



“Best practice” EMMC example  
Sustainability of projects:  
**Links with the labour market and enterprises**

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Faculty of Earth Science and Engineering

**Representing the EMMEP consortia  
(European Mining, Minerals and Environmental  
Programme)**

# Outline

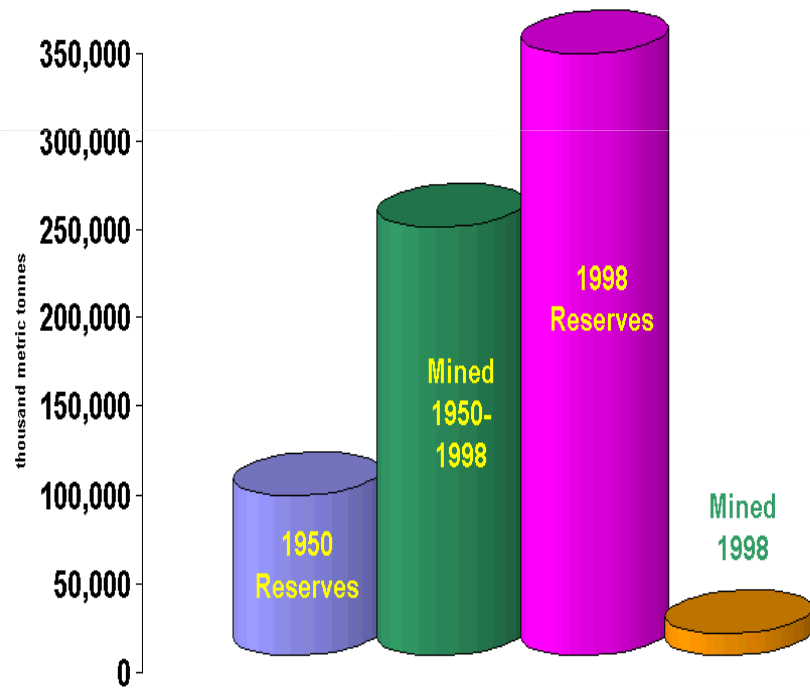
- Issues in mining industry in the 1980-90s
- Its influence on mining training programmes
- Cooperation: FEMP (1999)
- Development to EMMEP

# Issues in mining industry in the 1980s and 1990s

- Technology development to lower costs
  - Shift to large-scale open pit mining
  - Cheap transport: ocean tankers
  - New processing technologies (e.g. leaching)
- Arising environmental concerns
  - Large volume earth moved
  - Long-term geochemical and geotechnical stability (large accidents)
- Merges and acquisitions

# Technology development

World Mined Copper & Reserves



# Metal prices

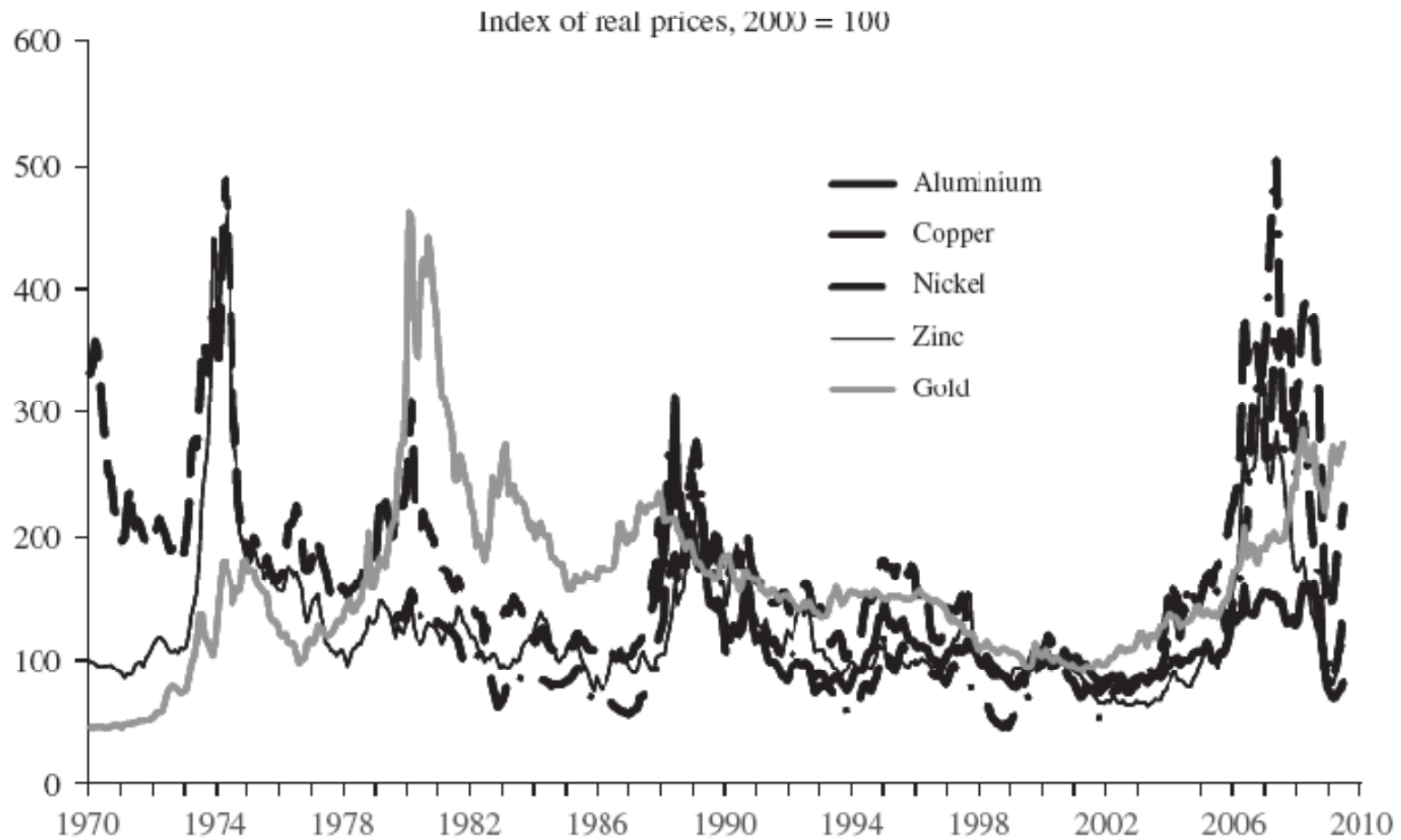
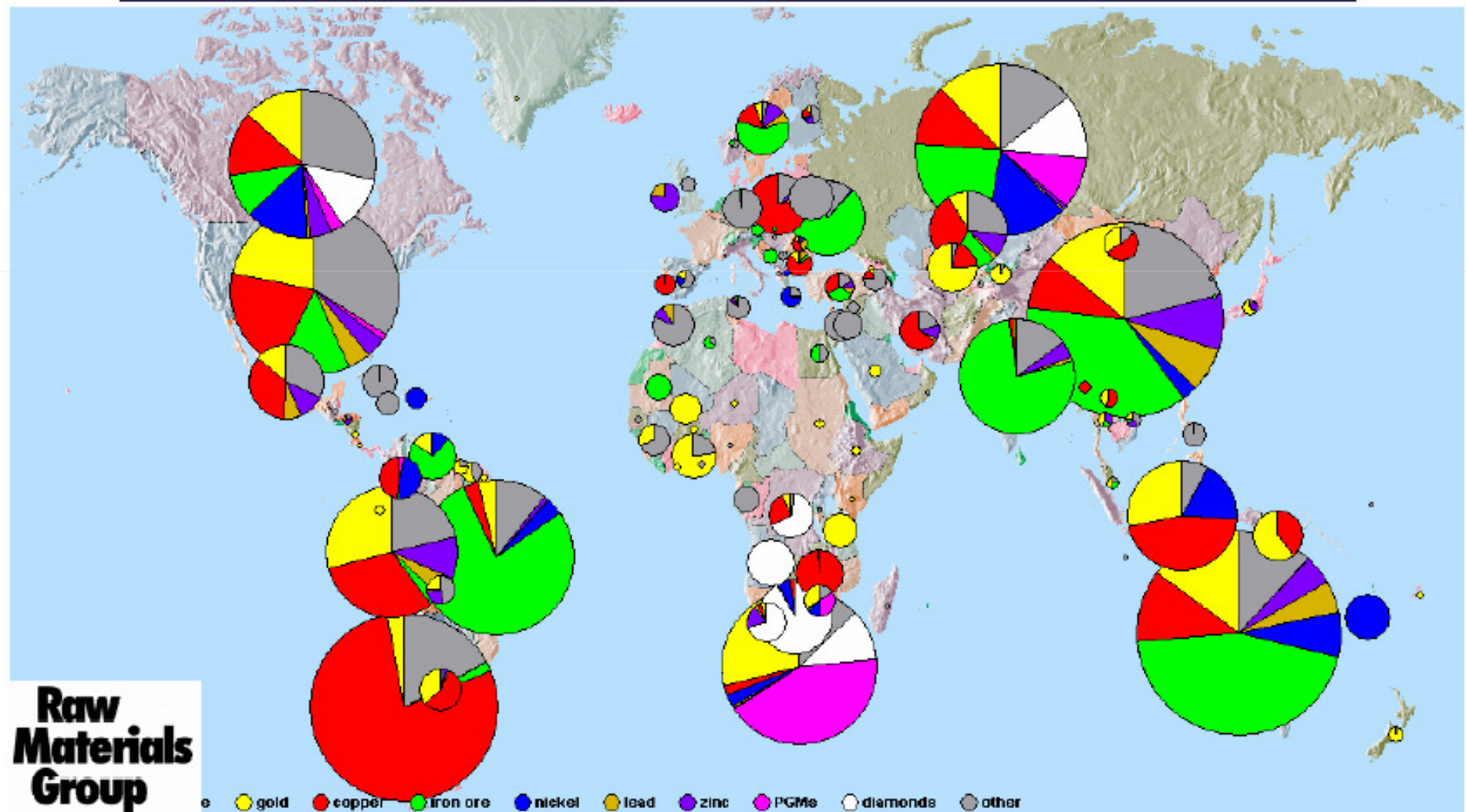


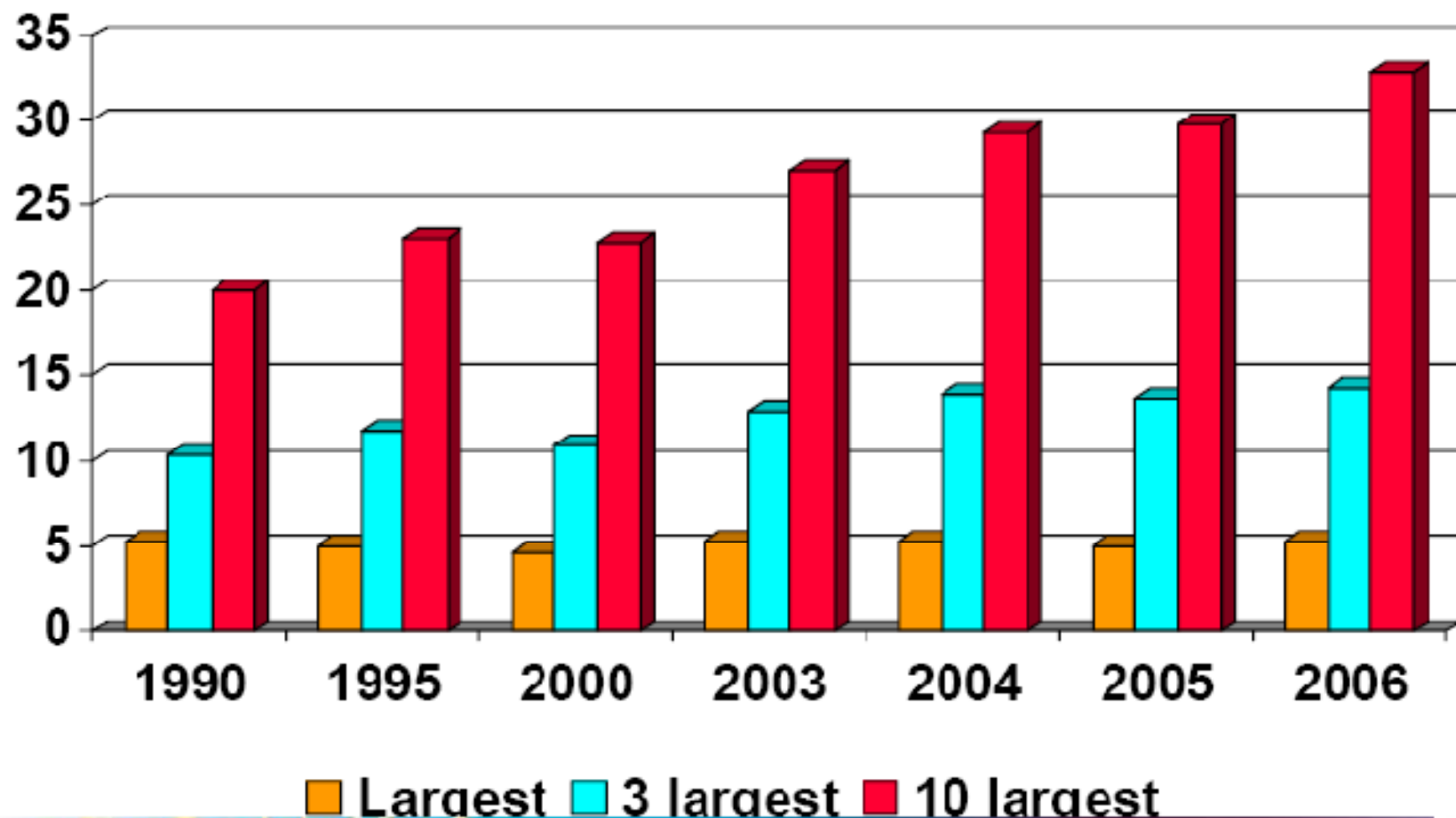
Fig. 3. Prices of selected metals 1970–2009. Sources: LME, LBMA, US Department of Commerce.

# One of the most globalized industry of the world



# CORPORATE CONCENTRATION

% of total value of non-fuel mineral production at the mine stage



Source: Raw Materials Group, Stockholm 2007.

# Mining Industry Capitalisation

Countries represented by CRIRSCO (excluding Chile, Peru, W Europe) account for >80% of mining industry stock exchange capitalisation. Figures at end-2004:

	US \$M	% of World
UK	151,578	35%
Canada	76,936	18%
USA	65,550	15%
South Africa	37,240	9%
Australia	12,154	3%
World	429,638	

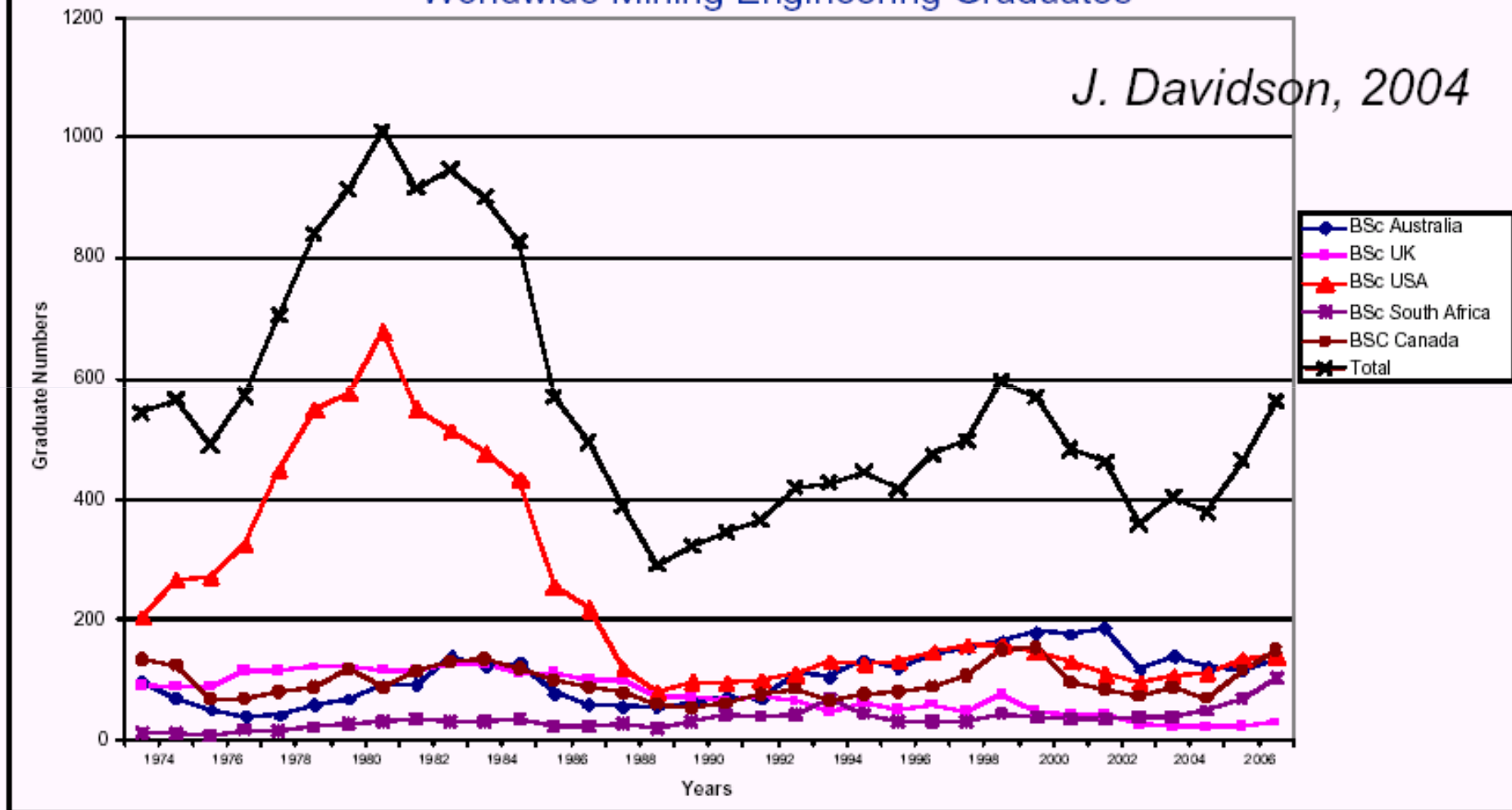
80%  
of  
World

# Supply / HR demand / education

- During 80's and 90's
  - low commodity prices
  - low industry hiring
  - low enrollment in universities
  - programs closed (USA from 30 to 14)
- During 2003-2007
  - high prices
  - baby boom retirement on the horizon
  - new deposits needed
  - Graduates needed: shortage and poaching
- 2008
  - Sudden stop

Long term trends - Australia, USA, UK, South Africa, Canada  
Worldwide Mining Engineering Graduates

*J. Davidson, 2004*



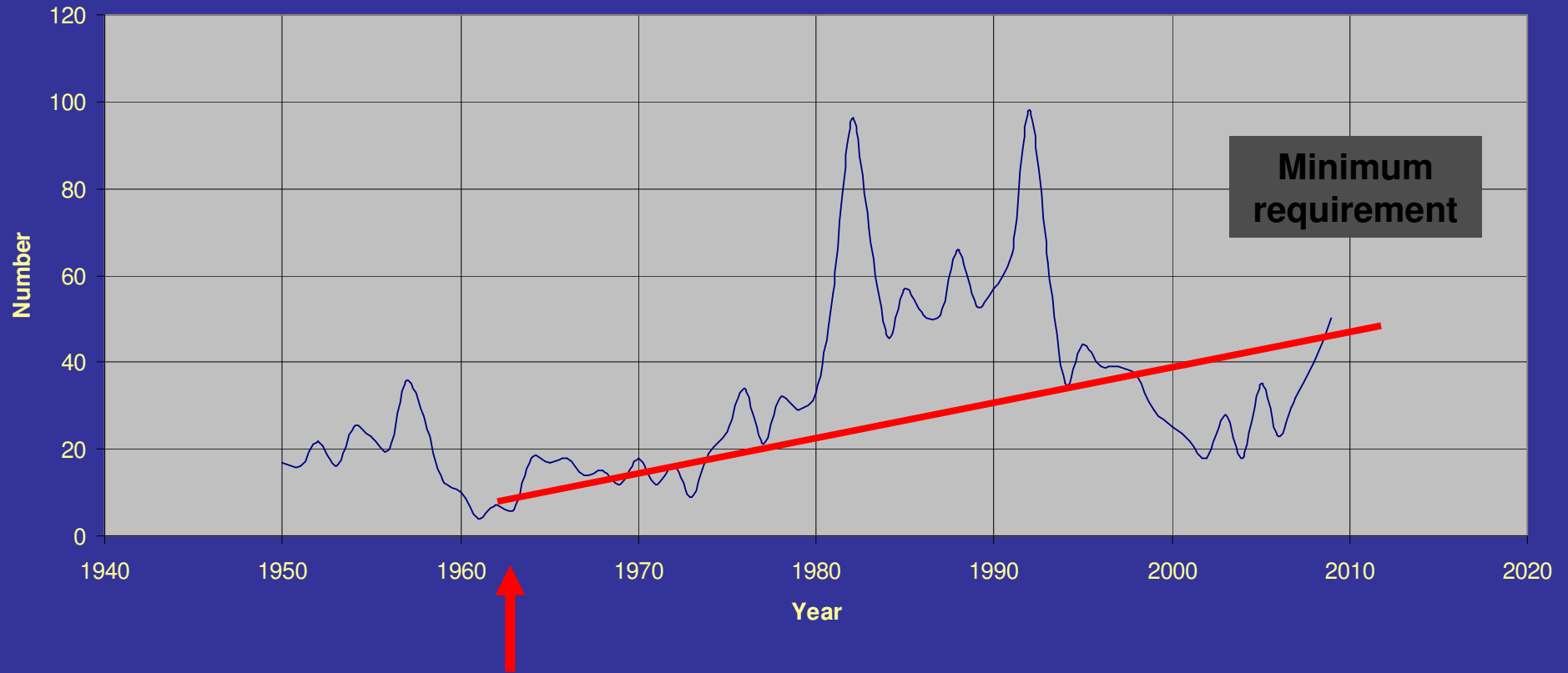
**SHORTAGE HUNDREDS OF ENGINEERS/YEAR FOR NEXT 10 YEARS!**

# Special role of Europe

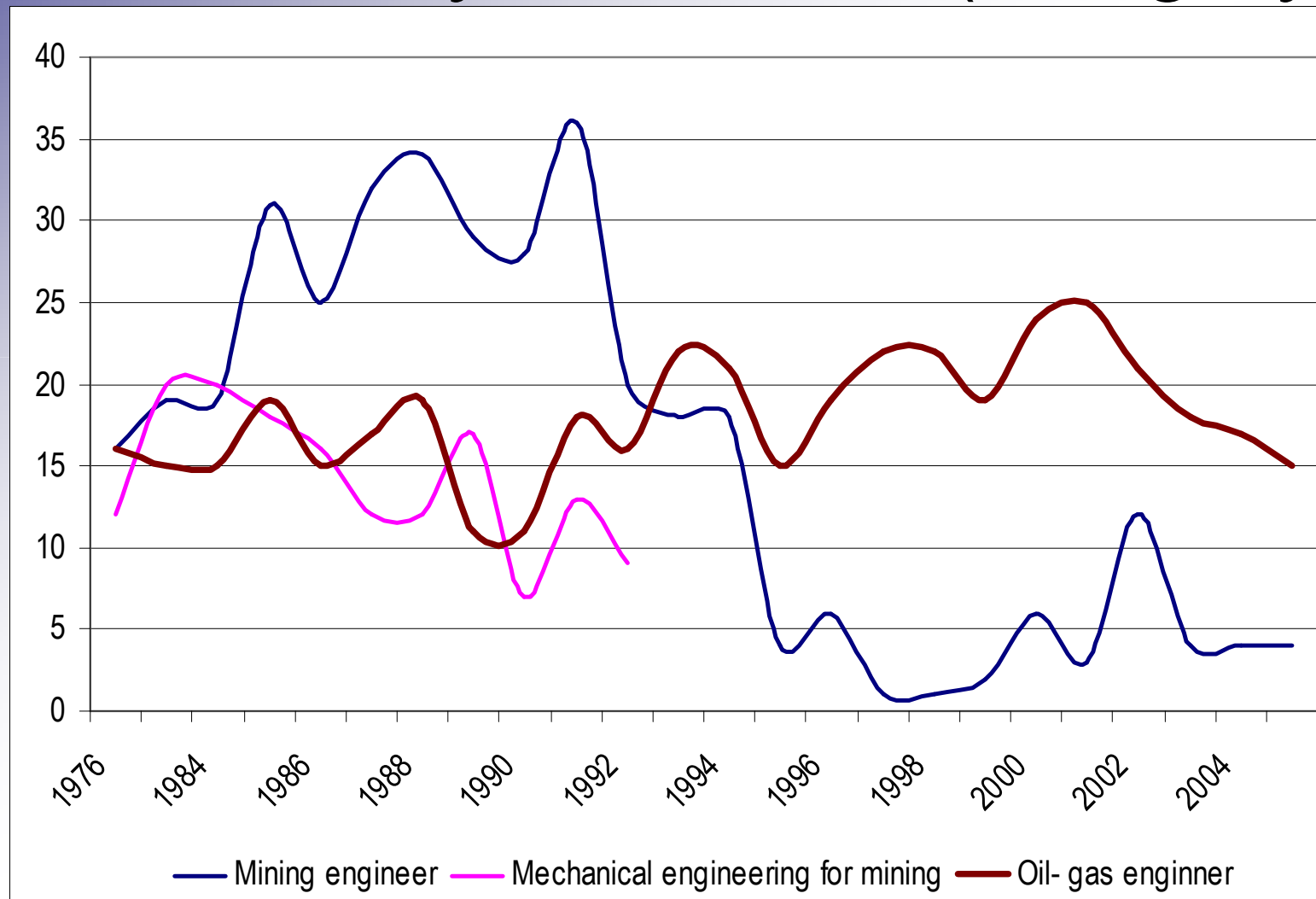
- Homeland mining activity compared to GDP is marginal (1-2%)
- Homeland of important TNC-s (Rio Tinto, Omya, RWE etc.)
- A major world processor and fabricator of minerals
- Still strong in scientific background
  - Research
  - Education
  - Before 1990: financing of education was less dependent on student numbers
  - Last 20 years: emphasis shifts from education to research

# TU Delft (The Netherlands)

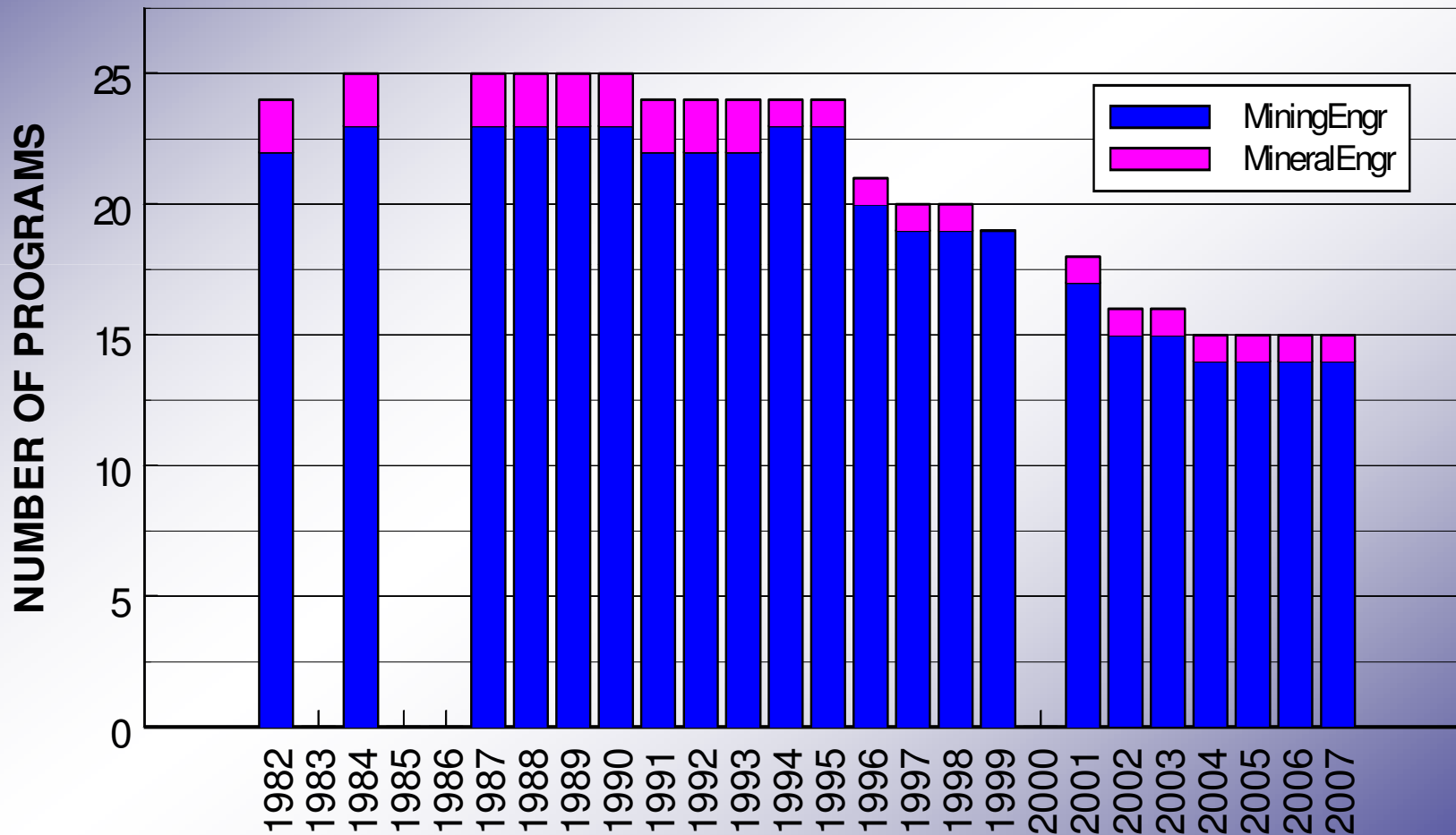
## Students Mining / Metallurgy / Petroleum / Geology



# Graduates per year University of Miskolc (Hungary)



# Mining and mineral engineering programs USA



# Initiatives for cooperation in Europe

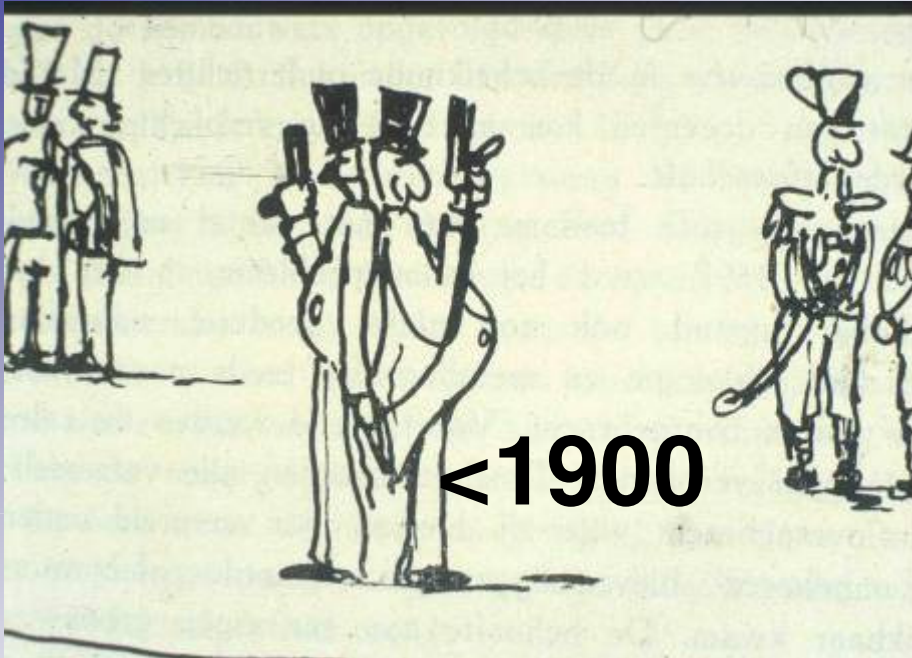
- Late 80's: TU Delft combined mining, processing, metallurgy and recycling
- Low number of mining students: TU Delft, RSM London
- 1995 / 1996: Delft investigates possible joint curriculum, with RSM London, TU Helsinki and TU Aachen
- September 1996: **European Mining Course (EMC)**
- September 1998: **European Mineral Engineering Course (EMEC)**
- September 2003: **European Geotechnical and Environmental Course (EGEC)**
- **2005 merged: European Mining, Minerals and Environmental Program (EMMEP)**

# Federation of European Mineral Programs (FEMP)

16 December 1999



# COOPERATION !!!!



**Delft, Aachen, Exeter, Helsinki,  
Miskolc, Wroclaw  
55 students, 24 nationalities  
35 Companies**

**Delft, Freiberg  
5 students 2 nationalities  
0 Companies**



# European Mining, Minerals and Environmental Programme (EMMEP)



1996



1998



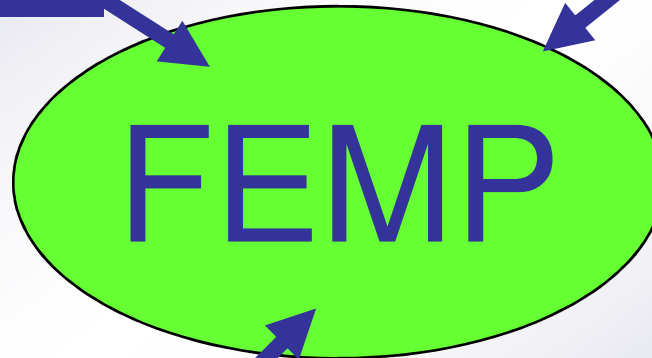
2003



# Structure FEMP

## European Partner Universities

- EMC
- EMEC
- EGEC



## Industry

AKZO-Nobel  
Anglo American Plc.  
Areva  
Atlas Copco  
Barrick Gold Corporation  
Boart Longyear  
BHP-Billiton  
Caterpillar  
Corus  
DSM-Energy  
Euromines  
Freeport McRowan  
Heidelberg Cement  
IHC  
Inmet  
K + S  
KGHM  
Lhoist  
Metso  
Nyrstar  
Orica Mining Services  
Outokumpu  
RAG  
Resource Capital Funds  
RWE Power  
Shell  
SRK Mining Services  
Surpac Minex  
Rio Tinto  
Sandvik  
Talvivaara Mining Oy  
Walter Beckers  
Washington Group  
Wirtschaftsvereinigung Bergbau  
Xstrata

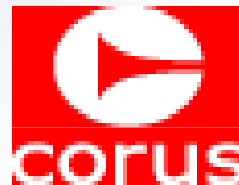
## Associated universities

Canada: Queen's, McGill, UBC  
USA: Colorado School of Mines,  
Virginia Tech  
Australia: Queensland  
Chile: Concepcion, Catholica  
Europe: France, Belgium, Sweden,  
Austria, Estonia etc.

# Boards

- **FEMP Board**
  - EMC
  - EMEC
  - EGEC
  - Industry (Alex Hathorn, Anglo American)
  - Chairman (Wijnand Dalmijn)
  
- **Industrial Advisory Board**
  - Euromines
  - Companies
    - Mining
    - Metallurgical
    - Supply, service
    - Financial

# Current industrial partners



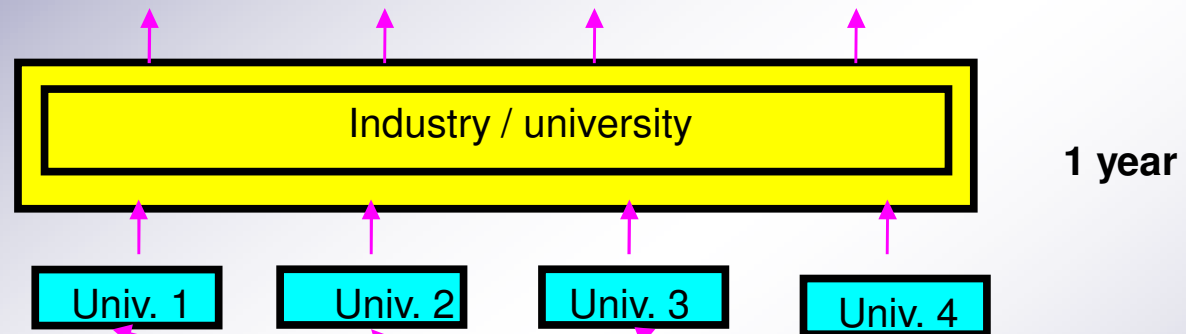
# Associated universities

Austria	TU Leoben
Belgium	KU Leuven
Estonia	TU Tallinn
Germany	TU Clausthal
Germany	Bergakademie Freiberg
Germany	TU Berlin
Poland	AGH Krakow
Slovakia	TU Kosice
Spain	Universidad de Madrid
UK	Imperial College
Sweden	Lulea
Argentina	Universidad de San Juan
Australia	University of Queensland
Brasil	Universidad Rio Grande
Canada	Queen's University
Canada	Mc Gill University
Chile	Universidad de Concepcion
Chile	Universidad de Chile
USA	Virginia Tech.

# Programs structure, FEMP

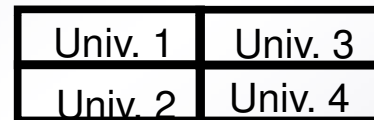
Degree

Thesis (home univ.)



M.Sc

European programs  
(EMC, EMEC, EGEC)



Basic Level (home univ.)

B.Sc



# Student enrollment

## Total enrollment European Mineral Programs 1996-2009

<b>Continent</b>	<b>EMC</b>	<b>EMEC</b>	<b>EGEC</b>	<b>Total</b>
Europe	212	135	64	411
N. America	29	1		30
S. America	4	27	1	32
Australia	3			3
Africa	2	3	4	9
Asia	9	6	12	27
<b>Total</b>	<b>259</b>	<b>172</b>	<b>81</b>	<b>512</b>

# INTERNSHIPS



**ROLF LEOPOLD**



**LUIS RUDOLPHY**



Rolf and Luis are studying metallurgical engineering at the University of Concepción, Chile and during 2002/03 were students of the EMEC programme.

Rolf and Luis were each offered an internship by Anglo American with Anglo Base Metals in Chile. Rolf was posted to Mantos Blancos to work at the SX-EW plant. Luis went to Los Bronces mine, Disputada, a world class, integrated copper producer.

"Gained a lot of experience. Specially in human relations and in Hydrometallurgy."



# Internships example: EGEC 2007/08 group

- |                                  |  |
|----------------------------------|--|
| • Aleksei Kovtunenکو (Ukraine)   | No internship                          |
| • Bartosz Jerzy Rys (Poland)     | Internship at Malta                    |
| • Ferenc M6ricz (Hungary)        | Internship in Norway                   |
| • Johan Hawinkel (Belgium)       | Internship in Namibia                  |
| • Marcin Walkowski (Poland)      | Internship in Poland                   |
| • Pieter Devill6 (Belgium)       | Travelling to Middle Africa            |
| • Romboud Harskamp (Netherlands) | Internship in Republic of South Africa |
| • Tomasz Walica (Poland)         | Internship in India                    |

# Employment

ABN Amro	Hanson Holdings	Resource Capital Funds
Accenture	Harrison Western	Rio Tinto
AGH Krakow	HeidelbergCement	Rockplan
Ahold	Helsinki University of Technology	RWE Power
Alliant Techsystems	Herhof Umwelttechnik	RWTH Aachen
Anglo American	IG&H	Sandvik
Ballast Ham Dredging	IHC	SecGo
Barrick Gold	iidesk	SEGEMAR
BECi	IMC Mining Solutions	Shell
BHP Billiton	Imperial College	SMS-Demag
Boliden Mineral	Internet Vision	SQM
Booz Allen Hamilton	Kali und Salz	State Supervision of Mines
BOT Mining & Power	Kennecott Energy	SWECO CMU
Cares	KGHM	Synvase
CNRL	KHD Humboldt Wedag	Talinn Technical University
Codelco	Krakov University of Technology	Tamrock
COGEMA-AREVA	Kvaerner	Targus Management Consulting
Compañía Minera Doña Inés	Lasselsberger	Technical University Kosice
Huachipato	Lhoist	Technical University of Berlin
Crystallex International	Liebherr	Technische Universität Clausthal
DBE Peine	Lisheen Mine	Thermphos International
DBT Mining Engineers	LKAB	ThyssenKrupp Stahl
Decoma Decotech	Martin Marietta Materials	Total
Delft University of Technology	MCR	TU Bergakademie Freiberg
Deutsche Steinkohle	Metso Mineral	Universidad de Concepcion
Dyno Nobel	Mina Solutions	University of Chile
E.ON	Mine Ventilation Services	University of Exeter
Elkem Materials	Moduslink	University of Geosciences Beijing
ENCI	Mondo Minerals Oy	University of Miskolc
ExxonMobil	MTI Holland	University of Queensland
FAG Industrial Services	Niedmers Jaeger Köster	University of San Juan
Falconbridge	Nobel drilling	Van Noort
FKuR Kunststoff	Nokia	Vattenfall Europe Mining
Fluor Chemie	Nuon	Virginia Polytechnic
Fraunhofer UMSICHT	Outokumpu	W.C. Heraeus
GE	Oy Forcit	Wall Street Analytics
Genivar	Perliya-Broken Hill	Weatherford
Technology	PWC	Technology
GTS	Queen's University	

# Alumni contacts

- 512 alumni and students per 2009
- Co-ordination by Aachen & Delft
- Maintain database (web-based)
- 8<sup>th</sup> reunion November 2008 hosted by Rio Tinto
  - 55 students
  - 50 alumni
  - 50 industry + universities + guests
- 9<sup>th</sup> reunion November 2009 hosted by Barrick Gold Corp.

# Database alumni

**iidesk** Mining Professionals

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nr*	prefix*	name*	year*	email*	company*	groups*
<a href="#">0415</a>	de	Haan	2003	<a href="mailto:G.J.dehaan@student.tudelft.nl">G.J.dehaan@student.tudelft.nl</a>	Student Delft U of T	<a href="#">ALUMNI EMEC</a>
<a href="#">0291</a>		Steeneken	2001	<a href="mailto:steefsteeneken@gmail.com">steefsteeneken@gmail.com</a>		<a href="#">ALUMNI EMEC</a>
<a href="#">0255</a>		Dresen	1998	<a href="mailto:Charles.Dresen@akerkvaerner.com">Charles.Dresen@akerkvaerner.com</a>	Kvaerner Process (Netherlands)	<a href="#">ALUMNI EMEC</a>
<a href="#">0249</a>	Mr	Jansen	2002	<a href="mailto:w.jansen@ug.edu.au">w.jansen@ug.edu.au</a>	Student University of Queensland	<a href="#">ALUMNI EMC</a>
<a href="#">0200</a>		Eysel	2000	<a href="mailto:eyssel@gmx.de">eyssel@gmx.de</a>	RWE Power AG	<a href="#">ALUMNI EMC</a>
<a href="#">0280</a>		Paronen	2001	<a href="mailto:nooraparonen@hotmail.com">nooraparonen@hotmail.com</a>	Nokia	<a href="#">ALUMNI EMEC</a>
<a href="#">0158</a>		Wings	1997	<a href="mailto:roywings@web.de">roywings@web.de</a>	State Supervision of Mines	<a href="#">ALUMNI EMC</a>
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<a href="#">0391</a>		Heiertz	2003	<a href="mailto:heiertz@yahoo.de">heiertz@yahoo.de</a>	Student RWTH	<a href="#">ALUMNI EMC</a>
<a href="#">0231</a>		Bishop	2001	<a href="mailto:Richard.Bishop@mosaicco.com">Richard.Bishop@mosaicco.com</a>	Mosaic	<a href="#">ALUMNI EMC</a>
<a href="#">0283</a>		Paschen	2001	<a href="mailto:roland.paschen@GMX.de">roland.paschen@GMX.de</a>	Projekt Management J&M GmbH	<a href="#">ALUMNI EMEC</a>
<a href="#">0243</a>	van	Lier	2002	<a href="mailto:R.M.S.vanlier@student.tudelft.nl">R.M.S.vanlier@student.tudelft.nl</a>	Student Delft U of T	<a href="#">ALUMNI EMC</a>
<a href="#">0261</a>		Mauel	1999	<a href="mailto:mauel_judith@bah.com">mauel_judith@bah.com</a>	Booz.Allen&Hamilton	<a href="#">ALUMNI EMEC</a>
<a href="#">0332</a>		Hensing	2004	<a href="mailto:IHensing@enci.nl">IHensing@enci.nl</a>	ENCI-Heidelberg Cement Group	<a href="#">IAB</a>
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# Finances FEMP

- Tuition Fee at home university (Socrates or exchange)

	<b>COST</b>	<b>PAID BY</b>
• Cost of teaching	~ 1 M	Universities
• Travel	50,000	Socrates
• Accommodation	150,000	FEMP (industry)
• Reunion	10,000	FEMP (industry)
• Misc. costs	10,000	FEMP (industry)
• Organization (TUD)	50,000	4 Mining Houses

# Erasmus Mundus

- Special MSc. courses with EU seal
- Scholarships for non EU students



- EMMEP received 36 scholarships since 2008
- Opportunity for companies to apply for young engineers

# Structure

- EMMEP is combination of:
  - existing EMC, EMEC and EGEC
  - Erasmus Mundus
- First year: together with FEMP students visiting 4 universities
  - EGEC: Wroclaw, Delft, Exeter, Miskolc
  - EMC: Helsinki, Aachen, Exeter, Delft
  - EMEC: Helsinki, Aachen, Exeter, Wroclaw
- Second year:
  - one semester: courses at one of the 4 universities
  - One semester: thesis writing

# Benefits of the programs

- Multinational group
- 2008-2009: 55 students from 25 countries
- Intensive program
- English language
- Networking
- Industry contacts (jobs)
- Social skills
- Flexibility

# New applicants (2010)

Bangladesh	1
Chile	2
China	1
Colombia	1
Ghana	7
India	1
Indonesia	4
Iran	1
Maleisia	1
Nigeria	5
Pakistan	5
Sierra Leone	1
Uganda	1
Vietnam	1
Austria	1

# Conclusions

- If nothing is done, EXTINCTION
- Things don't happen automatically
- Initiative has to come from universities
- Co-operation of universities is essential !!
- Many benefits for students
- Industry is willing but wants to see initiatives first