes the following Professors: Agioutantis (Greece), Archibald (Canada), Badino (Italy), Cedron (Peru), Drebenstedt (Germany), Durucan (Britain), Galvin (Australia and Oceania), Karmis (USA, North America), Martens (Germany), Palarski (Poland), Pasamehmetoglu (Turkey) Phillips (South Africa), Ramirez (Spain), de Ruiters (Netherlands), Scoble (Canada), Shaw (Britain) and Wagner (Austria). The subcommittee met in Delft on 12 and 13 January 2004 and has continued discussions electronically, through the completion of this final report.

2. The Mission of a Modern University

The goal of the modern university is to pursue academic excellence in instruction, research and scholarship. The university has a very important undergraduate educational mission that is closely entwined with the research function. Undergraduates receive an education in a "state of the art" atmosphere and post-graduate students form an important part of the academic cadre—tomorrow's teachers and researchers. The University also plays a major role creating and transferring new technologies to industries and government, thus maintaining the competitive position of a nation in the world economy. At the local level, research and scholarship promote and encourage economic development. Supplemental research funds support equipment, facilities and academic staff in order to fulfil the educational and research missions. The "Educator", therefore, must also be a "Researcher" and, as a result, the University seeks individuals with combined talents for academic careers.

It follows, therefore, that in order to review and assess the mission, composition, objectives and future role of the Society, three main influences must be considered that seriously impact "minerals education", namely:

- Global status and directions of the minerals industry
- Research and development patterns and priorities and

- Curricular requirements and academic trends.

3. The Status of the Global Minerals Industry

Throughout the first six decades of the 20th Century the wide range of minerals mined sustained industrial production and provided the basis for growth and development. Then, the position of the minerals industry began to deteriorate rapidly. Escalating labour and general production costs, spiralling environmental costs, over-capacity and surplus stocks, diminishing ore grades, depressed mineral markets, progressively more demanding regulatory and taxation policies and the direct or indirect subsidisation of the mineral industries by some governments all contributed to this decline. During the late 1970s and 1980s, major metal producers experienced unprecedented losses, commodities reached new lows, e.g., coal prices dropped drastically to about half their 1970s peak level and, finally, "The Death of Mining" was proclaimed by *Business Week* (1984).

But the wheel turned again for the minerals industries. Economic recovery in most industrialized nations, the emergence of new strong economies in the countries of the Pacific Rim and population and industrial growth in other regions of the world, particularly Asia, brought a strengthening in minerals demand. In view of these global economic, social and political changes, a restructured minerals industry emerged in the 1990s. This industry is now based on a new cost-cutting philosophy, utilisation of modern technology and globalisation of exploration, mining, processing and mineral markets. In a sense, the mineral industries have rediscovered the basic disciplines of the market place.

It is important to note that current (February 2004) forecasts for the general minerals sector are extremely positive. According to reports by respected analysts, copper consumption is estimated to increase by 4.9% in 2004 (after an impressive 5.9% increase in 2003) and refined copper production is expected to increase by about 6.4%. Copper prices have remained at their highest level. The spot market for gold has reached a 14-year high due to geopolitical uncertainties and the weak dollar. Experts predict that demand for gold in 2004 will be greater than supply. Finally coal, to look at a different commodity, is expected to reach new production records globally, in order to keep pace with electricity demands and GDP gains. Coal prices, in the last quarter, have reached record highs and export markets have been reinvigorated. Substantial budget increases by the minerals sector for global exploration activities is, perhaps, one of the most significant indicators of the recent impressive performance of the sector.

As a result, the environment under which the industry will operate during the next few decades and, consequently, the major parameters that would shape future growth, or even survival, of the minerals industries in the competitive market place will be determined by a number of factors:

- **Demand for Minerals:** The demand for minerals will continue to increase. Growing world



population and the continuous effort to improve standards of living, particularly in developing countries, is driving this demand. Mineral consumption is closely linked to per capita income. Today, the major consumers of minerals and energy are the OECD countries, while the greatest growth in minerals demand is in the rapidly developing economies of Asia.

- **Environmental Pressures:** The environmental pressures for “clean” mineral production continue to grow and are threatening local minerals production in many highly developed countries and societies. As a result, minerals production migrates to less environmentally demanding areas. This trend will not be sustained in the long term. The need for cleaner mineral production methods and processes, therefore, will continue to grow.
- **Mining and Sustainable Development:** Closely linked to the environmental discussion is that of sustainable minerals development. The debate includes techno-economic as well as socio-political issues concerning the broad benefits of mining with emphasis on “communities of interest”. This issue is of particular concern to developing countries that rely heavily on income from the exploitation of their mineral resources.
- **Globalisation of the Minerals Industry:** Mineral discoveries, significant improvements in sea transport, privatisation of mining activities, the end of the cold war, the emergence of multinational resources companies and the impacts of environmental legislation have made mining a truly global activity, with all its advantages and disadvantages. The availability of minerals on international markets has changed policies concerning mineral reserves and strategic positions of companies and governments.
- **The Growing Divide Between Industrialised and Developing Countries:** Developing countries are the source of a growing proportion of the mineral and metal supply, the greatest part of which is consumed by the industrialized world. As a result, a reasonable share of the economic benefits of mineral production must flow back to these countries to assure long-term economic, political and environmental stability.
- **Privatisation of Mining Activities:** Globally, the trend to move from state-controlled mining companies to privately owned mining operations is accelerating. There is also a worldwide trend toward the concentration of mining activities in a few multi-national minerals resources companies. One consequence of this trend is the reduction in the global mine-labour force, with associated social and structural problems.

- **The Growing Gap Between Large Producers and Small Operators:** While the size of the multi-national mining operations tends to grow, there are numerous small or artisanal miners, who operate globally under extremely poor safety and environmental conditions. There is an urgent need to address the problems encountered in these small-scale mining operations.
- **The Growing Importance of Industrial Minerals and Construction Materials:** Industrial minerals and construction materials account for a large proportion of worldwide minerals production. This segment of the industry deserves more recognition and broader acceptance by the community, since it has a significant presence in both developed and developing countries. In addition, industrial minerals and construction materials availability is closely tied to growth and infrastructure development and faces the same essential issues and problems as the “classic” mining industries.
- **The Growing Importance of Minerals Beneficiation:** The value addition resulting from advanced minerals beneficiation techniques is significant, although sometimes overlooked by minerals companies. This is particularly important due to the increasingly low metal concentrations of ore deposits, the environmental restrictions on mine waste production, and the need to develop high quality final products, e.g., in industrial minerals.
- **The Need for a Multi-disciplinary Approach to Mining:** Mining is becoming a more complex and integrated activity, with environmental, health and safety, socio-economic and legal issues gaining in importance and impacting operational and technical decisions. There is a need to take a more holistic view of the minerals industry.

4. The Status of Global Minerals Research and Development

Governmental and private support is the lifeblood of R&D enterprise, financing cutting-edge work at universities and the education of future generations of engineers and scientists, researchers and academics. The great advances of technology would not have been possible without an enormous amount of research, which, while costly in terms of time and money, has paid off handsomely in allowing the minerals industry to serve the world’s needs in a safer and more productive manner.

It is disturbing to note, therefore, that during the last two decades, with the possible exception of Australia, government sponsorship of, or mere public interest in, minerals research has almost ceased, or has decreased to extremely low levels, thus dangerously threatening the sustainability of the needed R&D infrastructure in the field. The demise of organisations such as Bretby in Britain, the Chamber of Mines in



South Africa and of course, the Bureau of Mines in the U.S., exemplifies this trend.

On the other hand, industry-conducted R&D is targeted toward improving short-term profitability and, to be acceptable, it must make measurable contributions towards the performance of a company's profit line. Mining R&D projects are usually the first victims of budget cuts. This has happened

to such an extent during the latter part of the 20th Century (according to some observers, the R&D capabilities of the industry have decreased by approximately 80 percent!) that research and development in most parts of the industry have either disappeared or shrunken to mundane levels.

The decline in minerals research has left a noticeable void in developing innovative mining and processing technologies that can maximize mineral recovery and develop new resources, while improving health, safety and environmental performance. In addition, this continuous downtrend is now dangerously depleting the expertise and knowledge in the field.

Mining and mineral processing are highly dependent on continued technological progress and new research must be undertaken now in order to meet the future technology needs of the industry. This was well recognized in the recent Global Sustainable Development Initiative (MMSD), when the following statement on R&D was included in the Toronto Declaration, May 2002:

–Responsible use of resources and technical advancements are the key

–Research and technology are vital to this initiative [i.e. SD] if the mining industry is to keep or be granted a “social license” to operate

Future technological advances require a significant infusion of public and private funds. In addition, R&D programmes will have to be accomplished largely through cooperative efforts between government, industry and the various mineral schools around the world. This requires viewing the traditional mining universities both as educational resources and as centres of excellence for the development of new technologies in minerals development.

5. The Status of Global Minerals Education

Minerals education, globally, is in a crisis. Many famous traditional mining schools have terminated their minerals programmes and those that have so far survived, in both developed and developing countries, are under severe pressure and scrutiny. Globally, minerals engineering programmes now represent a sub-critical mass of effort that, without adequate support, may deny the industry and the community proper technical/professional manpower within a few years.

Numerous factors have contributed to this decline. At the **undergraduate level**, recruitment and retention of students has been a matter of serious concern. According to a recent survey, students offered the following reasons for lack of interest in the field:

- Image (a sunset industry!)

- Lack of professionalism
- Size and academic reputation of the discipline
- Job location
- Starting salaries
- Lack of career development interest by employers. Students emphasized that they are “seeking a career not a job”

At the **post-graduate level**, the absence of research funding by industry and government is now a serious threat to the sustainability of post-graduate programmes in minerals education. In addition, recruitment and support of highly qualified post-graduate students is very competitive, particularly since related disciplines with broader appeal, better funding and more lucrative career options (i.e., geotechnical/geoenvironmental in civil engineering, industrial engineering, computer engineering/science, materials engineering and chemical engineering) are also trying to recruit from the same pool. On the other hand, the reverse trend, i.e., minerals disciplines recruiting from other disciplines, has not been as successful.

In terms of **academic staff** (or **academic faculty** in North American terminology), the continuous decline of minerals education has had a significant impact in the recruitment, retention and development of the “professorate”. The absence of any recognition of the minerals engineering field by the research and academic communities is a serious issue of morale amongst the ranks and also affects the way that university administration evaluates, respects and supports such programmes. The staff issue becomes even more critical when looking at the demographics of the profession. The significant majority of the academic staff in minerals programmes is at the senior level, which poses serious succession and continuity issues. Given the fact that the post-graduate pipeline is also decreasing, a serious crisis is developing. If the educational system is not creating and mentoring an academic staff cadre, *who will be teaching in the minerals schools in the 21st Century?*

The final point to note is that academic productivity and performance are based on criteria such as:

- Student enrolment
- Research expenditures
- Proposals submitted/accepted
- Ph. D. enrolment and/or completion
- Student credit hours or some other FTE performance factor
- Publications
- Peer benchmarking

This places minerals programmes in direct competition with other more prominent, larger and better-supported departments within the same university. As a result, retaining university support and even expecting new investments in minerals programmes, is currently very challenging. On a positive note, this environment has forced minerals programmes to become more innovative, seek new partnerships, develop joint educational and research efforts and expand to new areas and disciplines.

The sections below provide a more specific regional perspective of minerals education and challenges around the world. This summary focussed primarily on those regions around the world where the society is best represented.



5.1 Europe

A steady decline took place in Western Europe during the last twenty years in the number of mineral education programmes. This was caused on the one side by a decrease in the number of students enrolling in the programmes and on the other side by an increase in the “break-even” cost per student as a result of reduced financing by government. In order to optimise and enhance the quality of education and sustain programmes, a joint curriculum for mining engineering was established in 1996, during the final year of studies at RWTH Aachen, TU Delft, Helsinki University of Technology and Imperial College. This programme consists of one-year co-operative (masters) education programmes in mining engineering (EMC) or mineral engineering (EMEC), where each partner concentrates on subjects in which it was already strong. Thus a joint, high quality, curriculum could be realized. The concurrent effect was that each university did not have to maintain the entire curriculum, which in turn has yielded cost reductions.

In 2001-2002 the European Geotechnical and Environmental Course (EGEC) was prepared, in a similar format, with partners from Berlin, Freiberg, Wrocław, Miskolc and Kosice. The emphasis of this programme is the area of environmental issues and geotechnology, especially related to rehabilitation of old mining areas, storage of waste and underground space development.

In 1999 the Federation of European Mineral Programmes (FEMP) was established as a (legal) organisation in which the industry and the four universities participate. The purpose of FEMP is to optimise cooperation between industry and the European Mineral Programmes. This includes opportunities for recruitment, involvement in the curriculum, etc. One of the other objectives is to assist students financially with the extra cost, while abroad. In order to be able to subsidise the students for these extra costs, FEMP receives annual contributions from the member companies. In December 2003 the five universities of the EGEC programme joined FEMP as well.

5.2 Sub-Saharan Africa

Mining Engineering education in sub-Saharan Africa is currently under some pressure and is certainly undergoing some major changes. Strong programmes exist in Ghana at the Tarkwa School of Mines and in South Africa. In Zambia and Zimbabwe where European aid for mining education has effectively come to an end, the mining engineering programmes are suffering from staff shortages as academics move to more lucrative industry appointments. In the Democratic Republic of the Congo, Angola and Mozambique years of civil war have largely destroyed the educational infrastructure.

By far the largest concentration of mining engineering education on the continent is in the Johannesburg/Pretoria region of South Africa, where four institutions offer certificates,

diplomas and degrees in mining engineering.

The two Technikon and two University mining departments have over 1200 students enrolled and employ 30 full-time mining academics. Both the mining industry and the government have expressed the desire to see these four separate activities consolidated into a single South African School of Mines and the Minister of Education for South Africa is expected to pronounce on the size and shape of the proposed School of Mines. In particular, the choice between a federal system, in which each of the institutions retains its mining engineering department under an umbrella organisation, or a single School of Mines, at one institution, is eagerly awaited.

With regard to the Society, a straw poll of mining academics in Southern Africa has indicated the biggest concern is a feeling of isolation. There is a significant interest in Society membership among senior academics and also among more junior academics, should an associate member grade be created. The perceived benefits of membership would be an electronic directory of members, giving teaching and research interests and email addresses.

5.3 Australia

In 1998, the Minerals Council of Australia (MCA) undertook a review of minerals tertiary education in Australia. Entitled “Back from the Brink”, it concluded that, in its current form, the system was fragmented, unstable and fragile and could be pushed over the brink of viability by impending change in the university system. These findings caused the MCA to establish and resource the Minerals Tertiary Education Council (MTEC) to manage a five-year programme of engagement with nine university consortiums, three in each of the disciplines of earth sciences, mining engineering and metallurgy. It was agreed that the programme would be reviewed in 2003.

The 2003 review has highlighted that the challenges facing minerals tertiary education in Australia are more serious today than they were when MTEC was constituted in 1999. With few exceptions, Australian minerals tertiary education programmes are not viable under current circumstances. The changes in university education and their impacts as foreseen in “Back from the Brink” have materialised. These have been compounded by coinciding with major restructuring, consolidation and globalisation of the Australian mining industry and a number of external influences not foreseen in “Back from the Brink”.

Submissions were received from a broad range of stakeholders. Conclusions drawn from the review include:

- MTEC is functioning successfully in:
 - Bringing the importance of minerals education to the attention of university executive management and, thereby, caused small minerals departments to maintain a presence in large comprehensive universities.
 - Causing a step change in collaboration between minerals programmes at MTEC partner universities.

- Increasing industry's understanding of tertiary minerals education issues.
- Acting as a conduit to government on tertiary minerals education matters.
- Unforeseen external influences, however, have outweighed these gains.
- Simultaneously, tertiary mineral programmes have also been impacted upon by:
 - Restructuring and global consolidation of the minerals industry.
 - Ongoing funding cuts to universities in real terms.
 - University funding models that increasingly favour high volume, low teaching cost programmes.
 - A decreasing pool of school students studying maths and/or science.
 - The emergence of 'new economy' disciplines that compete for this shrinking pool of students.
 - A declining image of the minerals industry as a "career of choice".
- The net effect is that the sustainability of the minerals tertiary education system in Australia continues to deteriorate:
 - Since "Back from the Brink", seven Australian minerals programmes have closed, three more are under review and are likely to close and four have been rationalised or absorbed into larger schools.
 - More departments would have closed but for MTEC support.
- The ongoing boom/bust cycle in graduate recruitment is one of the factors that is adversely affecting student enrolments in minerals disciplines.
- Further consideration needs to be given to the implications of an aging academic staff profile.
- There are few in industry or university prepared to lead. However, the success of MTEC to date indicates that many are prepared to be led, especially in desperate times.

5.4 North America

According to 2003 data, the number of accredited minerals programmes in the USA has declined from over 20 in the 1970s to 13. Last year, three departments were reduced to programmes and were absorbed by larger units. Enrolment, academic staff size (i.e., faculty), post-graduate education and research activities vary considerably within the remaining schools. According to the most recent survey conducted by the Society of Mining, Metallurgy and Exploration, Inc. (SME), the academic infrastructure in the USA is comprised of:

- Thirteen (for now!) accredited programmes
- Eight programmes have a faculty size of less than four
- A total of about 500 undergraduates (4-year programme of study)

- Smallest programme lists 12 and largest 101 undergraduates
- About 150 students graduated with a B.Sc. degree
- At the graduate level, the universities conferred 26 M.Sc. and 7 Ph.D. degrees
- Five programmes graduated all the 7 Ph.D. students
- Ten U.S. post-graduate students were reported as Ph.D. candidates
- Seven programmes do not have any Ph.D. students
- Three programmes have no graduate students

The academic staff demographics are also of interest. Currently, USA academia includes 12 Assistant Professors, 26 Associate Professors and 43 Professors. More than 25 positions will become vacant, mainly at the senior rank, during the next few years due to retirements. At the same time, the cost of developing and establishing younger colleagues requires external funding estimated in excess of \$2 million per year to tenure and establish this group.

Competitiveness demands a continual improvement in technology. In the USA, this is especially important because of the prevalence of lower grade ores and stringent health, safety and environmental regulations. Mining and mineral processing are highly dependent on continued technological progress and new research must be undertaken now in order to meet the future technological needs of the industry. Research funding has, however, been under continuous decline. In an effort to identify and evaluate research needs and priorities, a number of studies have been conducted recently, including those by:

- Industry groups (National Mining Association [NMA], National Stone, Sand and Gravel Association [NSSGA])
- Academic institutions
- Professional societies (e.g., SME Research Forum)
- Government agencies (National Institute of Occupational, Safety and Health [NIOSH], Industries of the Future Program of the Department of Energy [IoF/DOE], Office of Surface Mining, Reclamation and Enforcement [OSMRE], and Mine Safety and Health Administration [MSHA])
- Policy groups (e.g., The Rand Organization)
- The National Research Council (e.g., Evolutionary and Revolutionary Technologies for Mining, 2001)

Similar Studies have also been conducted in other parts of the world, mainly in Australia, and Canada. The recommendations of these studies, however, have never being supported by proper funding and, as a result, these reports are rather academic and planning documents without any financial commitment.

The issue of undergraduate enrolment is also of great concern. According to a recent poll, the reasons for the lack of interest in the discipline include:

- Image—viewed as a sunset industry
- Lack of professionalism
- Programmes are not ranked by national or popular surveys



- Job location
- Starting Salaries
- Career development (graduates look for a career not a job)

If this trend continues, within the next decade there will only be a handful of mining engineering programmes in the USA. In fact, in a recent open discussion in *Mining Engineering* (the monthly magazine of SME) the notion of creating two national mining schools – one in the East and one in the West was advanced (W. G. Pariseau, “Endangered Species: Mining, Metallurgical and Petroleum Engineering Departments,” *Mining Engineering*, April 2002; W. Hustrulid, “You Can’t Make a Silk Purse out of a Sow’s Ear,” 2002 Jackling Lecture, *Mining Engineering*, September, 2002).

In Canada there appears to be signs of some resurgence in mining student enrollment. The damage, however, will not be repaired easily. The incoming number of mining students at schools is still less than the number of graduates in 2000, with 172 students graduating in 2000, but only 152 incoming students in 2003.

Canadian mining universities and technology schools formed an alliance, the Canadian Mining Education Council (CMEC) in 2000, aimed to network the schools with industry, government and other organizations. The Mining Industry Training and Adjustment Council – Canada (MITAC-Canada) was established in 1997 to address the various human resource issues that had been identified and to develop an ongoing human resource strategy for the Canadian Mining Industry. The Canadian federal government has established a Sector Study project in 2003 to assess the current situation with respect to human resource demands and gaps in the minerals industry and to conduct research into emerging trends and future human resources and skill needs. The project is funded by Human Resources Development Canada under the guidance of the Sector Study Steering Committee comprised of representatives from the Canadian Mining Industry, business, labour and industry associations, from the field of education and from the provincial and federal governments.

In Canada it is estimated that demand for university graduates in minerals and metals is about 130 annually, whereas universities are only producing around 80 graduates annually. A survey by Manpower Inc found very strong hiring intentions in 2003. In the mining sector 32% of companies anticipated the need for more employees. Contrast the above with MITAC’s Annual Report 2002: “anecdotal evidence indicates that 70% of the industry workforce will retire within 10-15 years”.

Prominence and visibility is another factor. Minerals programmes are not listed in any of the respected and well read, scientific, professional or popular surveys—including those conducted by the National Science Foundation (NSF), the American Association for Engineering Education (ASEE), and U.S. News and World Report. As a result, serious questions are often asked in academic administration circles

regarding the need to sustain or preserve such programmes and regarding the need to invest new resources in these programmes. The fact that the established research community (i.e. NSF) has largely ignored technical issues related to minerals also raises questions as to whether the nation is willing, or interested, in investing in this field.

Within the academic administration system, where the predominant performance measures and outcomes are based on peer rankings and evidence of national visibility, the absence of any recognition of the minerals engineering field leads eventually to a lack of interest in sustaining such programmes.

5.5 Latin America

Latin America constitutes one of the most important mining regions in the world and in the last three years it has attracted almost 30 percent of the world’s new mining investment, mainly in gold, copper and zinc projects, thus becoming the area of highest expansion in mine production. It represents 15% of the total worldwide mining output and many of its countries like Brazil, Chile, Mexico and Peru rank as the main producers of base and precious metals. Others like Argentina, Bolivia and Colombia have important mineral deposits and a rapidly growing mining industry.

This growth has caused a need for well-trained mining engineers. In response, mining education in Latin America has expanded to more than 45 universities offering careers in mining. Unfortunately, quantity does not always go along with quality. All but one of these universities is public. With few exceptions, these universities suffer from the typical problems of state-run educational institutions in the region; that is, lack of funds, too many students, low rates of pay, and many times, nonqualified lecturers, lack of laboratories and research, etc.

However, there are quite a few universities in the region that have managed to gain respect. Their graduates compete successfully with those coming from universities in more developed countries. Many of them obtain postgraduate degrees in the USA, Canada and Europe. Accreditation of mining engineering programmes is now a must in most Latin American countries; lecturers must have postgraduate studies and are periodically evaluated in order to allow them to continue their academic careers. Some universities run modern research facilities, mainly for rock mechanics, mine geology and mineralogy. A few have access to a nearby mine for practical training.

A rough estimate of student population is 9000, the length of undergraduate studies varies between 4 and 6 years, and the number of graduates per year far exceeds, in most cases, the demand for new mining engineers. Most of Latin America’s mining schools belong to AIESMIN (Asociación Iberoamericana de la Enseñanza Superior de la Minería), which also includes mining schools from Spain and Portugal. This association holds annual meetings, the last one in October 2003 at San Juan, Argentina, and the previous one in December 2002 at Escuela de Minas de Madrid in Spain on the occasion of the 225th anniversary of the school, an event that was also attended by the Society of Mining Professors. This



year's meeting will be held at Sao Paulo, Brazil, in August, and the 2005 meeting at Arequipa in September in conjunction with the Peruvian Mining Convention.

6. Goals and Mission of the Society

After careful consideration of the external factors presented above, the Planning Subcommittee has unanimously developed a vision and a plan of action to allow the Society of Mining Professors/ Societät der Bergbaukunde to transform and position itself as the premier global voice of the academic minerals disciplines and to lead the effort of restructuring minerals education. The recommendations follow:

6.1. Vision

That the Society of Mining Professors/Societät der Bergbaukunde (hereinafter referred to as the Society) should be a vibrant global Society, representing the majority of minerals academics, and that it will make a significant contribution to a sustainable future.

6.2. Goals

The main goal of the Society will be to help ensure that the scientific, technical, academic and professional skills are available for the sustainable supply of minerals to mankind.

More specifically the Society will be committed to:

- Ensure that university based education at the highest level in those disciplines concerned with the provision of mineral products from the crust of the earth continues to be available to those who wish to avail themselves of it.
- Ensure that advancement, through research, of the scientific and engineering knowledge and processes in the areas of relevance to the provision of mineral products continues.
- Establish a network of academics involved in achieving the above goals.
- Enhance the image of the minerals-producing industries, promote development of educational courses within these disciplines and foster pride in the disciplines.
- Establish and maintain ongoing contacts with the global mineral industry players.
- Promote co-operation in educational and research programmes and identify co-operative research opportunities.

6.3. Membership

Eligibility

The full spectrum of engineers and scientists actively participating in minerals education and research shall be eligible to be members of the Society.

Classes of Membership

There shall be five classes of membership (all of which are subject to the discretion of the Membership Committee):

- **Member:** A person who is a full professor, or who has demonstrated a high level of competency in minerals education and/or research and who is appointed as a member of academic staff at a university.
- **Associate Member:** A person who is a member of academic staff and who does not yet meet the full requirements of the 'Member' category, but who can demonstrate an important contribution to minerals education and/or research, or a person actively engaged in minerals education and/or research and who, in the opinion of the Membership Committee, is considered an asset to the Society.
- **Junior Member:** A postgraduate student involved in minerals education and/or research and who, in the opinion of the Membership Committee, shows potential for an academic career.
- **Emeritus Member:** A retired Member recognised by the Membership Committee for contributions to the Society.
- **Corporate Member:** An organisation actively promoting minerals education and/or research and which contributes towards the Society achieving its goals.

6.4. Management

Membership Committee

The President, the President-Elect, the Immediate Past President and the Secretary General will act as the Membership Committee. The Membership Committee shall pronounce on all applications for membership, taking into account the curriculum vitae of the applicant and a supporting letter from the council member for the region in which he/she works. The vote shall be by secret ballot, if desired. A three-quarters majority of the total membership of the committee is required for the admission of an applicant, or for the exclusion of a member.

The Society Council

- The President, President-Elect, Immediate Past President, Treasurer, Secretary General, and representatives from the following areas: Europe, North America, South America, Africa, Asia, Oceania, will form the Council of the Society. The Council may co-opt a maximum of two other members with specific assignments. If the organizer of the next annual general meeting is not one of the council, then he/she will automatically be one of the co-opted members.
- The President supported by the Secretary General and the Council shall have an annual programme of action, setting priorities for the activities of the



Society during his/her term of office and this programme shall be considered at the Annual General Meeting of the Society (that programme will have been drawn up during his/her year as president elect).

- The President supported by the Secretary General and the Council shall have an annual programme of action, setting priorities for the activities of the Society during his/her term of office and this programme shall be considered at the Annual General Meeting of the Society (that programme will have been drawn up during his/her year as president elect).
- Any member can bid to have an Annual General Meeting held at his/her university.
- The Council shall meet at least once per year, normally at the time of and at the same site as the Annual General Meeting. The President, in agreement with the Secretary General, may convene other meetings in case of need. Notices of such meetings shall be sent at least 21 days before the dates of such meetings.
- The vote in council shall be by secret ballot, if desired. Decisions shall be by simple majority of those present, except that a three-quarters majority of the total membership of the Council is required for modification of the Statutes. In this latter case, postal voting is acceptable.

6.5. Officers of the Society

There will be a President, President-elect, a Treasurer, and a Secretary General

Election of Officers

- All appointments start and finish at an AGM.
- Council will elect, for a five-year term, renewable for a maximum of one more term, a Treasurer of the Society whose responsibility it will be to maintain the finances of the Society.
- The Secretary General shall be elected by the members upon the recommendation of the Council and shall have a five-year term of office. The Secretary General shall be responsible for conducting the correspondence of the Society, assisting the President in organizing the AGMs, ensuring the implementation of decisions taken at all meetings, distributing information of interest to members and maintaining records.
- There will be a President-Elect who will hold office for one year. He/she will be elected by the members present at the Annual General Meeting

(AGM) and shall be nominated by council (normally a Professor from the University at which the next AGM is planned to be held).

- The President will normally be the last President-Elect. His or her appointment will be confirmed at the AGM by the members there present.

Election of Council Members

- The Officers of the Society shall all be ex officio Council members.
- In addition to the officers, the Immediate Past President will be a member of the council. Regional members will be elected by members from the region concerned.
- Additional members may be elected from time to time from the membership of the Society. They shall have terms of office of two years.

6.6. Society Programmes and Initiatives

Academic Programmes

The Society should foster the development of initiatives to ensure:

- Guardianship and leadership of academic knowledge and standards
- Awareness of health, safety, environment, community and sustainability in minerals education programmes
- Clusters/networks between universities, industry, governments, NGOs and alumni for the purpose of facilitating exchanges, sharing facilities and course offerings and reviewing and assessing programmes of participants
- Establishment of a register and data bank of programmes, personnel, facilities and other resources associated with minerals education and research
- Recognition of undergraduate, postgraduate and post academic / CPD programmes of participants
- Succession training of future academics in minerals disciplines

Research Programmes

The Society will actively seek to enhance the funding base for minerals related research with governments and industry. The Society will also actively promote coordination of research grants and the undertaking of major research initiatives. The fact remains, however, that minerals research today requires interdisciplinary approaches and talents and it is, or it should be, driven by the enabling technologies that are fuelling the high technology revolution.

Communications

The Society will pursue the resumption of the Mineral Resources Journal (MRJ) and upgrade its current newsletter to a more substantial communication note, published at regular intervals. A programme should be developed to feature in each issue one or more Minerals Engineering Departments, with



details of staff, student numbers, curriculum, research programmes, etc. This is an important tool to keep the members in touch with developments and foster further cooperation. Other communications programmes for which the Society is expected to demonstrate leadership include:

- Pride in the minerals industry and protecting and enhancing its image
- The involvement and coordination of external stakeholders.

Last year, the Society joined the premier minerals-related institutions and societies in drafting and endorsing the "Milos Declaration", presented at the Annual General Meeting of the Society and SDIMI 2003, in Milos, Greece. This declaration presents the vision of the minerals scientific community, comprised of engineers, scientists, technical experts and academics, to Sustainable Development. The leadership of the Society in this arena was well-recognized and such high profile exercises and initiatives should remain prominent in the agenda of the Society in the future

Exchange Opportunities

On July 17, 2002, the Commission adopted the proposal to establish the new programme, "Erasmus Mundus", to enhance quality in European higher education and to promote intercultural understanding through co-operation with third countries in higher education. The Erasmus Mundus scheme is intended to strengthen international links in higher education, by enabling students and visiting scholars from around the world to engage in postgraduate study at European universities, as well as by encouraging the mobility of European students and scholars.

The basic features of the programme include a global scholarship scheme for third country nationals, linked to the creation of "European Union Masters Courses" at European universities. These postgraduate courses will involve study at several higher education institutions in different Member States and be distinguished by their European label. The programme foresees the creation of around 90 inter-university networks to provide 250 EU Masters Courses by 2008. Partnerships between EU Masters Courses and third country institutions would also be encouraged. The planned budget for the Erasmus World project is 200 million euros for the period 2004-2008.

The Society believes that the network and operating practices described above are very similar to those currently used by EMC, EMEC and EGEC. Erasmus World would offer a great opportunity for further developments.

Development of Conferences and Short Courses

The Society should consider supporting with publicity, participation and know-how the development of conferences and short courses to benefit its members. One good

example is the Society's participation and sponsorship of the *International Conference on Sustainable Development Indicators in the Mineral Industries (SDIMI 2003)*, held in Milos, Greece, May 21-23, 2003.

7. Conclusion and Recommendations

This is a unique opportunity for a new beginning and for revitalizing, if not reinventing, the old paradigm of minerals research and education. In cooperation with other domestic and international organisations and institutions, we are proposing that the Society of Mining Professors/Societät der Bergbaukunde pursue the vision, goals and objectives set forth in the discussion above.

The engineers and scientists required to lead the minerals industry into a competitive position in the 21st Century will emerge from innovative educational environments and from institutions that are forming global partnerships and that understand the need to collaborate and share resources irrespective of location. Diverse international partnership opportunities are open, due to the growing demand for anytime, anyplace education that can be provided by information technology. If properly positioned, the Society can provide a vital link for establishing and implementing these global partnerships.

The minerals resources sector has the potential to contribute to wealth creation, quality of life and sustainable development. For this to happen, new technologies must be continually developed and innovative educational programmes and processes must be instituted. Industry, academia and government must work together to take advantage of the new opportunities and a revitalized and inclusive Society of Mining Professors/Societät der Bergbaukunde can provide the necessary leadership role in this global effort.