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Edition 2 | 2003

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MINING METALLURGY MATERIALS

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Magazine of the University of Leoben

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Annual Report 2002

Special Edition

Research:
More New
Facilities

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Teaching:
More First-year
Students

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Sponsoring:
Unprecedented
Activity continued

page 40





Annual Report 2002



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Annual Report 2002

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Good Potential for

The implementation of many strategic goals has opened the doorway into a prospective future, if the precarious financial situation allows it.

The Academic Year 2001/2002 was largely marked by the University Act 2002. This act was approved by all rectors in office provided that all arising implementation expenses would be completely compensated. Compared with the previous year the estimate of budget for the year 2002 still seemed to be promising for a future development concerning the investments as well as the personnel costs - assumed that the budget is cur-

rently adjusted as normal and profitable measurements are supported additionally.

Under these pre-conditions the implementation of the strategic goals of the University of Leoben has pressed forward. No less than six appointment procedures could be concluded. The new chair for information technology, the foundation chair for simulation of metallurgical processes as well as the chairs for metal forming, foundry technology, metallurgy and drilling engineering were filled with extremely competent personalities and are a guarantee, that the university has a good potential for the further development.

The introduction of the bachelor program Industrial Logistics in Leoben was also a success. In the field of raw material recovery/geo-engineering the first actions for a bachelor program and a master program were implemented, whereby the demands of economy were met by a restructuring of the degree programs with new contents.

The installation of the Polymer Competence Center Leoben (PCCL) was certainly a big event. In collaboration with the Materials Center Leoben (MCL), which passed the evaluation with an excellent rating, the university achieved another enhancement in the materials sector.

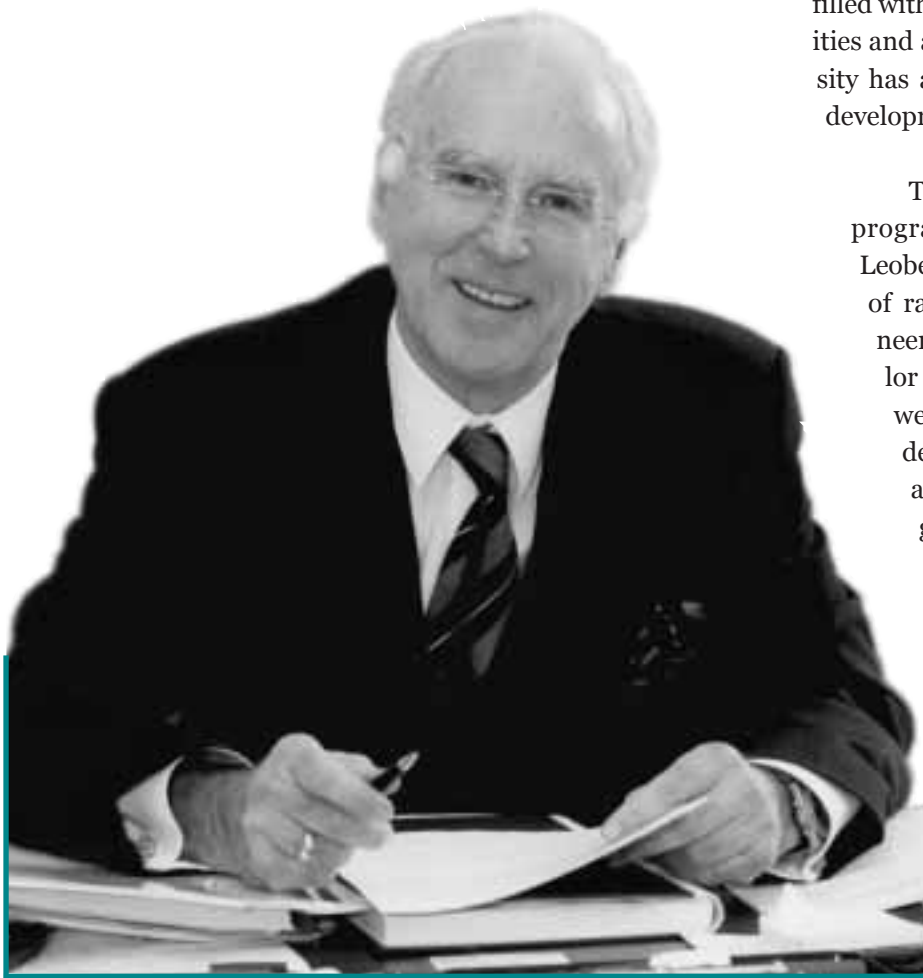


Foto Freisinger

Further Development

Recruitment and promotion have also been successful. Once again the university has succeeded in raising the number of students. The university intends to increase this number also in the future. Several media presentations (ORF, EuroNews, Bavarian Radio Station, 3sat, continuous news agency and press reports in Austria and abroad and the distribution of our university magazine "triple m") were vital for a better name recognition of the University of Leoben.

The electronic student ID improved our student service, our website will be improved continuously to cultivate the university's image and prestige.

The election of the new government cooled down the political atmosphere when it came to the financial means of the universities. In October the University of Leoben had to make the decision to stop the implementation of the strategic projects temporarily - unless they had already been started - because the funding of the current projects seemed to be problematic. Due to the provisional government, that ruled till the end of the year, there was no budget for the following year. The last quarter of the year and the financial planning had to be accepted with all the uncertainties.

The new act presents a very clear timeline and the university did not want to hesitate to take action. On November 27, 2002 the foundation convent was constituted as a structural requirement for the implementation of the university council and the future rectorate. Numerous training and continuous education programs for the introduction of a commercial accounting system, combined with the software program SAP R3, were arranged

and carried out.

Even in this precarious financial situation the University of Leoben could not and will not be dissuaded from implementing its topmost goals

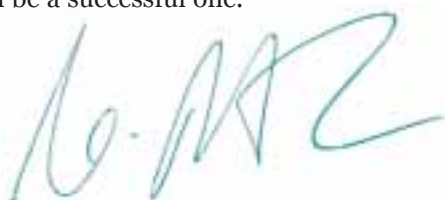
- to be attractive to students, industry, science and society,
- to have a clear profile which supports competition,
- to enhance internationality in research and education,
- to provide excellent leadership in issues and
- to have a reduced administrative organization.

The University Act 2002 opened new fields of action in:

- financial management,
- cost management,
- organization development,
- personnel development,
- quality assurance and
- market-orientation

These are reinforced management tasks that have to be managed appropriately so that the opportunities of the University Act 2002 do not turn into risks.

The doorway into the future has been opened. The path must not lead into uncertainty. The University of Leoben does open planning and therefore puts strong emphasis on the dialogue with its stakeholders so that the path into the future will be a successful one.



Bergrat h.c. Dipl.-Ing. Dr. Wolfgang Pöhl
Rector

"The University Act 2002 presents a very clear timeline and the university did not want to hesitate to take action."

Management

In 2003 the management and organization structures, as they are illustrated below, will be rearranged to a large degree, according to the regulations of the University Act 2002. In October 2003 a new rector will assume office.

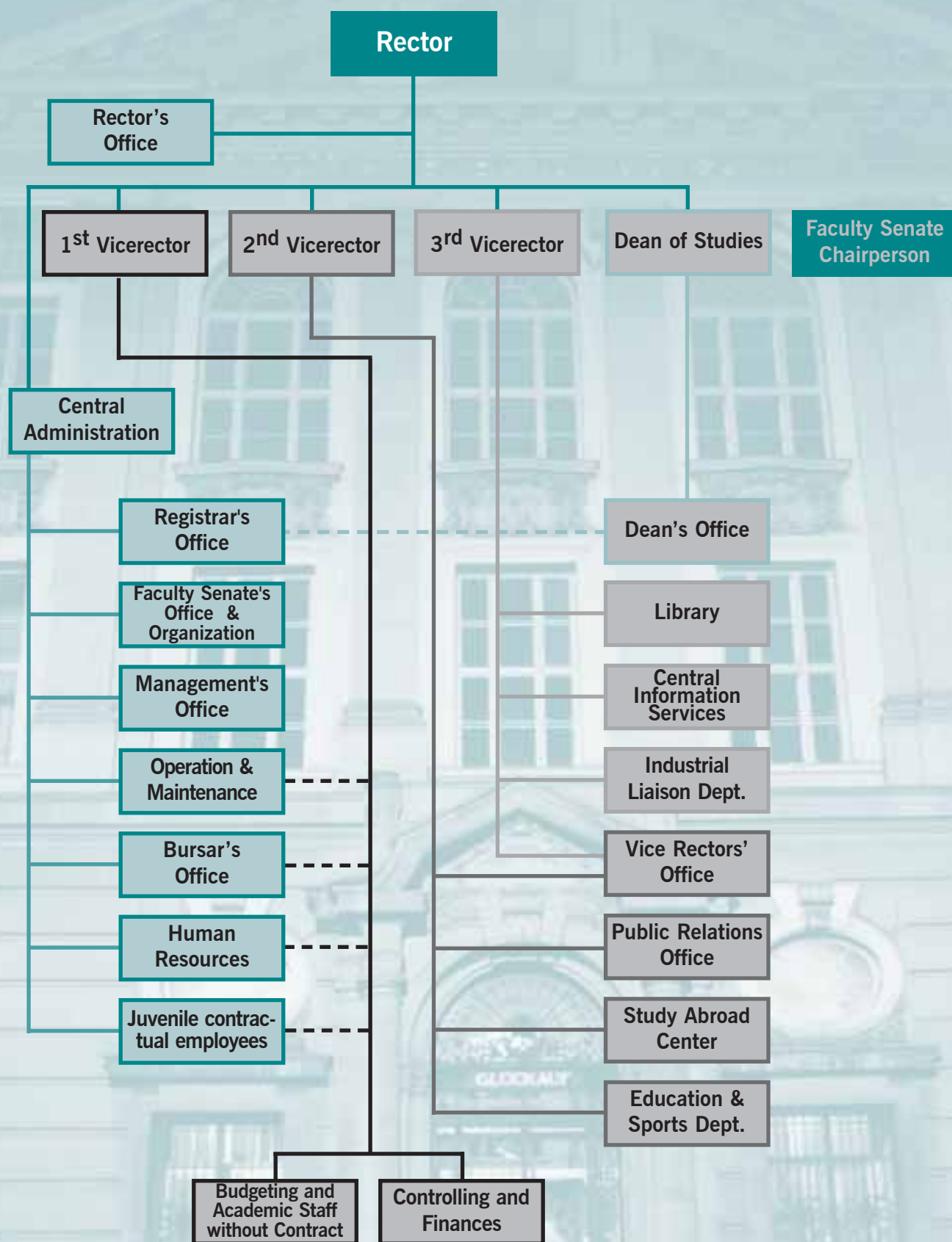
The university advisory board will be replaced by a university council of five, which will get involved in decision making to a large extent. The faculty senate will also be replaced by a smaller senate.



*Management Group (f.l.t.r.):
3rd Vice Rector Kuchar
Dean of Studies Imrich
1st Vice Rector Kneissl
Rector Pöhl
2nd Vice Rector Weinhardt
Chairperson of Faculty Senate
Kirschenhöfer*

Rector:	Bergrat h.c. Dipl.-Ing. Dr.mont. Wolfgang PÖHL
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2 nd Vice Rector:	Ao.Univ.-Prof. Dipl.-Ing. Dr.techn. Brigitte WEINHARDT
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Employment Committee Chairperson (staff):	Amtsrat Helmuth TSCHOGGL
Student Union Chairperson:	Bernd LINZER (until April 2001) Christian RAMMER (after May 2001)
Working Committee on Equal Treatment Chairperson:	Dipl.-Ing. Dr.mont. Tanja LUBE
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Organization



More New

Research activities at the University of Leoben could be expanded considerably with the Polymer Competence Center Leoben (PCCL) and three new CD-laboratories.

The University of Leoben experiences an enormous strengthening in plastic engineering with the coming competence center for plastic engineering and polymer sciences. The "Polymer Competence

Center Leoben" (PCCL) cross-links 14 research institutions of the University of Leoben, the TU Graz, the University Linz, Joanneum Research, and the Austrian Academy of Sciences with the respective industry.

effective sustainable development is the superordinate goal.

The projected annual budget will be between 3 and 4 million Euros. The Federal Ministry of Transportation, Innovation and Technology will support the PCCL with 5 million Euros for four years. The rest will be financed by the provinces Styria and Upper Austria, and partner companies. Some of these numerous companies are: Borealis, FACC, AT&S, Dow, Isovolta, Semperit, Steyr Daimler Puch, Lenzing Plastics, and IB Steiner.

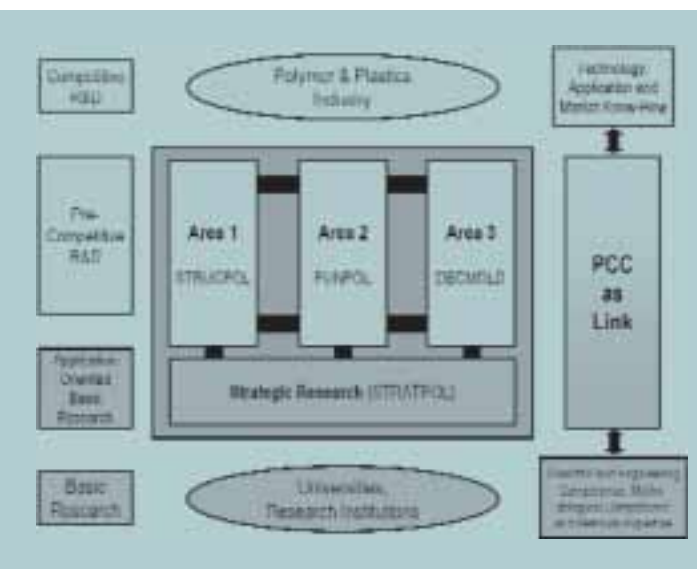
The leadership at PCCL will be assumed by the University of Leoben within the field of studies Plastic Engineering. The PCCL will sustainably strengthen the competence of the University of Leoben in materials sciences.

The Christian-Doppler-Research Institution decided to install another three CD-laboratories at the University of Leoben in 2002. The three new CD-labs operate in the following areas.

CD-Laboratory for Metallurgical Fundamentals in Continuous Casting Processes

The University of Leoben intensifies the main focus of research in metallurgy with the CD-Laboratory for Metallurgical Fundamentals of Continuous Casting Processes. voestalpine Division Stahl, voestalpine Stahl Donawitz, voestalpine Industrieanlagenbau, and RHI could be won as partners.

World-wide, continuous casting is one



PCCL as link bridging the gap between basic research at universities and other research institutions and competitive R&D performed by polymer industry.

Area 1: Performance Defined Structural Polymeric Materials (STRUCPOL)

Area 2: Functional Polymeric Materials and Polymer Surfaces (FUNPOL)

Area 3: Development of Components, Molds and Dies (DECMOLD)

This concentrated research capacity, in the field of plastic engineering, is aimed at developing property-optimized plastic materials, functional materials for technical applications, as well as components and tools. This involves a shortening of production procedures and an increase of the functionality and service life of various products. Improved technologies for the production and application of plastic materials are supposed to be developed especially for the key technologies of the future (microengineering, electronics, and information technology). "This helps small and medium-sized companies mainly to solve problems concerning plastic engineering," says PCCL-motor Professor Reinhold Lang. The contribution to environmental protection in the sense of an

Facilities

of the most important processes in the production of metals and is subject to continuous improvements in productivity and quality for economic reasons.

At the CD-lab, new scientific findings on initial solidification, the formation of inhomogeneities and defects as well as the correlation between microstructure and defect formation are searched. The results shall facilitate an optimization of the product quality.

The CD-laboratory for Metallurgical Fundamentals in Continuous Casting Processes will assist to develop materials for the thin strip casting of steel in close cooperation and cross-linkage with national and international research institutions, universities and partners from industry. Head of the laboratory is Dr. Christian Bernhard.

CD-Laboratory for Fatigue Strength

Fatigue strength dimensioning of components plays a decisive role in the mechanical design of aircrafts, road and rail vehicles, ships, as well as in equipment, machine and plant construction. The demands for light-weight construction, optimal utilization of the material or quality assurance have raised the requirements for fatigue strength and especially the importance of theoretical life time prediction essentially.

Mainly those mechanisms will be examined within the framework of research projects at the CD-Laboratory for Fatigue Strength, that lead to fatigue of materials, out of the results improved methods for an exact life time prediction of components shall be deduced.

The new CD-Laboratory for Fatigue Strength is located at the Mechanical Engineering Department and is supervised by Professor Wilfried Eichlseder.

Well-known partners from industry of the CD-laboratory are companies such as BMW, the Engineering Center Steyr, voestalpine Industriebau and Böhler Schmiedetechnik in Kapfenberg.

CD-Laboratory for Secondary Metallurgy

Secondary metallurgy of nonferrous metals deals with the reprocessing of residual materials - such as slag, dust and scrap - which accumulate during the production and processing of metals. The attempt is made, by means of a diversity of processes (pyro- hydro- and electrometallurgy), to reprocess these base materials into high-quality products.

Due to the new Landfill Ordinance, which will become effective in 2004, it is getting more and more difficult and also more and more expensive, to deposit non-treated residues on landfills or as backfill in mines.

The main goals are process engineering optimizations in ecological and economical respects. The CD-Laboratory for Secondary Metallurgy is supervised by Dr. Helmut Antrekowitsch from the Department of Nonferrous Metallurgy.

In the initial phase, partners from industry are the companies Rauch Schmelztechnik Austria, Montanwerke Brixlegg and Treibacher Industrie AG.

With these new facilities, the University of Leoben now possesses two competence centers (Materials Center Leoben and Polymer Competence Center Leoben) and eight CD-laboratories. The high concentration of additional research facilities, which focuses on cross-linking science and economy, emphasizes the importance of the University of Leoben as a research-oriented university.



The Christian-Doppler-Research Institution decided to install another three CD-laboratories at the University of Leoben in 2002.

Alma Mater

After an unprecedented increase in the number of first-year students by 40 percent in the academic year 2001/2002 the University of Leoben has topped this number again.

NUMBER OF FIRST-YEAR STUDENTS PER DEGREE PROGRAM						
Field of study	YEAR 2000		YEAR 2001		YEAR 2002	
	Men/ Women	Total	Men/ Women	Total	Men/ Women	Total
Mining Engineering	4 / 2	6	3 / 1	4	12 / 1	13
Mine Surveying	2 / 1	3	2 / 0	2	3 / 1	4
Petroleum Engineering	20 / 2	22	24 / 6	30	21 / 13	34
Metallurgy	25 / 1	26	18 / 4	22	25 / 4	29
Ceramics	3 / 10	13	1 / 5	6	6 / 2	8
Mechanical Engineering	6 / 1	7	14 / 1	15	18 / 2	20
Materials Science	16 / 5	21	36 / 5	42	34 / 7	41
Plastic Engineering	12 / 5	17	37 / 5	42	18 / 5	23
Applied Geosciences	2 / 4	6	15 / 15	30	12 / 13	25
Industrial Environm. Protection	22 / 14	36	27 / 18	45	26 / 7	33
Industrial Logistics (new)					13 / 9	22
TOTAL	112 / 45	157	177 / 61	238	188 / 64	252
Percentage of women		29		26		25

CHART 1: number of first-year students according to degree programs
(without preparatory year, qualifying date: end of registration period of the academic year)

Interestingly enough, the traditional and typical degree programs had the most applicants.

After a record number of 40 % more applicants in the last academic year the University of Leoben could come up with an additional 8 %. Without counting the doctoral degree students 250 first-year students started to study in Leoben.

Interestingly enough, the traditional and typical degree programs had the most applicants. Mining Engineering, for example, had an increase of 200 percent. Petroleum Engineering has a larger number of first-year students than any German university.

It is also a pleasant fact that the high

rate of of international students could be maintained at 20 percent. The percentage of female first-year students dropped slightly in comparison to the previous year. Of course the efforts to raise the percentage of female students will be continued.

Despite the very short preparation and promotion phase, the influx of applicants for the new degree program Industrial Logistics was enjoyably high. The introduction of this bachelor program has crucially increased the range of education at the University of Leoben according to the

REGULAR DEGREE STUDIES AT THE UNIVERSITY OF LEOBEN

	YEAR 2000		YEAR 2001		YEAR 2002	
	Men/ Women	Total	Men/ Women	Total	Men/ Women	Total
Number	2197 464	2661	1991 480	2471	2076 519	2595
Percentage of women:	18		19		20	

CHART 2: number of enrolments including doctorates, individual diploma programs (without preparatory year, qualifying date: end of registration period of the academic year)

SOURCES OF INFORMATION ABOUT THE UNIVERSITY OF LEOBEN

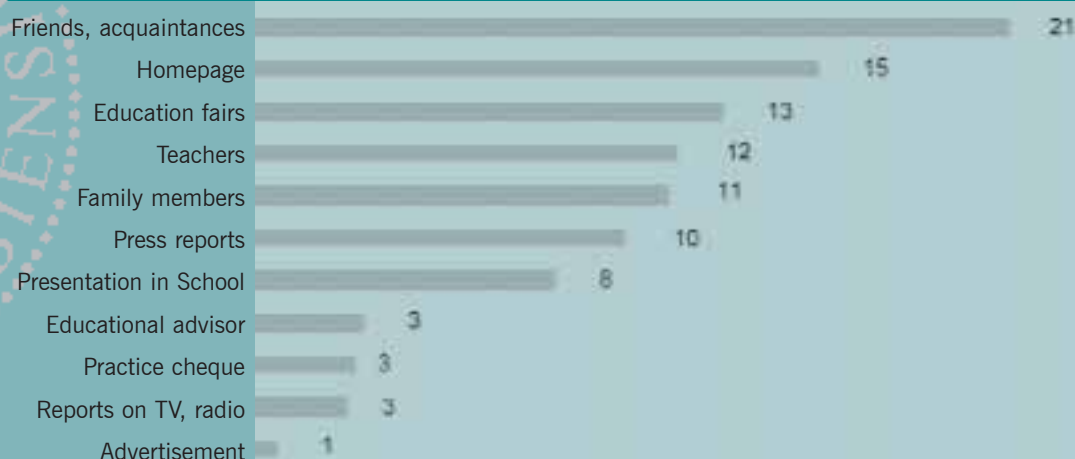


CHART 3: Survey of first-year students in winter semester 2002/2003. In %

value-added chain from raw material to material.

A survey among the first-year students from the year 2002 revealed that they learned about the University of Leoben mainly through friends. The importance of the website and the participation in educational fairs is also essential, it ranges second and third concerning the acquisition of initial information (see chart 3). The excellent job prospects and the interest in the degree program itself are named as the main reasons for the decision to study in Leoben. The students expect an interesting job with good career and income options. The students were of

the opinion that the difficult of such a degree program and little interest in technical subjects were the reasons for not studying in Leoben.

A striking fall in the number of graduates is an unpleasant aspect. Whereas in 2001 199 master students graduated, the number decreased to 135 in 2002. Internal statistics forecast that according to the current trend in Austria to not venture for a degree program in natural sciences and engineering there will be a further decrease in the number of graduates. The ambitions and efforts to draw more students to Leoben must be carried on consequently.

Further Statistics

GRADUATIONS PER DEGREE PROGRAM

Field of study	YEAR 2000		YEAR 2001		YEAR 2002	
	Men/ Women	Total	Men/ Women	Total	Men/ Women	Total
Mining Engineering	9 / 0	9	7 / 1	9	8 / 0	8
Mine Surveying	1 / 1	2	2 / 0	2	-	-
Petroleum Engineering	11 / 0	11	14 / 1	15	7 / 4	11
Petroleum Engineering (ISP)	7 / 0	7	14 / 0	14	13 / 3	16
Metallurgy	12 / 0	12	7 / 3	10	6 / 0	6
Ceramics	5 / 1	6	4 / 0	4	3 / 1	4
Mechanical Engineering	8 / 0	8	8 / 0	8	6 / 0	6
Materials Science	32 / 0	32	34 / 3	37	14 / 4	18
Plastic Engineering	28 / 3	31	15 / 4	19	12 / 0	12
Applied Geosciences	8 / 6	14	10 / 1	11	8 / 5	13
Industrial Environmental Protection	55 / 14	69	62 / 9	71	34 / 7	41
Other (individual diploma study, petroleum geology etc)	-	-	-	-	-	-
TOTAL:	181 / 17	198	177 / 22	201	111 / 24	135
Percentage of women		9		11		17

CHART 4: number of graduations according to fields of study
(period: 1.1. to 31.12. of the calendar year)

DOCTORATES

	YEAR 2000		YEAR 2001		YEAR 2002	
	Men	Women	Men	Women	Men	Women
Austrians	21	0	21	2	27	2
Foreign students	3	1	1	1	3	1
TOTAL:	25		25		33	

CHART 5: number of doctorates of Austrian und foreign students
(period: 1.1. to 31.12. of the calendar year)

MAIN REASONS FOR STUDYING AT LEOBEN

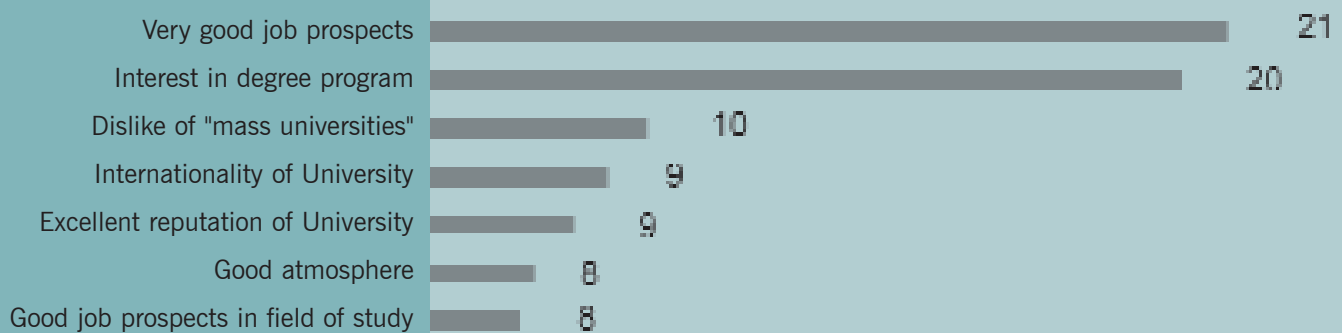


CHART 6: Survey of first-year students in winter semester 2002/2003.
In %

EXPECTATIONS AFTER GRADUATION



CHART 7: Survey of first-year students in winter semester 2002/2003
In %

MAIN REASONS FOR THE INHIBITION TO STUDY AT LEOBEN

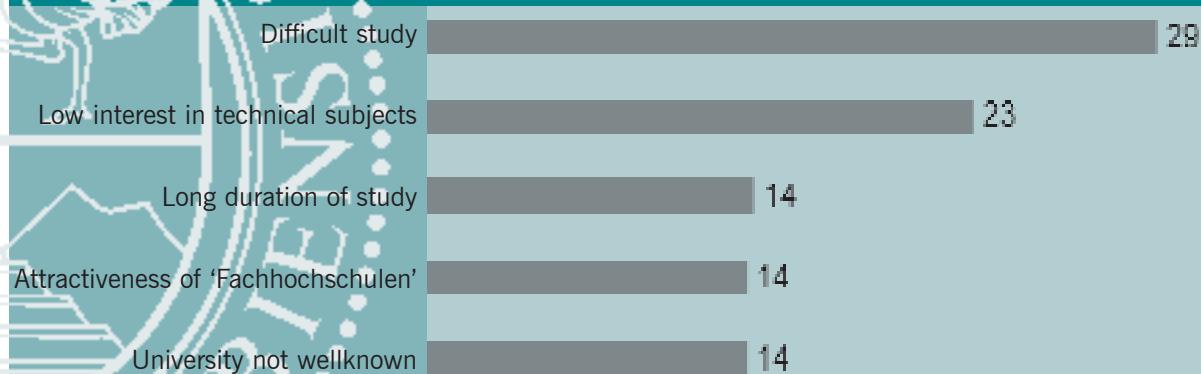


CHART 8: Survey of first-year students in winter semester 2002/2003.
In %

PERCENTAGE OF FOREIGN STUDENTS AT REGULAR DEGREE STUDIES

	YEAR 2000	YEAR 2001	YEAR 2002
EU-countries	73	34	35
Non-EU-countries	183	275	262
TOTAL	256	309	297
%	10	17	16

CHART 9: number of inscriptions of foreign students
(without preparatory year, qualifying date: end of
registration period of the academic year)

PLACES OF ORIGIN OF THE AUSTRIAN FRESHMEN

Numbers in %	YEAR 2000	YEAR 2001	YEAR 2002
Styria	57	52	55
Lower Austria	7	8	10
Upper Austria	15	13	9
Carinthia	5	10	9
Vienna	3	2	7
Burgenland	3	6	2
Salzburg	6	4	4
Tyrol	2	3	3
Vorarlberg	1	1	1

CHART 10: Distribution of freshman according to provinces
(Source: internal questionnaire at registration)

Life-Long Learning

In the year 2002 the continuing education program of the University of Leoben included lectures, workshops and 4 university courses.

CONTINUING EDUCATION PROGRAM OF THE DEPARTMENTS/SERVICE SECTOR

Master Program Generic Management (MBA)
 Type University course, degree: Master of Business Administration
 Organization Department of Economics and Business Management
 Location University of Leoben
 Duration 4 semesters

Quality Management Course
 Type University course, degree: Academic Quality Manager
 Organization Department of Economics and Business Management
 Location University of Leoben
 Duration 3 semesters

Environmental Management Course
 Type University course, degree: Academic Environmental Manager
 Organization Department of Economics and Business Management
 Location University of Leoben
 Duration 3 semesters

TPM Coach Training
 Type Continuing education seminar, degree: TPM coach certificate
 Organization Department of Economics and Business Management
 Location University of Leoben
 Duration April 3-6, April 10-13, September 10-13, September 24-27

Quality Assurance in Chemical Labs
 Type University course
 Organization Department of General and Analytical Chemistry
 Location University of Leoben
 Duration July 8-11 and September 23-27

Plastics Joining
 Type Industrial Liaison Department ("Technology Academy"),
 Organization Department of Designing Plastics and Composite Materials
 Location University of Leoben
 Duration May 16

Poison reference licence
 Type Course
 Organization Industrial Liaison Department ("Technology Academy"),
 Department of Waste Management and Landfill Technologies
 Location University of Leoben
 Duration May 27-29

Innovation Management
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy"),
 FWF
 Location University of Leoben
 Duration June 3-6

Research Funding
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy")
 Location University of Leoben
 Duration June 3-6

CONTINUING EDUCATION PROGRAM OF THE DEPARTMENTS/SERVICE SECTOR

Amending law to the Mineral Material Act and its effects on companies and businesses
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy"),
 Department of Mining Engineering
 Location University of Leoben
 Duration June 5

Recycling in automobile industry
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy"),
 Department of Waste Management and Landfill Technologies
 Location University of Leoben
 Duration Juni 20

Bulk Deformation
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy"),
 Department of Plastic Deformation and Plant Machinery
 Location University of Leoben
 Duration Juni 24

Investment Cost Estimation
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy"),
 Department of Process Engineering and Environmental Protection
 Location University of Leoben
 Duration October 24

Developing successful products
 Type Seminar
 Organization Industrial Liaison Department ("Technology Academy"),
 Location University of Leoben
 Duration November 20

Geotechnical measuring for the extraction of raw material
 Type Course
 Organization Department of Mining Engineering
 Location University of Leoben
 Duration October 24-25

Blasting Engineering
 Type Course
 Organization Department of Mining Engineering
 Location University of Leoben
 Duration November 11-20

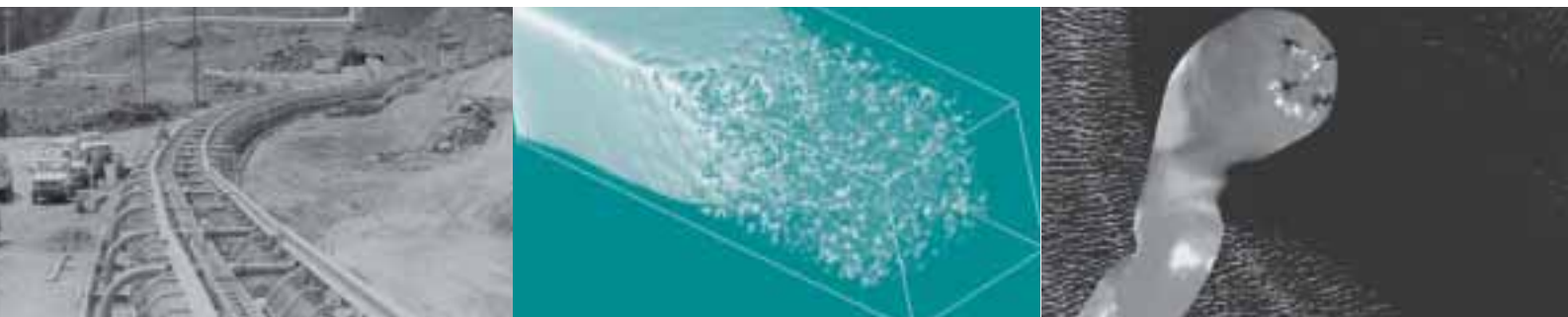
Numerical Simulation in Steelmaking Metallurgy
 Type Seminar
 Organization Department of Ferrous Metallurgy,
 voestalpine Stahl Donawitz
 Location University of Leoben
 Duration June, July

Basics in Steelmaking Metallurgy
 Type Seminar
 Organization Department of Ferrous Metallurgy,
 HTL Leoben
 Location HTL Leoben
 Duration April - October

Metallurgy of Continuous Casting
 Type Seminar
 Organization Department of Ferrous Metallurgy,
 HTL Leoben
 Location HTL Leoben
 Duration September

Projects for Solutions

The majority of the research projects are implementation-oriented in their approach. Especially in the core areas "Mining, Metallurgy, Materials" the University of Leoben demonstrates excellent research competencies.



The scale of research projects, which were finished within the framework of the partial legal capacity of the departments in 2002, is listed in the table below. In total the income, raised from third party funding, amounts to 7.9 million Euro. The year 2002 has been even more successful than the year 2001 with roughly □ 7.5 million Euro. (The comparison of the past three years can be found on page 44).

The presentation of all projects and scientific developments carried out in 2002 would go beyond the scope of this report. Three particular items shall be emphasized:

1. With the new "Triple-M" strategy the University of Leoben intends a consequent further development of the core ar-

eaes "Mining, Metallurgy and Materials" to achieve international competitiveness and acceptance.

2. Cooperation with industry is of crucial importance which is demonstrated by several Christian-Doppler-Laboratories, the Materials Center Leoben, the new Polymer Competence Center Leoben, FFF-projects and direct projects with companies. Fundamental research, as a basis for applied research and for technical innovations, also plays an essential role.

3. Scientific research mainly focuses on the three core areas. In the sense of interdisciplinarity and competence expansion, important contributions are made to research in environmental engineering and bio-materials, which is exemplified by the projects listed below.

RESEARCH PROJECTS AT THE UNIVERSITY OF LEOBEN COMPLETED IN THE YEAR 2002

Type of the project	EU	FWF	FFF	k-plus	Christian-Doppler-Laboratories	Federal Government, provinces, communities	Other customers/sponsors
Number	10	11	12	28	28	52	329

Total: 470

EU: European Union

FWF: Austrian Science Fund (Fonds zur Förderung der wissenschaftlichen Forschung)

FFF: Industrial Research Promotion Fund (Forschungsförderungsfonds für die gewerbliche Wirtschaft)

k-plus: Technology funding program to facilitate and establish competence centers

150 Years of Research

In the middle of the 19th century geologists of the former Imperial Institute found the first magnesite deposits in Styria and started exploiting them, decades before the large deposits overseas were discovered.

When one speaks about magnesite, one also talks about the Austrian research spirit. Economic geologists of the University of Leoben have been considered to be protagonists of the magnesite/siderite discussion from the very beginning, which was exactly 150 years ago. The project presented below is based on a very long tradition and will certainly contribute, that also in the future trend-setting research results on this topic from economic geology will come from Leoben.

Cooperation with Russia

In summer 2002 a cooperation project between the Russian Academy of Sciences and the Department of Applied Geosciences - Division of Geology and Economic Geology - began. On the Russian part this joint project is supervised by Dr. Mikhail T. Krupenin and on the part of the University of Leoben, by Professor Dr. Walter Prochaska. The project is supported by an exchange program of the Austrian Academy of Sciences and is part of an international UNESCO-project on magnesite and talc deposits, which is supervised by professor Prochaska. Within the framework of this project, one female student of the University of Leoben will write her geological and economic geological diploma thesis.

Largest Magnesite Deposit

The magnesite deposit Satka and also the very closely situated siderite deposit

Bakal are about 300 km south of Ekaterinenburg in southern Ural. The siderite deposit, which is about 20 km away, is economically going through a different phase at the moment. Current production has decreased from approx. 5 million tons per year ten years ago to less than 500,000 tons per year at the moment. The stratified magnesite deposit Satka belongs to the so-called "Veitsch-type" and at present delivers about 95 percent of the Russian magnesite production with an output of approx. 2 million tons.

Deposit Model

The objective of the current project is the development of a genetic model for these deposits and for the geodynamic position, the crucial question deals with the possible interrelationship between magnesite and siderite fluids. The respected results will influence the further prospection strategies and the quality prognosis and will be permanently discussed with company geologists. Once again the University of Leoben stresses its core competence on the sector "magnesite research" and makes an important scientific contribution to applied research.

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When one speaks about magnesite, one also talks about the Austrian research spirit.

(Photo: Department of Geology and Economic Geology)

New Mining Machine

A worldwide unique mining machine, which "cuts" raw materials in the gallery and at the same time strengthens the cavity, was developed by VA Bergtechnik in Zeltweg and by the Department of Mining Engineering at the University of Leoben.

The recently finished joint research project "AVSA" (Alternate Heading System Cutting Anchoring) of voestalpine Bergtechnik and the University of Leoben sets new standards. By order of the DSK (German bituminous coal), a completely new concept for a so-called selective cut heading machine was developed for the use in moderately firm hard rock. This new concept combines milling and the setting of the supports into one machine. This helps to minimize the dwell time in tunneling drastically.

Advantages for Both Partners

"This cooperation has only advantages for us," says Mag. Bernd Lippacher, marketing director of the voestalpine Bergtechnik in Zeltweg, which belongs to the Sandvik group. Lippacher continues, "On one hand we can concentrate the attention of the excellently educated graduates from the University of Leoben with us on the project because of the close contact; on the other hand, we are able to contribute practical research projects to the university." Professor Peter Moser at

the Mining Engineering Department is also of the same opinion. "We are cooperating with a group which is leading worldwide in full section and selective cut heading machines, in addition we can use the infrastructure in Zeltweg also for basic research," summarizes Moser.

Keeping up with Industry

"In the future we want to cooperate closer. The faster the students keep up with industry, the better," says Professor Peter Moser. For Mag. Bernd Lippacher, the EU-project "ICACUTROC" and the current project "AVSA" are only the beginning of a longer partnership. ICACUTROC, which was finished in 1999 and cost 3.6 million Euros, significantly contributed to the fact that the application of milling machines for tunneling, which is limited to moderately firm rocks at the moment, will also be possible for very hard rocks in the future. "We intend to tackle many more projects together," says Lippacher.

Long-term Collaboration

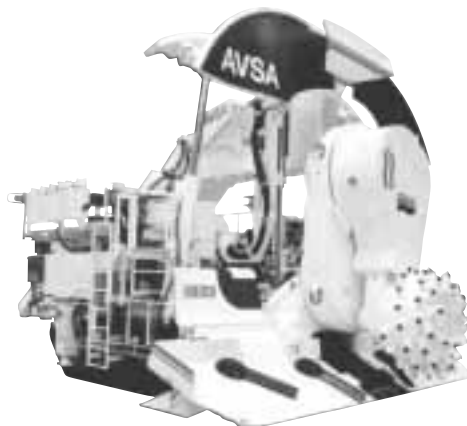
For this reason a long-term cooperation agreement was signed by the voestalpine Bergtechnik Zeltweg and the Department of Mining Engineering in 2002, which determines the research and development activities of certain project activities for a long period.

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A completely new concept for a so-called selective cut heading machine was developed for the use in moderately firm hard rock.

(Photo: VA Bergtechnik)



New Conveying Technology

The conveying systems developed at the Department of Conveying Technology meet the global demand for cheaper, more efficient and low-maintenance conveying technology. Now the bridging of rivers, mountains and buildings is no longer an additional expense for mining industry.

Bulk materials are the basis of our engineered society. This concerns ores and mineral materials of different kinds, which are needed for the production of materials applied by industry. The bulk material extracted from mines must be transported from the site to the treatment plants and even further to the production plants.

Transportation is a Crucial Cost Factor

Due to the specifically low value of these materials, the portion of the conveying cost has a decisive impact on the lump sum price of the product. This is the reason why all companies world-wide demand cheaper, more efficient and lower-maintenance conveying systems. Under the guidance of Professor Dr. Franz Kessler, conveying systems were developed at the Department of Conveying Technology at the University of Leoben, which meet the demands of industry.

Flexible Conveying System

The problem the Leoben experts were mainly confronted with was the fact that the transport drift in widely-used belt conveying technology is usually straight. This is of great disadvantage when obstacles such as rivers, lakes, mountains or buildings are in the way of a straight conveying track. In this case, several straight conveyors with the necessary hand-over points have to be arranged in line. Next to operating problems this led to very high noise exposure and dust formation.

Furthermore, energy supply systems had to be installed for all intermediate drive systems. "We faced the task to find possibilities to adapt the conveying track of the belt conveyors to the conditions of the site," explains Professor Kessler.

The expert team succeeded with the help of so-called vertical and horizontal curves. "The belt guidance in the horizontal curves was a very special challenge", stated the expert.

Applied World-wide

The new developments at the department concern the belt supporting idler supports, which adjust to the occurring belt tensile forces and the pre-set curve radii themselves and optimally guide the loaded as well as the unloaded belt through the horizontal curves. Since the idler supports adjust themselves, the assemblage does not require a great deal of work. "The belt guidance systems developed by us are applied world-wide and are an extremely cost-saving and eco-friendly solution for the user for the conveying of bulk material," says Professor Kessler.

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The bridging of rivers, mountains and buildings is no longer an additional expense for mining industry.

(Photos: Department of Conveying Technology)



The belt supporting idler supports adjust to the occurring belt tensile forces and the pre-set curve radii themselves and optimally guide the loaded as well as the unloaded belt through the horizontal curves.

Fabric Softeners

The development of an innovative and seminal material sets new standards for the production of polymeric materials. Domestic graphite mining industry benefits as well.

The Department of Chemistry of Polymeric Materials attracts attention with a new material, which is revolutionary for the plastics industry. One plastics engineer succeeded in raising the electrical and thermal conductivity of materials by mixing the plastic material polypropylene with graphite and by adding tensides. In addition, with this new process these materials can be produced more eco-friendly and at a considerably lower price.

Increase of Quality and Reduction of Costs for Polymeric Material

"The addition of tensides also contained in detergents optimizes the adhesive strength between the plastic material and the graphite. Therefore the graphite proportion at the production of the granulate necessary for plastics production can be reduced essentially without affecting the quality," reports Dipl.-Ing. Karl Schnetzinger on his research results. Within the framework of the project, sufficient electrical properties with a lower content of graphite could be achieved and the flexibility of the material could be improved. "This is of great importance because plastic is only attractive as packaging material for electronic components if it has a high flexibility," says Schnetzinger. "At the same time the tension, which is responsible for the damage of electronic components could be relieved," Schnetzinger adds. Graphite also does not contain any heavy metals and poisonous combustion products which facilitates an eco-friendlier and also cost-

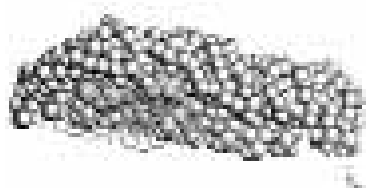
saving production of this material.

Stimulation of Domestic Graphite Mining Industry

Due to this new process domestic graphite mining industry gains expanded access to plastics producing and processing industry. "Plastics industry has already announced great interest in the new material, this resulted in the foundation of a spin-off center "Advanced Polymer Compounds", which is engaged in the production of this material and the finding of new ways of application," says Schnetzinger. The materials produced this way are of interest for economy mainly as packaging material in electronic industry and as casing material in explosive environments such as car tank filler necks. The company, "Advanced Polymer Compounds", was founded in 2002 at the University of Leoben in the framework of the Center of Applied Technology, Austria's first university spin-off center. The first phase as a consulting office for recipes and production processes shall be followed by a production company. After the first year of operation this company can name well-known industrial firms such as DOW Europe SA, Horgen, CH, Zizala Light Systems, Wieselburg and Poloplast GmbH&CO KG, Linz as its clients.

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*New material: plastic material polypropylene with graphite and tensides
(Photo: Advanced Polymer Compounds)*

Copper Research Center

Seven of the world's most important copper producers, that cover about 40 % of the world's total copper production, trust in the University of Leoben as research center.

Shorts not only interrupt the train of thoughts but also the flow of copper ions in a copper electrolysis which then consumes energy without producing copper. The Department of Nonferrous Metallurgy at the University of Leoben was authorized by seven of the world's most important copper producers - Atlantic copper (Spain), Boliden (Sweden), Codelco (Chile), Noranda (Canada), Northern German Affinity (Germany), Umicore (Belgium) and Outokumpu (Finland) - to optimize the operating conditions for copper electrolyses so that shorts of this kind no longer occur.

Staff and Cost Reduction

At present about 90 % of the produced copper are refined by electrolysis. The electrolytic copper refining is of importance in two ways. On the one hand electrolytic copper can be produced, which has a minimal content of foreign elements and a very high quality, on the other hand this process is a very low-priced method for extracting noble metals from copper ores and scrap. If the production can be increased by one percent due to the avoidance of shorts at an average production of a copper plant of 400,000 tons, then this means 4000 tons of copper per year at a market value of approx. 6 million Euro. It also has to be considered that the frequent occurrence of shorts means more staff for a company in order to avoid them, this increases the personnel costs considerably.

Optimization under Practical Conditions

Since January 1, 2002 research is done at the Department of Nonferrous

Metallurgy at the University of Leoben on the topic "Modeling of the development of shorts on cathodes". Project leader Iris Bacher explains: "In order to create the most practical conditions it was not only necessary to build electrolytic cells up to one meter high, it was also necessary that the test procedure was as close to reality as possible. In this case, special aggregates (heating rods, circuit systems, rheostats) had to be designed and built because commercial appliances could not be used for this purpose. Staff at the department constructed these electrolytic refining cells themselves."

Shift Operation

The cells are operated in three-week shifts and the operation is completely automated. In the fall of 2002 two other cells were taken into operation to increase the capacity. Not only the implementation of these tests is decisive for the success of the process but also the following scientific analyses. "We are working with the latest metallographic appliances and with different analysis methods such as atomic absorption spectrometers and scanning electron microscopes," explains Iris Bacher. "In the next two years a mathematical simulation and modeling of the process will follow next to further optimizations of the refining electrolysis and will be presented to the international copper industry," Bacher concludes.

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At present about 90 % of the produced copper are refined by electrolysis.

(Photo: Department of Nonferrous Metallurgy)

Iron Curtain

50 years of regional policy and missing cooperation along the so-called "Iron Curtain" have left deep marks. Leoben scientists were authorized to erase them within the framework of a EU-project.

All across Europe borderlands are distinguished by their heterogeneity concerning the ecological balance, land use, the socio-economic structure, as well as the agricultural and industrial development.

"Iron Curtain"

The project "Iron Curtain" belongs to the 5th framework program of the EU to the section "Quality of Life and Management of Live Resources" and is connected with the campaign "Sustainable Agriculture and Forestry as well as Integrated Development of Rural Areas Including Mining Areas". The main focus is "New Instruments and Models for the Integrated and Sustainable Development of Rural and Other Areas".

Objective "Environmentally Compatible Development"

"The aim of the project is a set of methods based on the multifaceted experience of project partners, which shall be developed to a standard procedure for integrated resource analysis, assessment and cultivation on the basis of a sustainable environmentally compatible develop-

ment," says Dr. Hans Kürzl of the University of Leoben. "These will be tested and scaled in several case studies along a European north-south profile. Then a generic model will be developed which can be transferred and applied to other areas along the former Iron Curtain," Kürzl adds. Relevant users can be found mainly in institutions of regional and agricultural policy, regional planning and natural and environmental protection.

Project Management in Leoben

The project is managed by the Department of Technical Eco-System Analysis at the University of Leoben headed by Prof. Jürgen Wolfbauer. Dr. Hans Kürzl is in charge of the management. The scientists at the University of Leoben concentrate on the fields of project planning and conception, preparation of project applications, partner management as well as the topics development of assessment methods, regional economy and eco-system analysis.

International Cooperation

Besides the University of Leoben, the project partners are the Aristotle University of Thessaloniki, the Department of Geography and Applied Geoinformatics at the University of Salzburg, Interconsult International ASA in Oslo, GEO Ltd. in Prag, Geonardo Ltd., Budapest, the Friedrich-Schiller-University Jena and the University Miskolc in Hungary.

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*EU-project "Iron Curtain": case studies along a European north-south profile.
(Photo: Department of Technical Eco-System Analysis)*



Brewing without Residues

In cooperation with the Puntigamer and Gösser brewery the Department of Process Engineering developed a new process for the complete recycling of residues from brewing. Residue-free and energy-saving beer brewing has already raised international interest.

Due to an innovative process the Department of Process Engineering and Environmental Protection at the University of Leoben managed to change beer brewing in Göss into a residue-free production process, half of the natural gas consumption can now be saved.

During the production process of beer so-called spent hops, residues that so far could not be recycled, accumulate, this amounts to 10 dekagram per half a liter of beer. Because of the high protein content the breweries could sell it partly to farmers as vegetable cattle feed. Since live stock is declining this also has an effect on the demand for this kind of feed. Depositing remained the only alternative. According to the Landfill Ordinance, which comes into force in 2004, spent hops must be deposited as hazardous waste. This would involve costs of approx. 10 percent of the production costs for the Gösser brewery.

The Brewery confronted the University with the problem in order to turn spent hops into marketable products or to reuse them within the company. "The incineration of spent hops is not possible because of the high water content of 80 percent", says the head of the department Prof. Dr. Werner Kepplinger.

So the scientists at the Department of Process Engineering had the idea to dehydrate spent hops mechanically. With the help of a modified screen belt drier the water content could be reduced to less

than 60 percent and reached the mark where incineration was possible.

Energy Production by Thermal Utilization

The Gösser brewery constructed a pilot plant which was finished by the end of that year. Kepplinger predicts: "With this plant the brewery can save more than half of the natural gas consumption for steam generation". The amortization will last only three or five years. Even residues from incineration can be used as admixture for fertilizers since they have a high phosphate content. "With this plant we accomplish a reutilization of spent hops of 100 percent", says process engineer Kepplinger. The new process has already raised international interest.

The Heineken group wants to implement this innovation in a brewery in Africa. Once again the Department of Process Engineering and Environmental Protection could solve an environmental engineering problem with this process.

Other projects deal with the cleansing of large oil tanks, flue gas desulfurization or the improvement of electric shaft furnaces. As a result third party funding finances more than half of the 18 employees.

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*The Heineken group wants to implement the new process for the complete recycling of residues from brewing.
(Photo: Department of Process Engineering and Environmental Protection)*

100 % Recycling

The precious hard rock granite will totally disappear from landfills. A research project at the Department of Waste Management and Landfill Technologies at the University of Leoben made this possible.

Granite belongs to the group of hard rocks of eruptive origin. These rocks are used in plate form or they are carved into plaster stones. Due to their high toughness, they are ideal for plastering and for all areas outside.

Disposal as Construction Waste

In the past, stonemason's granite waste was collected together with construction waste, mixed with other mineral waste, and deposited on landfills for construction waste. Therefore the already scarce landfill space is used up and the precious raw material granite is lost. Now the granite fraction is collected apart from construction waste and utilized. The process developed at the University of Leoben and supported by the Research Fund of Industrial Economy is a process innovation which offers far-ranging economic and ecological advantages. Especially the aspect of a sustainable utilization of natural resources is taken into account to a huge extent.

EDP-supported Collecting System

At first a potential analysis about the available granite waste was carried out in Middle and Eastern Austria. Then a geoinformatics system for the planning of the collection system of the waste was developed. At the moment 14 companies in Styria, Carinthia, Vienna, Lower Austria and Burgenland are involved. The potential of these 14 companies is settled at approx. 1,000 tons per year, this is about one fifth of the total amount.

Enormous Cost Reductions

"A company's granite waste is collected and stored temporarily," explains project leader Dipl.-Ing. Michael Kotschan, "this saves energy costs because granite waste

can be collected at prices below the current disposal costs." The sorting of the waste for further utilization depends on size, form and color of the waste. A part of the waste - large plates with a thickness of 2 or 3 cm - are cut into square plates and used as paving stones for inside and outside.

The largest part of the sorted waste is crushed and sieved to a grain size of 0 to 3mm. The processed granite material (0-3mm) is used for the surface design of concrete slabs. Surface treatment essentially improves the quality (optical characteristics, surface weathering resistance) and raises the sales revenue in comparison to conventional concrete slabs.

Pioneers in Europe

Environmental engineering in Leoben is not only leading edge in the field of applied research. The department of the field of studies Waste Management and Landfill Technologies is subject to fast changing of issues unlike anyone else. Developments clearly tend to avoid and reduce waste and emissions, that means effluent free manufacture by material flow management. This fact also results in altered curricula and foci. The field of studies was adapted according to the demands of economy and altered to a branch of supply and waste technology. The University of Leoben is the only European university that educates environmental engineers in this field.

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Granite will totally disappear from landfills.

(Photo: Department of Waste Management and Landfill Technologies)

Successful Battle

The Christian-Doppler Laboratory for Applied Computational Thermofluidynamics does research in the avoidance of dust exposure caused by diesel vehicles.

Recent tests of the air quality in Graz have shown that the main components of fine dust in the air are emissions from diesel vehicles. The Christian-Doppler-Laboratory is concentrating on the reduction of diesel soot.

Research, supported by the EU, is focused on the development of particle filters in diesel engines. The main objective is, according to the head of the laboratory Professor William Brandstätter, "that the exhaust systems of diesel engines meet the new strict EU-guidelines "Euro IV" which will become effective in 2005". The scientist from Leoben is optimistic, "because nowadays the available particle filters already manage to filter at least 99 percent of the fine particles contained in diesel soot".

New calculation methods developed at the laboratory in Leoben also make it possible to examine the physical processes which take place inside the filter material in detail. Particle filters currently on the market are just as effective but very expensive. By application of computer simulations, new materials shall be developed which provide a similarly outstanding filter effect at considerably lower costs.

Pan-European Research Projects

The results of the research, which is almost completed, are based on Europe-wide scientific efforts which were made within the framework of the EU-cluster DEXA (Diesel Exhaust Aftertreatment). Eight partners from industry and four research institutions including three universities cooperate in this cluster.

Prof. Brandstätter and his team are al-

ready thinking beyond the future strict exhaust guideline. His laboratory is also involved in the project "IMITEC" (Integrated Material and Information Technologies for Novel Emission Control Systems), there the research team from Leoben is doing research in the next generation of exhaust sensors and the relevant software for the timing gear. Additional partners are "Aerosol and Particle Technology Laboratory" (Greece), AVL List GmbH (Austria), Robert Bosch GmbH (Germany), Johnson Matthey PLC (England) and Centro Ricerche Fiat (Italy).

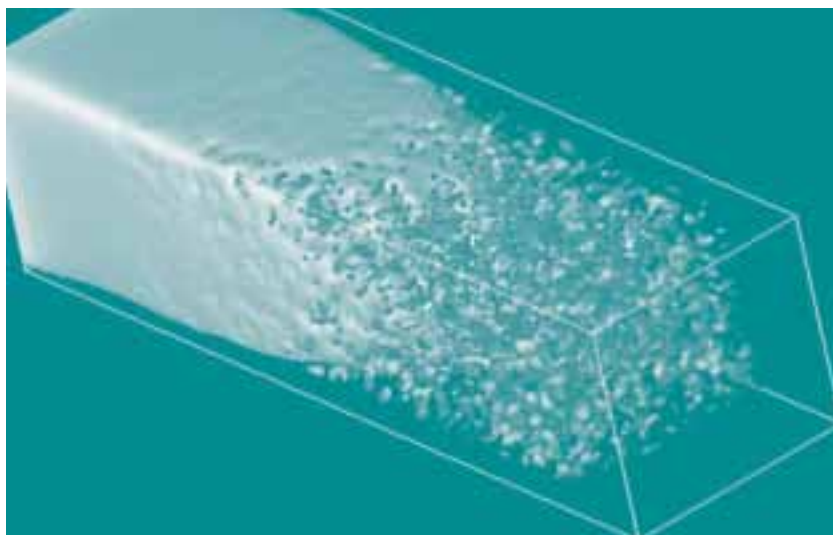
The research is financed by the EU with 4.4 million Euro, from this amount the CD-laboratory in Leoben receives approx. 1.3 million Euro.

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New calculation methods make it possible to examine the physical processes which take place inside the filter material in detail.

(Photo: Christian-Doppler-Laboratory for Applied Computational Thermofluidynamics)



Cannibalistic Worms

The reputable journal Science published results of an extraordinary scientific examination of cannibalistic worms. A project of the University of California in cooperation with the Department of Metal Physics proves the development of a biologically formed copper mineral which is unique in the field of biology after the current standard of knowledge.



The copper in the teeth of "Glycera dibranchiata" is responsible for elasticity as well as toughness.

(Photo: Department of Metal Physics)

The focus of scientific research in cooperation with the University of Leoben was not on the aggressive predatory behavior of certain maritime worms, but on the even more surprising mineral composition of their teeth.

The October 11 edition of the renowned science journal published the results of this interdisciplinary research project under the title "High Abrasion Resistance with Sparse Mineralization: Copper Biomineral in Worm Jaws". In the very tiny teeth of the worm, only 1.5 millimeter long, inclusions of copper were found, partly in the form of a very rare mineral. It was an important task of the project to demonstrate, how these copper inclusions improve the material properties of the teeth noticeably.

Emergency Call from California

The project was a cooperation between two departments of the University of California, Santa Barbara, and the Department of Metal Physics at the University of Leoben. The cooperation was initiated by Dr. Helga Lichtenegger, a former doctoral degree student of Prof. Dr. Peter Fratzl at the University of Leoben and now employed at the Chemical and Biochemical Department of the University of California. Since the Leoben Department of Metal Physics is one of the few research institutions with a nano-mechanical laboratory, Dr. Lichtenegger asked Leoben for help. Dr. Thomas Schöberl supervised the mechanical examinations and proved the importance of the copper inclusion for the ex-

traordinary properties of the teeth.

Elastic and Tough at the Same Time

The copper in the teeth of "Glycera dibranchiata" is responsible for elasticity as well as toughness, this is an advantage because they are not as brittle as human teeth and have a high abrasion resistance. "We would be happy," says Leoben's scientist Schöberl, "if we could produce such a material artificially."

In 1980 the first evidence of copper inclusions was found in worms living in the North Atlantic, that were a little bit longer than earthworms. It was assumed then, that an aftereffect of the global maritime pollution had been detected. However, the research results of the scientific team from California and Leoben have proven, that the copper belongs to the biological construction plan of the dental material, completely independent from the metal content of sea water.

On Track of Nature

The Department of Metal Physics in Leoben, which also functions as Department of Material Sciences of the Academy of Sciences, deals with biological materials as "models" for materials in-depth. Current research concentrates on the mechanical properties of human bones and wood.

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Research Networks

Networking has been applied by the University of Leoben for a long time.

For approximately 20 years bilateral agreements have existed between the German technical universities Clausthal and Bergakademie Freiberg as well as the University Miskolc in Hungary. 12 years ago the first agreement with the Colorado School of Mines, Golden, USA was signed, which - due to its great success in student exchange - was extended on a broader basis.

These agreements with the aim of promoting science and research (joint projects, exchange of scientists) as well as teaching (mainly student exchange) were and will be carried on on the basis of cooperating institutions.

In addition to this numerous departments, the University of Leoben demonstrated initiative of their own and initiated close connections to related institutions all around the globe.

In the preceding years many universities have joined within the framework of the EU-programs (SOKRATES, TEMPUS and so on), so that a listing of all active cooperations is impossible.

Therefore only those cooperation agreements with universities and research institutions are listed below which were signed in 2002.

Department of Mineral Processing Paul Scherrer Institut (PSI), CH Neutron diffraction studies on thermally treated carbonaceous iron ores	Signatory institution Partner Field of cooperation
Department of Chemistry of Polymeric Materials Kamaraj College Virudhunagar, Tamil State, India Student exchange	Signatory institution Partner Field of cooperation
Department of Ferrous Metallurgy Christian Doppler Research Association Installation of a Christian Doppler Laboratory	Signatory institution Partner Field of cooperation
Department of Mechanical Engineering Kochi University of Technology (Japan) Student exchange, collaborative research	Signatory institution Partner Field of cooperation
Christian Doppler Research Association Installation of a Christian Doppler Laboratory	Partner Field of cooperation
Department of Mechanics Materials Center Leoben (MCL), Christian Doppler Laboratory for Functionally Oriented Materials Design, Vienna Non-Equilibrium Thermodynamics of Multiparticle and Multicomponent Systems	Signatory institution Partner Field of cooperation
Austrian Science Fund (FWF) Large Deformations in Lamellar Structures	Partner Field of cooperation
Department of Physical Metallurgy and Materials Testing Korea University of Technology and Evolution, Cheonan, Korea Metallography	Signatory institution Partner Field of cooperation
Department of Non Ferrous Metallurgy Christian Doppler Research Association Installation of a Christian Doppler Laboratory	Signatory institution Partner Field of cooperation
Department of Technical Ecosystem Analysis Aristotle University of Thessaloniki, Greece Student exchange	Signatory institution Partner Field of cooperation

Cooperation with Universities and Research Institutions (continued)

Signatory institution	Department of Petroleum Engineering
Partner	Certh/Cperi, Thessaloniki
Field of cooperation	Diesel Particulate Filters
Partner	KTH, Stockholm; Fraunhofer Gesellschaft, Darmstadt
Field of cooperation	Virtual Reality
Partner	Paul Scherrer Institut, Villingen
Field of cooperation	Fuel Cells
Partner	Technical University Graz, Joanneum Research, Graz
Field of cooperation	Training Simulator Tunnel Fire
Partner	Politecnico di Torino, Italy
Field of cooperation	Syloc-Dexa
Signatory institution	Department of Physical Chemistry
Partner	Austrian Science Fund (FWF)
Field of cooperation	Special Research Program Electroactive Materials
Partner	Max Planck Institute for Solid State Research, Stuttgart
Field of cooperation	Electrochemistry of Ag/AgX (X=Cl,Br,I) systems with high lateral resolution
Partner	Massachusetts Institute of Technology, Cambridge, USA (Department of Materials Science and Engineering)
Field of cooperation	Oxygen exchange kinetics of mixed conducting oxides
Partner	Research Institute for Electron Microscopy (FELMI), Graz
Field of cooperation	Microstructural investigations of oxide perovskites
Signatory institution	Department of Structural and Functional Ceramics
Partner	Institute of Material Research-Deutsches Zentrum für Luft-und Raumfahrt, Köln, Germany; Department of Mechanical Engineering-University of Sheffield, U.K.; Istituto di Scienza e tecnologia dei materiali ceramici-CNR,Faenza, Italy; Institute of Materials Research-Slovak Academy of Sciences, Kosice, Slovakia; Instituto de Ceramica y Vidrio CSIC-Consejo Superior de Investigaciones Científicas, Madrid, Spain; Departament de ciència dels Materials i Enginyeria Metallurgica-Universitat Politècnica de Catalunya, Barcelona, Spain; Departement de Metallurgy and Materials Engineering-Katholieke Universiteit Leuven, Belgium
Field of cooperation	SICMAC - Structural Integrity of Ceramic Multilayers and Coatings
Signatory institution	Department of Plastic Deformation and Plant Machinery
Partner	Technical University of Kosice, Department for metal forming
Field of cooperation	Numerical Simulation
Signatory institution	Department of process technology and industrial environmental protection
Partner	Jozef Stefan Institute, Ljubljana, Slovenia
Field of cooperation	Low cost flue gas desulphurisation technology
Signatory institution	Department of Metal Physics
Partner	Ludwig Boltzmann Institute of Osteology, Vienna; Hanusch Hospital Vienna; ELETTRA, Trieste, Italy
Field of cooperation	Nanostructure of bone
Partner	University of Natural Resources and Applied Life Sciences, Vienna
Field of cooperation	Wood research

New Impetus for Economy

Following a tradition the University of Leoben establishes close contact with economy.

The spectrum of the cooperations ranges from "minor" expert reports to major research contracts. Since there are so many cooperations between departments of the University Leoben and the economy and industry, the list is restricted to those cooperations with a contract value above 40,000 Euro in the year 2002.

A total of 75 projects which are mentioned below be-

longs to this category. 27 of the cooperating companies have their headquarters in Styria, a clear indication for the impetus given to the direct industrial environment by the University of Leoben.

44 foreign companies are also mentioned that assigned research contracts of a larger value to the University of Leoben.

CERAMICS		Department Partners
1. RHI AG, Vienna		
2. voestalpine Stahl Donawitz GmbH, Donawitz, Styria		
3. voestalpine Stahl Linz GmbH, Linz, Upper Austria		
Characterization, simulation and optimization of the behavior of refractory building material under mechanical and thermomechanical stress		Project
HERAKLITH GmbH, Fürnitz, Carinthia		Partner Project
Development of new binders for the building materials industry		
BÖHLER SCHMIEDETECHNIK GmbH & Co KG, Kapfenberg, Styria		Partner Project
Auxiliary substances for improved precision forge processes		
CONVEYING TECHNOLOGY		Department Partner Project
AMAG Ranshofen		
Tread plate profiles		
DOPPELMAYR, Wolfurt		Partner Project
Further development of RopeCon		
MONTAN SPEDITION, Kapfenberg		Partner Project
Development of a multifunctional container		
CHEMISTRY OF POLYMERIC MATERIALS		Department
All Projects in cooperation with POLYMER COMPETENCE CENTER LEOBEN (PCCL)		
BOREALIS GmbH, Linz; GABRIEL CHEMIE GmbH, Gumpoldskirchen; LENZING		Partner
PLASTICS GmbH & Co AG, Lenzing; POLOPLAST KUNSTSTOFFWERK GmbH & Co KG,		
Leonding		
PP-Based Substitution Materials for PVC with Flame Retardant Properties		Project
TICONA GmbH, Frankfurt;		Partner
SEMPERIT Technische Produkte GmbH & Co KG, Wimpassing		
Optimized Molecular Characterization of Synthetic and Natural Polymers of Ultra-High Molar Mass		Project
BOREALIS GmbH, Linz		Partner Project
Structural Characterization Tools for the Development of Heterophasic EP-Copolymers		

Department **ECONOMICS AND BUSINESS MANAGEMENT**
Partner IRONWORKS KRUPP MANNESMANN Ltd., Duisburg, Germany
Project Implementation of a Generic Management System

Department **ECO-SYSTEM ANALYSIS**
Partner NOPRO Wärmesysteme Ges.m.b.H., Katsch/Mur, Austria
 RANDA Group S.A., Barcelona, Spanien
 TECHNISCHE BÜRO SCHNEIDER, Trofaiach, Austria
 WAGNER Ges.m.b.H., Stallhofen, Austria
Project INSTITUT DE INNOVACIO EMPRESIAL ILLES BALEARES, Palma de Mallorca, Balears
 EU-Contract No. NNE5/2001/310 "Development of sustainable energy systems for communities adapted to different economic and environmental conditions in 5 European model regions"

Partner ARISTOTLE UNIVERSITY OF THESSALONIKI, Greece
 BULGARIAN ACADEMY OF SCIENCE, Sofia, Bulgarien
 UNIVERSITY OF SALZBURG, Austria
 FEDERAL INSTITUTE OF AGRICULTURAL ECONOMICS, Vienna, Austria
 GEO GROUP A.S., Ostrava, Czech Republic
 INTERCONSULT GROUP ASA, Fredrikstad, Norway
 INSTITUTE OF THE INDUSTRIAL ECOLOGY PROBLEM OF THE NORTH, Apatity, Russia
 TERRA ENVIRONMENTAL TECHNOLOGIES, Budapest, Hungary
 FRIEDRICH-SCHILLER-UNIVERSITÄT JENA, Germany
 UNIVERSITY OF MISKOLC, Hungary
Project EU-Contract No. QLK5-CT-2001-0401 "Innovative models of critical key indicators as planning and decision support for sustainable rural development and integrated cross border regional management in former Iron Curtain areas based on north to south European reference studies"

Department **FERROUS METALLURGY**
Partner voestalpine Stahl Donawitz
Project CD-Lab-Module: "Center Segregation in the Continuous Casting of High Carbon Rounds"

Partner voestalpine Stahl GmbH
Project CD-Lab-Module: "Structure and crack formation in the continuous casting of high strength microalloyed steels"

Partner VAI
Project CD-Lab-Module: "Deformation limits in softreduction of high carbon steels"

Partner voestalpine Stahl GmbH
Project Metallurgy of alternative lightweight steels

Partner BÖHLER EDELSTAHL GmbH & Co KG, Kapfenberg
Project Thermodynamic calculation of bath slag reactions

Department **GEOMECHANICS, TUNNELLING AND HEAVY CONSTRUCTION ENGINEERING**
Partners ALPEN STRASSEN AG
Project Rock mechanical laboratory tests and mineralogical analyses

MATERIALS SCIENCE AND TESTING OF PLASTICS

Voestalpine STAHL GmbH, Linz
Coil Coating

Department
Partner
Project

FACC AG, Ried/Innkreis
Adhesives for Phenolic Matrix Composites 1

Partner
Project

FACC AG, Ried/Innkreis
ISOVOLTA AG, Werndorf
Optimization of Resin Formulation

Partner
Project

IB STEINER, Spielberg
Case Studies

Partner
Project

ECONOMOS Austria GmbH, Judenburg
Elastomer Tribology

Partner
Project

SEMPERIT Techn.Prod. GmbH, Wimpassing
ECONOMOS Austria GmbH, Judenburg
Failure Behavior of Elastomers

Partner
Project

MECHANICAL ENGINEERING

BMW Motors, Steyr
Fatigue Analysis, modellization of materials behaviour

Department
Partner
Project

BÖHLER SCHMIEDETECHNIK, KAPFENBERG
Fatigue Behaviour of formed components

Partner
Project

PANKL, Bruck/Mur
Fatigue Behaviour of Drive Shafts

Partner
Project

JENBACHER AG
Fatigue Analysis of crankshafts

Partner
Project

MIBA
Fatigue Analysis of sliding bearings

Partner
Project

AAR
Fatigue Analysis of aerospace components

Partner
Project

MECHANICS

voestalpine Schienen GmbH
Modelling of the Deformation State and the Microstructure of Rails

Department
Partner
Project

voestalpine Eisenbahntechnik
Modelling of the Deformation State and the Microstructure of Crossings

Partner
Project

SGP Verkehrstechnik
Modelling of the Deformation State and the Microstructure of Wheels

Partner
Project

MINERAL PROCESSING

VOEST Alpine Erzberg GmbH
FFF-Project No.: 803 170; "Flue gas Steirischer Erzberg"

Department
Partner
Project

Department	MINING ENGINEERING
	together with the Department of MINERAL PROCESSING
Partners	DYNO NOBEL, Oslo, Norway UNION ESPANIOLA EXPLOSIVOS, Madrid, Spain CEMENTOS PORTLAND, Madrid, Spain NORDKALK PARTEK, Gotland, Sweden HENGL BITUSTEIN, Eibenstein, Austria SWEDISH ROCK RESEARCH ENGINEERING, Stockholm, Sweden ECOLE NATIONALE SUPERIEURE DES MINES DE PARIS, Paris, France ESCUELA DES MINAS, Madrid, Spain
Project	EU-project "Less Fines" production in aggregate and industrial minerals industry
Partner	NAINTSCH MINERALWERKE GmbH, Graz
Project	Feasibility study for a new underground mine in Austria
Partner	VAB SANDVIK, Zeltweg
Project	General co-operation contract for the development of new type of machines for the mechanical excavation of underground openings (tunnels, drifts) and mechanical exploitation of hardrock deposits

Department	NONFERROUS METALLURGY
Partners	CODELCO, Chuquimata, Chile NORANDA, Montreal, Canada ATLANTIC COPPER, Huelva, Spain UNION MINIÉRE, Olen, Belgium NORDDEUTSCHE AFFINERIE, Hamburg, Germany BOLIDEN MINERAL AB, Div.Copper, Sweden OUTOKUMPU OYI, Harjavalta, Finland
Project	Avoidance of short circuits in copper electrolysis
Partner	EU project
Project	Halocleanconversion
Partner	CBMM, Brazil
Project	Reduction of niobium pentoxide in a cyclone reactor
Partner	MONTANWERKE BRIXLEGG AG
Project	Secondary metallurgy of copper, refining processes
Partner	TREIBACHER INDUSTRIE AG
Project	Secondary metallurgy of ferroalloys, desulphurisation of ferroalloys, metallurgy of slags
Partner	RHI AG
Project	Gas treatment in the secondary metallurgy of aluminum and copper at the refining process
Partner	RAUCH SCHMELZTECHNIK GmbH
Project	Secondary metallurgy of magnesium, preheating of ingots
Partner	TRIBOVENT GmbH
Project	Splashing of metals and slags with reactive gases

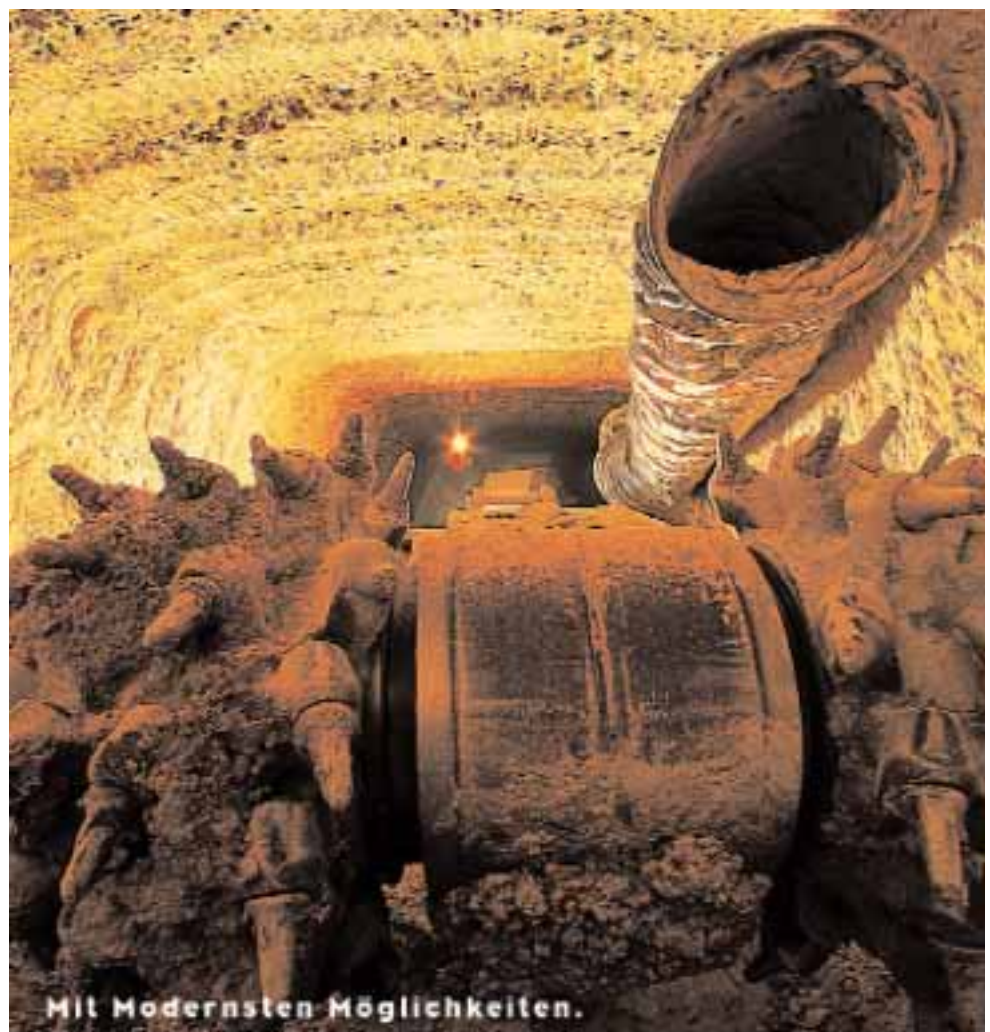
PETROLEUM ENGINEERING voestalpine Stahl, Linz; RHI AG, Leoben Vortex Formation RHI AG, Leoben Corrosion MAGNA-STEYR ENGINEERING, Graz; MESSER AUSTRIA, Gumpoldskirchen Kryogenic Tank LENZING AG, Lenzing Process Simulation Cellulosis Production WINDHAGER AG, Seekirchen Porous Burner VAI, Linz Cowper SIEMENS AG, Graz; CENTRE D'ETUDES DES TUNNELS, France; LYON-TURIN FERROVIAIRE, Italy; FEUERWEHR STADT DORTMUND, Germany; EUROPEAN VIRTUAL ENGINEERING S.A., England EU project "Virtual Fires" AVL LIST GmbH, Austria; BOSCH GmbH, Germany; JOHNSON MATTHEY PLC, England; CENTRO RICERCHIE FIAT, Italy; ZEUNA-STÄRKER GmbH, Germany; CUTEC GMBH, Germany EU project "Syloc-Dexa"	Department Partners Project
	Partner Project
	Partners Project
	Partner Project
	Partner Project
	Partners Project
	Partners Project
	Partners Project
	Partners Project
	Partners Project
PROCESS ENGINEERING AUSTRIAN ENERGY & ENVIRONMENT AG, Graz, Austria Multi-phase flow simulations in Turbosorp reactors ECKART Granules, Austria Aluminium powder production by two-fluid melt atomisation BRAU UNION Austria Internal use of spend grains ROHRER GmbH, Austria Low emission process for the cleaning of oil tanks SAUBERMACHER AG, Austria Material recycling of retired acetylene gas bottles VOESTALPINE INDUSTRIEANLAGENBAU, Austria Reduction of Dioxins/Furans & VOC's in the waste gas from electric arc furnace SAG LEND, Austria Reduction of the Dioxin/Furan emissions in the secondary aluminium industry LENZING AG, Austria Recovery of Zinc from effluents in the viscose industry EU-Project as subcontractor for the VOEST-ALPINE INDUSTRIEANLAGENBAU, Austria Zero Waste Steelworks	Department Partner Project
	Partner Project
	Partner Project
	Partner Project
	Partner Project
	Partner Project
	Partner Project
	Partner Project
	Partner Project
	Partner Project

Department	METAL PHYSICS
Partner	MATERIALS CENTER LEOBEN
Project	T5, SP8, SP9
Partner	EURATOM
Project	EUP0037 & BWK0095

Department	PHYSICAL METALLURGY AND MATERIALS TESTING
	Together with the research institutions: Institute of Chemical Technologies and Analytics, Vienna University of Technology; Joanneum Research Ltd, Laser Center Leoben; Department of Structural and Functional Ceramics; Institute of Materials and Machine Mechanics, Slovak Academy of Sciences
Partner	BÖHLER YBBSTAL Band GmbH & Co.KG
Projects	Bi-metal strips with user defined properties manufactured by laser technology
	Together with the research institutions: Department of Chemistry of Polymeric Materials; Department of Plastics Processing
Partners	BÖHLER YBBSTAL Band GmbH & Co.KG; BÖHLER Edelstahl GmbH & Co.KG; BÖHLER Bleche GmbH; Uddeholm Tooling AB; RÜBIG GmbH & Co.KG
Project	Adhesive wear of cold work and plastic mould steels
	Together with the research institutions: Department of Metal Physics; Department of Physical Metallurgy Freiberg (D)
Partner	PLANSEE AG
Project	Induction vacuum plasma spraying of reinforced refractory metal coatings
	Together with the research institutions: Department of Metal Physics
Partners	PLANSEE AG; CERATIZIT AG
Project	High Wear-Resistant Low-Friction Hard Coatings for Tooling Applications

Department	WASTE MANAGEMENT AND LANDFILL TECHNOLOGIES
Partner	FEDERAL MINISTRY OF AGRICULTURE Forestry Environmental and Water Management
Project	Waste fractions with high calorific value retrieved from mechanical treated waste (MT) and mechanical biological treated waste (MBT)
Partners	CITY OF VIENNA (MA 48) and AUSTRIAN INSTITUTE FOR APPLIED ECOLOGY
Project	Scientific study about the possibility regarding avoidance, material recovery and treatment of demolition waste in Vienna
Partner	The AUSTRIAN INDUSTRIAL RESEARCH PROMOTION FUND (FFF)
Projects	1. Development of an EDP-aided decision support model for the reuse of brownfields 2. Utilization of granite residues 3. Feasibility and risk assessment of recovery fuels in incineration plants
Partner	OESTERREICHISCHE NATIONALBANK
Project	Benchmarking in Waste Management

Department	STRUCTURAL AND FUNCTIONAL CERAMICS
Partner	EPCOS OHG; Deutschlandsberg, Styria
Project	Development of FE-Modells for the simulation of thermistors
Partners	SNECMA (F), VOLVO Aero (S), INTERTURBINE (NL), SULZER INNOTECH (CH), ONERA (F), JRC (NL), DLR (D), RWTH (D)
Project	High Insulation Thermal Barrier Coatings (HITS)



Mit Modernsten Möglichkeiten.

WIR BRINGEN'S ANS LICHT.

Die Geschichte des Bergbaus ist untrennbar mit einem Schatz verbunden, den uns das gipfelnreiche Erbe der Jahrtausende hinterlassen hat: Salz. Diese Kostbarkeit hat bis heute nichts von ihrem Wert verloren – als unverzichtbares Nahrungs- oder Wärmemittel wie als wesentlicher Bestandteil ausgiebiger Ernährung. Effiziente Abbaumethoden unter Nutzung modernster, weltführender Technik sowie das Know-how hochqualifizierter Spezialisten sichern den allgemeinen Kompetenzvorsprung des Unternehmens.

Salinen Austria – innovative Salzförderung im Einklang mit der Natur.



Discussing Knowledge –

Science thrives on the exchange of experience and ideas. In the year 2002 the departments organized 22 academic events in total, 11 events took place in Leoben itself.

The convention "Knowledge Management - Concepts and Field Reports on Practical Experience" took place on April 10 and 11 at Semmering, it dealt with trend-setting developments for successful companies and institutions. The main focus was on a very comprehensible presentation of theoretical concepts and their implementation in the operational or institutional context. The convention was organized by the Department of Economics and Business Management and the Industrial Liaison Department, both at the University of Leoben, in cooperation with the "Knowledge Management Forum".

The 46th Austrian Foundry Conference took place on April 18 and 19 in Leoben. More than 200 experts from all over Europe met to exchange experiences in new technologies implementations in the foundry sector. Main motor in research is automobile industry. This international expert conference was organized by the Austrian Foundry Institute (ÖGI), which can look back on almost fifty years of history. Co-organizer of this conference was the Department of Foundry Technology at the University of Leoben and the Association of Foundry Experts, Vienna.

At the 52nd Annual Meeting of the Austrian Physical Society, 200 physicist met at the University of Leoben from September 23 to 26. The new challenges of nanotechnology were the main focus. This event was organized by the Departments of Metal Physics and Physics and the Erich Schmid Institute of the Austrian Academy of Sciences. More than 200 participants from research and science attended the meeting and about 50 pedagogues came to the final "teacher's day".

The symposium DepoTech 2002 stayed abreast of changes in content in environmental engineering from November 20 to 22 at the University of Leoben. This time, the biggest Austrian symposium in this field, which takes place every other year in Leoben, concentrated on the avoidance and reduction of waste and emissions, that is effluent free manufacture by material flow management. Traditional areas such as rehabilitation of contaminated sites and thermal utilization of waste are certainly also represented. Other important issues of DepoTech 2002 were management systems, eco-balancing and process optimization.

Conference on "Geometry and Analysis"

Organization Department of Applied Geometry
Department of Mathematics and Statistics
Location Szentgotthárd (H)
Date January 15

Virtual Worlds - New Chances for Science and Economy

Organization Department of Petroleum Engineering
(CD-Lab for Applied Thermofluid-dynamics)
Location University of Leoben
Date January 18

273rd WE-Heraeus Seminar, Micro to Macromechanics of Hierarchical Living Materials and Technical Structures

Organization Department of Metal Physics
Location Physikzentrum Bad Honnef (D)
Date February 25-28

21th Plastic Deformation Colloquium

Organization Department of Plastic Deformation and Plant Machinery
Location Planneralm (A)
Date March 3-9

Exchanging Experience

Knowledge Network

Organization Department of Economics and Business Management
Location Semmering (A)
Date April 10-11

Microstructure and Fracture

Organization Department of Structural and Functional Ceramics
Location Leoben
Date April 10-12

48th Symposium on Physical Metallurgy

Organization Department of Physical Metallurgy and Materials Testing
Location Lech am Arlberg (A)
Date April 15-17

46th Austrian Foundry Conference

Organization Austrian Foundry Institute (ÖGI)
Location Leoben
Date April 18-19

Raw Materials Conference 3M: Mining.Metallurgy@3.Millennium

Organization Department of Mining Engineering
 Department of Nonferrous Metallurgy
Location Vienna
Date May 29 - June 1

Recycling in the automotive industry

Organization Department of Waste Management and Landfill Technologies
Location Leoben
Date June 20

5th Material Physics Symposium

Organization Department of Metal Physics
Location Schloss Seggau (A)
Date July 5-7

Bulk Material Symposium

Organization Department of Conveying Technology
Location Munich
Date September 5-6

11th International Metallography Conference

Organization Department of Physical Metallurgy and Materials Testing
Location University of Leoben
Date September 11-13

Conveying Technology Conference

Organization Department of Conveying Technology
Location Sofia
Date September 11-15

Pyrolysis 2002

Organization Department of Chemistry of Polymeric Materials
Location University of Leoben
Date September 17-20

52nd Annual Meeting of the Austrian Physical Society

Organization Department of Metal Physics
Location University of Leoben
Date September 23-26

Process-oriented plant management

Organization Department of Economics and Business Management
Location Semmering (A)
Date October 9-10

Geotechnical measuring for the extraction of raw materials and for tunnelling

Organization Department of Mining Engineering
Location University of Leoben
Date October 24-25

New Media Day

Organization Department of Ceramics
Location University of Leoben
Date October 24

Ceramics Colloquium

Organization Department of Ceramics
Location University of Leoben
Date October 25

DepoTech 2002

Organization ARGE DepoTech
Location University of Leoben
Date November 20-22

4th Austrian-French research seminar on problems in raw materials extraction

Organization Department of Mining Engineering
Location Fontainebleau, Nancy (F)
Date December 18-20

Going Public

The academic performance, which can be demonstrated by the number of publications, is worth mentioning. If all submitted publications of the year 2002 are added, then there is a total of 1045 publications.

PUBLICATIONS AT THE UNIVERSITY OF LEOBEN			
	2000	2001	2002
Reviewed publications	257	255	287
Publications	149	140	173
Textbooks and reference books	13	9	11
Academic lectures and posters	505	432	574
TOTAL:	924	836	1045

StadtKraftWerk Leoben



Heimische Energie aus Wasser

Das neue StadtKraftWerk Leoben wird das bereits 100 Jahre alte Kreml-Wasserkraftwerk, eine traditionelle Energiequelle Leobens, ersetzen. Geplant ist, das alte Kraftwerk stillzulegen und im Bereich des jetzigen Wehres ein neues Klein-Wasserkraftwerk in der Mur zu bauen. Das alte Ausleitungskraftwerk wird durch ein neues Laufkraftwerk ersetzt.

Die VERBUND-Austrian Hydro Power AG (AHP), als Planer und Errichter des neuen Stadt-KraftWerkes, ist auch in Leoben bestrebt, den Strom unter größtmöglicher Bedachtnahme auf die Umwelt zu gewinnen. Das heißt, mit Rücksicht auf die Interessen der in Leoben wohnenden Menschen und im Einklang mit dem Stadtbild und der Natur.



Thank you!

The University of Leoben has to rely on the support by its friends, sponsors and benefactors in its efforts to further develop the opening to the public.

The following individuals and institutions donated money for advertising and public relations in 2002.

Many thanks!

More than 35 Euro

Gesellschaft von Absolventen und
Freunden der Montanuniversität Leoben
(Society of Alumni and Friends of the
University of Leoben)
Stadtgemeinde Leoben
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Hellmut Longin
Ebner Industrieofenbau
Günter Petzow
Helmut Moitzl
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BMG Metalle u. Recycling GmbH
Wirtschaftskammer Steiermark
Lafarge CTEC
Karl Leitner
H. J. Mauritsch

Up to 35 Euro

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Unprecedented

The PracticeCheck campaign as a reimbursement for the tuition fees turned out to be a continuous success. Sponsors supported the students of the academic years 2001/02 and 2002/03 with 909 checks.



The PracticeCheck combines practical work experience, mandatory for all degree programs, with the financing of the tuition fees.

The University of Leoben started an unprecedented campaign to cushion the impact of the tuition fees introduced in the winter semester 2001/02. Companies and institutions, for which it is of great interest that the University of Leoben produces as many graduates as needed, were asked to support this campaign.

The result was remarkable and unique. Companies, institutions and even private persons made 909 checks of roughly 332,000 Euro in total available for students in the academic years 2001/02 and 2002/03.

The PracticeCheck is unbureaucratic, flexible and individually applicable, it combines practical work experience, mandatory for all degree programs, with the financing of the tuition fees.

Practical work experience is an essential part of the education. Six months in total are obligatory for the diploma examination. The PracticeCheck is therefore linked to at least 2 weeks of practical work for which the students will receive ☐ 365 in addition to the regular payment.

No.Sponsor

80	voestalpine Konzern
50	Stadt Leoben
40	OMV
30	VAI
30	Dipl.-Ing. F. ZAGLOUL
27	EHÖ
25	Böhler Uddeholm
25	Fachverband Stein & Keramik
25	Professorenverband
25	BP
20	AMAG
16	RAG
15	SAG
15	Böhler Edelstahl
12	RHI
12	Eng.Center Steyr
12	Dr. Longin
12	Veitsch Radex
10	Metallkunde, Prof.Jeglitsch
10	BKS
10	Heraklith
10	VLK
10	AT&S Leoben
10	Schlumberger

Activity continued

10	VERITAS-VES	3	Cincinnati Extrusion GmbH
10	Energie Stmk Holding AG	3	Geberit Produktions GmbH
9	Lafarge	3	ISOVOLTA
8	Institut für Geowissenschaften	3	Hilti AG
8	Weatherford Oil Tool GmbH	3	Böhler Schmiedetechnik
8	Marienhütte	2	Dr. Pöhl, Rektor
8	INTECO GmbH	2	VLW
8	Winters Hall AG	2	Stahl Judenburg
7	VA Bergtechnik	2	Brauerei Puntigamer
6	Steirische Ferngas	2	Metallphysik, Prof. Fratzl
6	Bergbaukunde, Prof. Wagner	2	Markscheidekunde
6	Plansee	2	DI Mosser
6	WIKÄ Kärnten	2	EudT, Prof. Lorber
6	FV Gießerei	2	KT, Prof. Langecker
6	Lafarge Perlmooser	2	Wolfram Bergbau- u. Hüttenges.
6	Prof. Dr. W. Krieger	2	Prof. Knappe
5	Brauerei Gösser	2	max.mobil
5	ECONOMOS	2	Automation, Prof. O'Leary
5	C!Schacht	2	Compact Druck
5	Bayer Austria GmbH	2	Treibacher Auermet
5	Bayer Austria GesmbH	2	IBS Austria
5	RWE-Dea AG	2	Chemie d.Kstoffe, Prof.Lederer
5	Knapp Systemintegration GmbH	2	FV Bergwerke
5	Logistik Club Leoben	2	Universal Druckerei
5	Logistik Center Leoben	2	Werkstoffkunde
5	Wirtschaftsinitiativen Leoben	2	Philips Semiconductors
5	Südsteir. Weinlandregion Leibnitz	2	Prof. Heinemann
4	ISFK, Prof. Dr. Danzer	2	Andritz KG
4	DI Schuscha	2	Fa. Saubermacher
4	Omya	2	RAIKA Leoben
4	BVO	2	Siemens
4	Keller Grundbau	2	SPK Leoben
4	LH Schögg	2	Funder
4	Philips Haushaltsgeräte	2	Rosendahl Maschinen GmbH
4	Treibacher Ind.-Powdermet	2	PM Lucas Enterprises Ltd.
4	Treibacher Ind.-Alloymet	2	OMV Cogeneration GmbH
4	AEVG	2	Norske Skog Bruck GmbH
4	Luzenac Naintsch	2	Solutia Austria GmbH
4	Gmundner Zement	2	Sparkasse Leoben
4	SML Lenzing	2	Verein der Umwelttechniker
4	FCI Mattighofen	2	Senoplast Klepsch & Co GmbH
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4	Fa. Sattler AG	1	GR H. Tischhardt
4	VTU-Engineering GmbH	1	ISOVOLTA
4	Lafarge CTEC	1	Winterthur Technologie GmbH
3	Theysohn Extrusionstechnik	1	Reicher Feuerungs GmbH
3	Buntmetall Amstetten	1	EMS-Grivory
3	Arkadenhof	1	Pipelife Austria GmbH
3	Fa. Engel	1	Gabriel-Chemie GmbH
3	Fa. MIBA	1	Binder + Co AG
3	Institut für Geophysik	1	Tribovent Verfahrensentwicklung
3	BAWAG Leoben	1	Böhler Ybbstal Band
3	Head Sport AG	1	Dr. Ch. Schmid

PERMANENT POSITIONS			
	YEAR 2000	YEAR 2001	YEAR 2002
University Professors	40	40	41
Academic staff (professors excluded)	147,5	143	143
Non-academic staff	211,5	216	218,7
TOTAL	398	399	402,7
Number of permanent positions in the given calendar year			

Not all permanent positions were occupied continuously in 2002. When employment is ended by retirement, termination of contract or - rather seldom - by dismissal or even death of the employee, a vacancy over a long period is the rule. As for re-appointments in the groups "academic junior faculty" and non-academic staff there are budgetary reasons for a longer vacancy. Is there a longer vacancy due to the sudden leave of a professor then mainly the problems at the search for eligible candidates impede a fast reappointment. One of the 41 Chairs, mentioned above, is a foundation Chair, which is financed by industry.

Faculty and Staff

In addition to permanent positions the university management knows of the following private employees, employed by the departments within the framework of their restricted legal capacity for contractual research projects.

2002

Academic staff: 220 persons, a total of 129.85 man-years
Non-academic staff (incl. student assistants): 67 persons, a total of 25.98 man-years

2001

Academic staff: 175 persons, a total of 80.05 man-years
Non-academic staff (incl. student assistants): 86 persons, a total of 21.81 man-years

2000

Academic staff: 148 persons, a total of 71.75 man-years
Non-academic staff (incl. student assistants): 52 persons, a total of 19.03 man-years

UTILIZABLE SPACE

YEAR 2000	YEAR 2001	YEAR 2002
47.977	47.977	47.977

Utilizable space at the University of Leoben in m² incl. hallways and sanitary facilities

EVENTS

	2000	2001	2002
Own events	80	74	70
External events	10	12	14
TOTAL	90	86	84

Events took place in the lecture halls

All data on premises and facilities of the University of Leoben in the period from 2000 to 2002 are summed up in the opposite chart. In 2001 23 lecture halls and seminar rooms were available which were used to 73 % of capacity by courses in the summer semester 2002 from Monday to Friday between 8 am and 6 pm. Next to teaching another 84 events took place in the lecture halls in the year 2002, thereof 70 which were organized by university members.

Compared to the previous year no floor space was added.

Energy and Floor Space

The considerable reduction of energy costs in 2002 at only minimally lower energy consumption is a result of new contracts with gas and energy suppliers.

Energy Statistics

	2000		2001		2002	
	Amount	Euro	Amount	Euro	Amount	Euro
tons diesel	6.9	3,873	3.3	3,259	2,8	2,547
tons fuel oil ultra-light	3.3	1,424	5.0	2,646	6,7	2,230
m ³ gas	455,580	175,316	582,873	319,374	534,944	199,670
kWh electricity	2,656,407	308,750	2,900,654.5	305,775	2,831,925	289,009
Total (Euro)		489,363		631,054		493,456

Financial

BUDGET DISTRIBUTION			
	YEAR 2000	YEAR 2001	YEAR 2002
UT 0 (personnel expenses)	EURO	EURO	EURO
Personnel incl. DGB	16,516	17,088	17.184
Visiting professors incl. DGB	16	7	20
Allowances for faculty members	65	74	69
Total expenses UT 0	16,598	17,169	17.273
UT 3 (Investments)			
Appointments - Investments	304	719	446
Investments Departments	473	611	865
Investments Service Sector	209	388	727
Miscellaneous	24	64	
Total expenses UT 3	1,009	1,782	2.038
UT 7 (External Teaching)			
Academic staff in training		12	142
Adjunct faculty and visiting professors	539	545	596
Visiting lecturers	28	35	22
Student assistants and tutors	136	149	162
Occupational pension costs	162	164	212
Total expenses UT 7	866	905	1.134
UT 8 (Operating expenses)			
Operating expenses of departments	1,620	1,544	1.864
Operating expenses incl. services and others	3,369	3,654	4.122
Internationalization	57	42	68
Z-Posts (imbursements, contributions)	167	168	172
Total expenses UT 8	5,214	5,408	6.226
TOTAL	23,686	25,264	26.671
Allocation of Budget in EURO 1000 (rounded)			

THIRD PARTY INCOME			
	YEAR 2000	YEAR 2001	YEAR 2002
	EURO	EURO	EURO
Third Party Income (for investments & personnel)	6,969	7,452	7,897
Income of the departments for finished projects in the given calendar year in EURO 1000			

Report

The budget allocation in the financial year shows a principally positive development. 1,235,000 Euro were allocated from the "university billion".

Personnel costs

The increase in personnel costs can be attributed mainly to the assignment of newly established posts, to pay rises and to the structural effect. Nevertheless, about 6 % of the vacant jobs - during the full working year - could not be filled.

Investments

Fortunately the investments could be increased. Due to the allocation from the university billion more means could be provided for the equipment of EDP-project rooms for students, for appliances and laboratory equipment, mainly for teaching but also for the complete redevelopment of the electrical engineering lecture hall and for other projects.

The amount of 446,000 Euro was allocated for new appointments, other means were allocated to the departments and service institutions as well.

External teaching

The table on the left shows that the budget volume for external teaching and for academic staff in training could be increased from 905,000 Euro to 1,134,000 Euro. Therefore teaching could be continued at the qualitatively high level in the sense of the main focus of the University of Leoben on the one hand, on the other hand efficiency bonuses could be paid.

Operating costs

Mainly due to the allocation of the university billion several projects with the main focus on education could be realized in this area. Additionally a lift for the handicapped could be installed in the main building. More money could also be used for the project "KAT 5- Wiring".

The Industrial Liaison Department received a supplementary grant of 195,000 Euro.

Budgetary Priorities

Following priorities concerning the allocation of the budget were set:

- keeping of appointment commitments
- Intensification of public relations and internationalization
- Installation of a lift for the handicapped in the main building
- Investments for the improvement of study conditions
- Chip-card for students
- Kat 5-wiring

Excellent!

Honors and awards for scientists at the University of Leoben



"Mines Medal": Prof. Dr. Brigitte Weinhardt



Fred Margulies Award: Dr. Franz Pernkopf



Award of the Austrian Mathematical Society: Prof. Dr. Jörg Thuswaldner

Prof. Dr. **Georg Walach** and Hon.Prof. Dr. **Hubert Preßlinger** were awarded the "Golden Medal of the Province Styria". The medal was awarded for "archeological studies in mining in the Palten-Liesingtal region".

Em.Prof. Dr. **Eugen Stumpf** was bestowed the title "Honorary Doctor" of the Natural Sciences Faculty of the University Oulu, Finland.

At the Technical University Kosice, the academic board of the Department Mining Engineering decided to bestow the title "Doctor Honoris Causa" upon Em.Prof. Dr. Dr.h.c.mult. **Günter Fettweis**. He also received the "Golden Medal of the City of Leoben".

At the University Miskolc, the senate of the faculty Mechanical Engineering decided to bestow the title "Professor Honoris Causae Facultatis Mechanicae Universitatis Miskolciensis" upon Prof. **Wilfried Eichlseder**.

Em.Prof. Dr. Dr.h.c. **Franz Jeglitsch** received the Great Golden Medal of the Austrian Republic for his achievements for the Austrian Republic.

At the Colorado School of Mines the Board of Trustees decided to award the "Mines Medal" to Prof. Dr. **Brigitte Weinhardt** for exemplary achievements for CSM.

The senate of the University Miskolc bestowed the title "Doctor Honoris Causa" upon Prof. Dr. **Jürgen Wolfbauer** in the course of the commencement ceremony at Miskolc.

Dr. **Peter Supancic**, university assistant at the Department of Structural and Functional Ceramics, received the Georg Sachs Award of the German Society for Materials Science for his metallurgical research closely related to practical implementation.

In honor of his innovative research in self-organization phenomena in semiconductor technology Dr. **Christian Teichert**, Professor at the Department of Physics, received the Gaede Prize 2002 of the German Vacuum Society.

The Fred Margulies Award of IFAC (International Federation of Automatic Control) goes to Dr. **Franz Pernkopf** at the Department of Automation. In cooperation with voestalpine Donawitz and MecCom Kindberg he developed an excellent procedure for automated defect

detection in metallic surfaces.

In honor of his excellent research results in the field of traction current supply, Dr. **Andreas Schmidhofer** at the Electrical Engineering Department received the sponsorship of the Society of Measurement and Automation Technology.

The **Department of Economics and Business Management** received the award in the field of knowledge management at the 6th Speyer quality contest for public administration for innovative knowledge management and the development of a knowledge balance.

Dr. **Jörg Thuswaldner**, professor at the Department of Applied Mathematics, received the award of the Austrian Mathematical Society for his scientific publications.

Prof. Dr. **Franz Dieter Fischer**, head of the Mechanics Department, was appointed visiting professor for three years beginning in October at the Erich-Schmid-Institute for Material Sciences of the Austrian Academy of Sciences.

In recognition of his work on surface engineering, Prof. Dr. **Christian Mitterer** (Department of Physical Metallurgy and Materials Testing) was presented the Hans Malzacher Award of the Austrian Society for Metallurgy and Materials.

Prof. Dr. **Peter Fratzl**, head of the Metal Physics Department, and six other scientists received the Herbert Czitober Research Award of the Austrian Society of Research in Bone Material and Mineral Metabolism for his research in age- and genotype dependence of bone material properties in the osteogenesis imperfecta murine model.

Dr. **Martin Mlacnik**, staff member at the Petroleum Engineering Department, received the Erwin-Schrödinger-Scholarship of the FWF for one year of research at Stanford University.

Prof. Dr. **Zoltan Heinemann**, head of the Petroleum Engineering Department, was appointed distinguished lecturer by the Society of Petroleum Engineers, USA.

Two staff members at the Department of Economics and Business Administration received the science award of the Federation of Austrian Industry (Industriellenvereinigung): Dr. **Karl Hall** and Dr. **Jochen Sagadin**.

Honors, awards and appointments by the University of Leoben

Youngest professor

With his ideas for research and teaching the new professor at the Petroleum Engineering Department Dr. **Gerhard Thonhauser**, who was tenured on November 1, 2002, wants to upgrade the division drilling engineering into an international center of well-drilling data analysis. At the age of 33 years, Dr. Thonhauser is the youngest professor at the University of Leoben. He graduated from the University of Leoben and there he also finished his doctoral thesis, on which he had worked in Australia. After graduation he founded the TDE Thonhauser Data Engineering GmbH, which operates internationally in the field of data analysis for petroleum industry.

Schumacher succeeds Bührig-Polaczek

On December 2, 2002, Prof. Dr. **Peter Schumacher** succeeded Prof. Dr. Andreas Bührig-Polaczek. Like his predecessor he will head both the Austrian Foundry Institute and the Department of Foundry Technology. With Peter Schumacher, born 1964 in Bremen, the University of Leoben succeeded in obtaining an already well-known young and ambitious professor for foundry technology. Schumacher was awarded his doctoral degree at the University of Cambridge, Department of Materials and

Metallurgy. Since 1989 he was on the academic staff and a scientist in diverse research institutions in Germany and England. He lectures at the University of Oxford and received several awards and fellowships for his research.

Honorary citizen

In the course of the commencement ceremony on June 21, Hofrat Dr. **Peter Piffel-Percevic** was awarded the title of a honorary citizen. For years Dr. Piffel-Percevic has been a friend of the university, he not only backed it up in both word and deed, he also supported it considerably with his high interest. Hofrat Piffel-Percevic is also a member of the university council.

Erzherzog Johann medal

The Erzherzog Johann medal in bronze was awarded to Dr. **Erika Augustin**, the Erzherzog Johann medal in silver was awarded to Dipl.-Ing. Dr. mont **Alfred Moser**.

Honorary senator

Dkfm. Dr. **Ernst Pöcksteiner** was awarded the title honorary senator for his essential contribution to the further development of the university concerning the strengthening of the location and the upgrading of the field of studies Plastic Engineering.



Prof. Dr. Gerhard Thonhauser



Prof. Dr. Peter Schumacher

IN MEMORIAM

In 2002 the University mourned the loss of well-known scientists and personalities:

On February 18, 2002, Associate Professor Dr. Wolfgang Aggermann-Bellenberg died. He became an associate professor in 1973 and the head of the division plant machinery at the Department of Plastic Deformation and Plant Machinery. Dr. Aggermann also taught metallurgy at the Secondary Technical College for Metallurgy, worked as a consulting engineer, he was the first president of the Kiwanis-Club Leoben, and also a "philistine senator" of the fraternity K.Ö.St.V. Glückauf for many years.

On July 11, 2002, Dr. Wilhelm Denk died. Dr. Denk was honorary citizen of the University of Leoben and honorary president of the Historical Mining Society. His main concerns were the increase in the number of conferences and symposiums hosted at the university, the monthly mining and metallurgical booklets as a magazine of the university, the construction of the Erich Schmid-Institutes for Solid-State Physics of the Academy of Sciences, which is closely connected with the university, and the cultivation of history, art and culture of mining and metallurgy.

The deceased will always be remembered at the University of Leoben.

Excellent! (continued)

Honors and prizes for graduates and students at the University of Leoben

Rector-Platzer-Ring

On the occasion of the 125th anniversary celebrations of the University of Leoben, the former "Mining Academy", an honorary ring - the Rector-Platzer-Ring - was donated for graduates who completed their studies with honors. Representatives of this foundation are "ASMET" (Austrian Society for Metallurgy) and the Austrian Mining Association as founding members as well as the "Austrian Society of Petroleum Engineering" and the "Union of Plastic Engineers in Leoben".

In a meeting on February 26, 2001 the board of professors decided not to award the Rector-Platzer-Ring to students anymore who only passed the third stage of study in Leoben. New guidelines for the award of the Rector-Platzer-Ring were also set up in 2001:

1. the third diploma examination must be passed with distinction
2. the GPA of all diploma subjects of the II. and III. diploma examination including the grade of the thesis must be better or equal to 1.5
3. No grade may be worse than "average" on all course and diploma exams during the II. and III. stage of study.
4. The total number of semesters taken must not exceed 12.

In 2002 the following ladies and gentlemen were awarded the Rector-Platzer-Ring at commencement:

Dipl.-Ing. Christoph Zinner,
Petroleum Engineering
Dipl.-Ing. Stefan Baumgarthuber,
Petroleum Engineering
Dipl.-Ing. Marco Christoph Haverl,
Petroleum Engineering
Dipl.-Ing. Werner Schinagl.

Petroleum Engineering
Dipl.-Ing. Stefan Pöllitzer,
Petroleum Engineering
Dipl.-Ing. Ulrike Prenner,
Petroleum Engineering
Dipl.-Ing. Barbara Maria Schatz,
Petroleum Engineering
Dipl.-Ing. Gerhard Günther Bittner,
Metallurgy
Dipl.-Ing. Harald Johann Weger,
Mechanical Engineering
Dipl.-Ing. Florian Georg Grün,
Mechanical Engineering
Dipl.-Ing. Peter Schalk,
Mechanical Engineering
Dipl.-Ing. Ulrike Ingeborg Hain,
Materials Science
Dipl.-Ing. Robert Josef Minichmayr,
Materials Science
Dipl.-Ing. Elmar Arno Klausecker,
Industrial Environmental
Protection
Dipl.-Ing. Alexander Schmiderer,
Applied Geosciences
Dipl.-Ing. Walter Kosi,
Applied Geosciences
Dipl.-Ing. Rene Eugen,
Plastic Engineering
Dipl.-Ing. Dietmar Gruber,
Ceramics

Conferment of Golden Engineering and Doctor Diplomas

The Golden Engineering Diploma was conferred to the mining engineers Angerer, Essl, Göbner, Kink, Kortan, Kunert, Schachinger, Sterk, Trattner and to the metallurgical engineers Altmann-Althausen, Beck, Krön, Kübel, Ortner, Rätsch, Schlager, Tarmann, Zauner at Commencement on June 21

RAG Sponsorship

Jürgen Dreier received the 1st RAG sponsorship of 3,500 Euro for his previous academic performance. In the following year Mr. Dreier will spend one semester at the partner university Colorado School of Mines. Two additional RAG sponsorships of 2,000 Euro each were awarded to the students Andreas Berger and Michael Lechner.

Environmental Research award of voestalpine Stahl AG

This prize is awarded for excellent diploma and doctoral theses which contribute essentially to the enhancement of environmental protection. The first prize amounts to 3,635 Euro, the second to 2,910 Euro and the third to 2,180 Euro. In 2002 the laureates were Dipl.-Ing. Alexander von Zitzewitz, Dipl.-Ing. Gernot Graller-Kettler and Dipl.-Ing. Michael Schwarz.

Prof. Dr. Rudolf Posselt's Travelling Fund

A scholarship from the Prof. Dr. Rudolf Posselt's Travelling Fund was awarded to Dipl.-Ing. Jürgen M. Lackner at the Department of Physical Metallurgy and Material Testing. The scholarship is meant for study trips and research in the course of the academic training.

Huber + Suhner Award

The Huber + Suhner Award was received by Dipl.-Ing. Gerald Berger. This prize is awarded to degree program students or graduates from the University Leoben for outstanding diploma theses in the field of plastic engineering.

Magna-Steyr-Award

Dipl.-Ing. Thomas Trinkl recently received the second prize of the Johann Puch Award for Excellence in Automotive Engineering from the company Magna-

Steyr for his examination of petrol tank corrosion. Dipl.-Ing. Thomas Trinkl did extensive research in the optimization of materials and production methods at the Department of General and Analytical Chemistry and at the Department of Physical Metallurgy and Material Testing. The company Tesma Highly Engineered Engine and Transmission Systems Sinabelkirchen supported this research financially. The results of the corrosion examination led to clear problem specifications for production industry, which can be implemented and realized immediately in the production process.

GDMB-Badge

Dipl.-Ing. Petra Süß, former diploma student at the Department of Nonferrous Metallurgy, received the "Redenplakette" of the German Company for Mining, Metallurgy, Material and Environmental Engineering (GDMB) when she passed her diploma examination with distinction. Süß is the first metallurgy graduate who passed the course of studies with distinction.

Automotive Association

Dipl.-Ing. Florian Grün, graduate of the degree program Mechanical Engineering received the award of the Austrian Automotive Association for his diploma thesis "Form and topology optimization in consideration of fatigue strength".

RHI Student Support Program

The RHI-AG program supports first-year students and students in higher semesters with excellent performance at school and university. In 2002 the prize went to:

Thomas Auer,
Josef Domitner,
Eva-Katharina Fischböck and
Manuela Janesch.



Festivities and Events

In addition to traditional festivities such as the "Ledersprung" or the university ball numerous events took place in 2002.

Numerous celebrities and delegations visited the University of Leoben again in the year 2002. Some summaries and highlights of the events that took place at the university are listed below.

Money Maker

On February 25 Dr. Klaus Liebscher, governor of the Austrian National Bank, and 12 governors of the European Central Bank gave a speech on the topic Euro.

"Montanistischer Abend"

This time the "Montanistischer Abend" on March 20 was organized by the fraternity Zornstein. This evening is meant for all those university members that have had relatively little experience with the "Glückauf"-culture. The lecture of Dr. Lieselotte Jontes, manager of the university library, was an essential contribution to the success of the evening. She conjured up student life dating from Peter Tunner until after the second world war very vividly.

Libyan petroleum industry in Leoben

In a "letter of understanding", the intensified collaboration between the umbrella organization of the Libyan petroleum industry corporation N.O.C. (National Oil Corporation) and the University of Leoben was confirmed. Zayed Ali Wanis, one of the top managers of N.O.C., signed an agreement for a simpler processing of the student exchange program of the degree program Petroleum Engineering in March.

OMV CEO and Chairman of the Board Ruttenstorfer

The traditional cooperation of the Austrian petroleum and natural gas corporation OMV and the University of Leoben was confirmed by the visit of CEO Dr. Wolfgang Ruttenstorfer on May 8. In general Ruttenstorfer pointed out the "close cooperation of the University of Leoben with industry" as the hallmark of

the university.

First "Festival of Nations"

The "Festival of Nations" on May 17 on the main square in Leoben was the top event of the year. Students of the University of Leoben from 15 different nations presented their home countries in a cultural and culinary respect. With music, dance performances and traditional delicacies they gave the Leoben residents a better understanding of their culture and could make an important contribution to a better understanding and integration.

Science Week: new world record set

Not only university departments but also Leoben high schools participated in the Science Week from June 13 to 14. Students of the secondary school Leoben-Stadt I set a new world-record with the biggest and longest fruit-battery: 186 lemons produced a current voltage of 11.6 volt. So the wonders of technology could be put across to the audience in an impressive way.

On the set with London International TV

The University of Leoben was invited together with London International TV, to film a report, which was broadcasted in five languages as a five-minute special after the news in 41 countries abroad by EuroNews on August 20. The shooting program was very tight, the script was written in cooperation with the university. Leoben is the only Austrian university which was selected for the presentation of top universities. Other presented institutions were the University Delft, the Howard University Boston and internationally operating research institutions.

Kochi University of Technology

On October 2 a General Agreement of Academic Exchange was signed with Kochi University of Technology, which was represented by professor Sakai. This



Top event of the year: first "Festival of Nations"



On the set with London International TV



Photo Freisinger

EVENTS for Students extracurricular activities

agreement mainly settles the exchange of professor, lecturers and students, furthermore the exchange of information, joint interests and cooperation at projects such as seminars, symposiums and publications. A special scholarship is intended for doctoral degree students.

Ambassador of Lithuania

The ambassador of the Republic Lithuania Dr. Jonas Rudelewizius came to Leoben on October 31. On his schedule were visits to AT&S, voestalpine Schienen and the University of Leoben.

Federal ministers day in Leoben

Altogether three federal ministers visited the University of Leoben on November 11. Federal Minister for Education, Science and Culture, Elisabeth Gehrler, was the very first visitor and had a discussion with the university management about the future challenges. The Federal Minister for Economy, Martin Bartenstein, participated in a panel discussion on the topic "EU-expansion to the East - New chances for engineers". The minister mentioned "that at the moment there are already very good chances for engineers in the new accession countries." Federal minister for Agriculture and Forestry Molterer and the federal commissioner for environment Pörtl gathered information about two current research projects on dioxin reduction and flue gas desulfurization at the Department of Process Engineering and Environmental Protection.



Elisabeth Gehrler, Federal Minister for Education, Science and Culture discussed with the university management.

Parent's Night

The first parent's night took place on January 30th. The topic, "University of Leoben -Why?," got across quite well thanks to the enthusiasm of the engaged Leoben student team. PowerPoint presentations helped to demonstrate the unique fields of studies at Leoben in an impressive way.

FIT

In order to convince potential female students that women are also technically talented, the campaign FIT (women for engineering jobs) took place on February 13th. This initiative is meant to increase the percentage of female students which would also result in a higher percentage of future female academic staff.



14th Contact Forum 2002

International companies presented themselves at the university to establish contact to potential future employees. The students had the chance to get to know diverse company concepts and application requirements. The event was organized by IASTE, an international student organization, which arranges industrial placements for practical training.

The Winners of the Autonomous Mobile Robots Seminar: Ergun Ender Nuri, Kofler Rudolf, Lamik Abdelrhani, Planer Bernd (photo: Department of Automation)

Grand prix for intelligent robots

The internationally well-known seminar, "Automated Mobile Robots," took place for the sixth time on April 26th. International students from Canada, Morocco and Turkey trained their robots to collect and sort differently colored balls, which were scattered all over the field, autonomously. The seminar was organized by the Department of Automation.



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FCI – Technik, die verbindet



From 1840 till now

The history of the University of Leoben is marked by a continuous development of the academic range of studies.

Due to an initiative of Archduke Johann the "Styrian Corporate School of Mining" was established in Vordernberg on November 4, 1840. The inaugural address of Peter Tunner demonstrates the intention of keeping the instruction on an academic level and of developing his school to a center for all experts in mining and metallurgy from the alpine region.

The revolutionary year 1848 put an end to extremely successful years in Vordernberg and led to a significant change. Peter Tunner initiated the nationalization of his school and the transfer to the nearby town of Leoben. On November 1, 1849 the "Imperial and Royal School of Mining" could be inaugurated in Leoben with 48 students initially enrolled.

On December 15, 1874 the "Imperial and Royal School of Mining" received a new statute which guaranteed a sound and steady development. The status of the teachers was ranked equal to the status of professors at Technical Universities.

An imperial decree of July 31, 1904 changed the name of the mining academy to the "University of Mining". Equal status to technical universities was finally gained when the academy was entitled to bestow doctoral degrees. In the fall of 1910 the university could move into new quarters which were extremely spacious for those days. Due to the rapid development of mining engineering the fields of studies Mining Engineering and Metallurgy were separated in the interval between World War I and II and a new study program was developed. In 1934 the administration of the University of

Mining and of the Technical University of Graz were united and the two preparatory years of studies were transferred to Graz. This meant a serious decrease in enrolment which was followed by a severe lack of a young generation of academics for the Austrian mining industry. The re-installation of the independent University of Mining by the federal law of April 3, 1937 was due to the joint efforts of industry, professors and all residents of Leoben.

An era of steady development was interrupted again by the annexation of Austria to the Third Reich in 1938. World War II brought serious interferences in studying. These problems could be mastered by a decisive rector after 1945 and an urgently needed extension for laboratories was built.

Rapid stabilization

The rapid stabilization after the war can also be seen in the increasing number of enrolment. After 1955 new fields of studies were added continuously, which in addition to the core subjects encompass a broad range of subject areas from raw materials to materials.

In 1970/71 the fields of studies Plastic Engineering and Materials Science were added. In 1990 the planning of two new fields of studies, Applied Geosciences and Industrial Environmental Protection was begun, they were installed in 1992. The construction of a new building, opened in 1970, also demonstrates this growth. Since October 1, 1975 the university was named "Montanuniversität Leoben" according to the University Organization Act.

UNIVERSITY OF LEOBEN

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Degree Programs

In Austria the degree programs at the University of Leoben - ranging from raw materials to component/systems - can only be studied in Leoben.

Bachelor Program (7 semesters)

- | | |
|----------|--|
| Elective | Applied Geosciences
Applied Geophysics and Petroleum Geology
Petroleum Geophysics
Raw Material and Environmental Geology |
| Elective | Natural Resources
Mining
Geoengineering, Geoinformatics and Tunneling |
| Elective | Petroleum Engineering
Drilling Engineering
Petroleum Production Engineering
Reservoir Engineering |
| Elective | Metallurgy
Ferrous and Steel Metallurgy
Nonferrous Metallurgy
Foundry Engineering
Metal Forming
Heat Engineering
Industrial Economics |
| Elective | Plastic Engineering
Polymeric Materials - Development and Characterization
Production Engineering and Component Design |
| Elective | Industrial Environmental Protection, Disposal Techniques and Recycling
Process Engineering
Supply and Waste Technology |
| Elective | Industrial Logistics
Logistics Management
Technical Logistics |



Master Program (3 semesters)

- Applied Geosciences
- Mining and Tunneling
- Mineral Resources: Processing & Materials
- International Study Program in Petroleum Engineering
- Metallurgy
- Plastic Engineering
- Industrial Environmental Protection, Disposal Techniques and Recycling
- Industrial Logistics
- Industrial Management and Business Administration

Diploma Program (10 semesters)

- | | |
|----------|---|
| Elective | Mechanical Engineering
Automation of Plant Machinery and Plants
Fatigue Strength and Construction
Plant machinery |
| Elective | Materials Science
Metallic Materials
Metal Physics and General Material Physics
Ceramics
Biomaterials
Modeling and Simulation
Polymeric Materials Project and Quality Management |