

# miro NEWS

Mineral Industry Research Organisation

**Jui Valley, Romania:**  
inwatco project



*Consultation & Information Acquisition Programme*  
*Future Technologies Initiative*

**Quarry Restoration:**  
*For Sustainable Biomass Energy Production*

**Brunner Mond Joins MIRO**  
*A New MIRO Member*



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# business

*The Chancellor's Spending Review 2004 and the 2004 - 2014 Science and Innovation Investment Framework have announced an increase in government funding for science of £1 billion by 2008. It is hoped that this will encourage further private sector funding and aid the transfer of knowledge into new products and services.*

## The Chancellor's Spending Review 2004 Aims To Encourage RTD

The Chancellors' Spending Review 2004 and the 10 year framework for science and innovation 'Science and Innovation investment framework 2004-2014' is good news for science research funding. It recognises that 'harnessing innovation in Britain is key to improving the country's future wealth creation prospects', and that there is a need to invest more strongly in Britain's knowledge base than in the past. Translating this knowledge more effectively into new products and services will be a key to future success and wealth generation. The main ambitions for UK science innovation are:

- World class research at the UK's strongest centres of excellence.
- Greater responsiveness of the publicly-funded research base to the needs of the economy and public services.
- Increased business investment in R&D, and increased business engagement in drawing on the UK science base for ideas and talent.

- A strong supply of scientists, engineers and technologists by achieving a step change in the education system.
- Sustainable and financially robust universities and public science laboratories across the UK.
- Confidence and increased awareness across UK society in research and its innovation applications.

The governments' long term objective is to increase the level of knowledge intensity (as measured by the ratio of R&D across the economy to national GDP) from its current level of around 1.9 % to 2.5% by 2014, and this will require substantial growth in business R&D in the UK. To meet these goals the government is increasing investment to both the core funding of universities and the strategic funding for Research Councils and other programmes sponsored by the Office of Science and Technology. Government funding for science will rise from £3.9 billion this year to £5 billion by 2008, which is an annual

average growth rate in funding, through the DTI and DfES, of 5.8% in real terms. The government will also encourage increased R&D investment from the private sector. Performance success will be assessed against a range of metrics that describe past and present performance of the research base against international comparators.

The Spending Review 2004 brings a positive outlook to science research funding over the next ten years as the government sets out its commitment to increasing innovation and knowledge transfer.

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# business

## *EU Natural Resources Strategy:*

### *MIRO continues work with DG Environment on the New Thematic Strategy on the Sustainable Use of Natural Resources (Natural Resources Strategy)*

## *EU Natural Resources Strategy*

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MIRO attended meetings in Brussels on 12 March 2004 and between 29 April and 3 May to continue work on the Natural Resources Strategy document which DG Environment plans to issue early in 2005. DG Environment oversees work on the Strategy through an Advisory Committee drawn from 87 applicants representing a wide range of European industrial and trade associations, NGOs and interest groups. As the mineral industry view is important in this context MIRO is represented on the Advisory Group by Rio Tinto and Imerys. The work involves robust debate between environmental NGOs and the various resource-based industries.

At the technical level MIRO is also helping to draft the Strategy, with a representative in each of two Working Groups (about 45 people each). Working Group 1 covers 'Supply of Resources' and Working Group 2 covers 'Use of Resources' Both remits are relevant to the minerals industry and the European minerals industry has a strong presence on Working Group 1,

which is chaired by EuroGeoSurveys. Working Group 2 is chaired by ASSURRE (Association for the Sustainable Use and Recovery of Resources in Europe). Issues which the Working Groups plan to document as a draft Strategy by early 2005 across the four main groups of natural resources (raw materials, environmental media, physical space and flow resources) include:

- For the present: the state of knowledge of current EU-25 natural resources consumption and provenance; the scales and locations of related impacts; the content and effectiveness of current EU policies related to Natural Resources Use and Management.
- For the future: trends likely to influence shifts in resource production; likely consequences; opportunities for lowering the impacts of resource use; likely priority resources to be targeted and required courses of action (including knowledge gathering, improved availability of data, new policies and instruments) needed over the

short-term (2 years), medium-term (5 years) or long-term (25 years) time frame set for the strategy.

A major challenge of the draft Strategy is to suggest practical ways in which materials use can be 'decoupled' from economic growth, thus enabling the EU to maintain economic growth while reducing the negative impacts related to resource consumption. An important potential benefit to participants in the Advisory and Working Groups will be the opportunity to identify new opportunities for effective collaboration across traditional industrial boundaries. From the minerals industry viewpoint, such an outcome could attract new customers for mining and quarrying by-products classified hitherto as waste.

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# business

## *New Structures for EU Research & Technological Development (RTD) Programmes:*

### *The Seventh Framework (FP7, 2006-2010) and European Technology Platforms (ETP)*

#### *New Structures For EU RTD Programmes*

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On 29th April the UK Office of Science and Technology (OST) issued a Consultation Paper on FP7, inviting the UK S&T community to respond by 26th July with its own viewpoints. The OST Consultation Paper lists information based on preliminary enquiries to the UK S&T community on requirements and aims, science and human capital, business and industrial competitiveness, including addressing the needs of SMEs, research in support for policy, funding instruments and S&T research priorities.

MIRO has returned comments highlighting UK minerals industry issues applicable to large corporations and SMEs. Initial feedback from the consultation will be published on the OST website in August 2004.

The Consultation Paper refers to the European Commission's suggestion to set up 'European Technology Platforms'(ETPs), each of which would bring together all aspects of the research, innovation and technological development chain for a particular sector. Those suggested tentatively to date are

aerospace, embedded systems, steel, microsystems and hydrogen technology. Participation in an ETP will be broad, open to the entire public and private research community, industry (from raw materials to retail), public authorities (including policy-makers/regulators and consumers), the financial community, users, consumers and civil society. ETP stakeholders will need to generate a vision and strategic research agenda, using a small amount of EU support for a secretariat and travel. The second phase of ETP development will implement the strategic research agenda with increased financial support from the EU, Member States and industry through FP and other project structures.

MIRO is keen to play a central role in constructing a Minerals Industry ETP which could draw together the combined RTD efforts of this key European sector for the next two decades. In February 2004 MIRO had discussions with DG Research on the scope of FP7 as the content of FP5 and FP6 has held little interest for the minerals industry. Next generation challenges for a

Minerals Industry ETP will depend on suggestions from Members and could include deep mining, remote automated operation of mines and energy/water-efficient technology. MIRO is continuing its discussions with the European Commission and welcomes Members' comments on the ETP idea.

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# development

*An independent Panel of high-level experts has evaluated the effectiveness of the 'New Instruments' introduced in the Sixth Framework Programme (FP6). This evaluation is based on information deriving from the first calls for proposals and feedback received from participants.*

*The following text gives a brief description of the instruments and outlines the research and development recommendations important for MIRO members.*

## *European Commission Recommends Changes Of Emphasis For FP6 Research Instruments.*

The new Instruments introduced for FP6 were:

### **Networks of Excellence**

Developed to bring together large numbers of research groups working in a field and in cross-disciplinary fields to transfer knowledge and build future research programmes.

### **Integrated Projects**

Originally considered to be large scale cross sectoral research programmes aimed at delivering step changes in production and understanding.

### **Strategic Targeted Research Programmes**

These projects are research projects akin to the traditional FP5 research projects.

NoE's and IP's were originally considered to be far reaching and aimed at large consortia with budgets of 'tens if millions' of Euros. STREPS are smaller and have budgets of up to £3 million.

### **Recommendations**

The New Instruments introduced in FP6 are a powerful means to foster transnational collaborative research in the European Research Area (ERA).

The New Instruments should therefore be maintained in FP7. There are however many design and implementation aspects that need to be improved, possibly already during FP6.

The requirement that IP's and NoE's be large is a common misconception. "Critical mass" depends on the topic, the thematic area, the participants and the potential impact and added value. Participants should justify in their proposal the way they have built their consortium to reach the adequate critical mass.

Networks of Excellence should be designed as an instrument to cover different forms of collaboration and different sizes of partnerships.

The emphasis of Integrated Projects is primarily to deliver new knowledge and competitive advantage to European industry. As IPs and Specific Targeted Research Projects (STREPs) have many common characteristics, the differences between these Instruments need clarification.

A greater role must be played by Instruments such as STREPs and small consortium IPs. Such

instruments are better adapted to risk-taking, industry, participants from new Member States and to smaller players in general. Their role for the research community is essential. This must be reflected in a substantial increase in the total share of the budget finally allocated to STREPs in future calls of FP6 and in the future FP7.

The position and participation of small and medium sized enterprises (SMEs) in the New Instruments has not been satisfactory. The inclusion of e-research SMEs as participants in the New Instruments is to be welcomed especially ones willing to become / or are already engaged in research.

The portfolio of Instruments for collaborative research should be designed and developed to enhance co-ordination and collaboration with other forms of public and private funding across the European Union. Simplified administrative procedures and financial rules to allow greater flexibility and participation.

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# development

*Over the last quarter MIRO has undertaken a focused consultation and information acquisition programme to support formal establishment of the Future Technologies Initiative*



## FUTURE TECHNOLOGIES INITIATIVE (FTI)

### *Consultation & Information Acquisition Programme*



#### **Introduction**

Society today is highly dependent on mineral-related materials for energy generation and transmission, mobility and transportation, information and communications, food supply, health delivery, and countless other services. Mineral use and production is also essential in terms of the livelihoods provided through employment and income generation to a significant number of national economies (MMSD, 2002).

However, due to increasingly strict legislation, external demands and focused organisational objectives the global mining and mineral industry has found itself under great pressure, over recent years, to increase its performance and find

the correct balance between environmental, social and economic development.

It is recognised that the global mining and mineral industry makes a huge contribution to global economic development and are becoming increasingly aware of the advances that are needed in social and environmental development.

This socio-environmental development is vital in order for mineral organisations to operate in a more sustainable manner in response to the increasing demand for minerals. Organisations are striving to lower environmental risk, increase environmental efficiency, improve health and safety, and maintain a rich social structure without compromising economic development.

Future research and technological development (RTD), in the mining and mineral sector, has a major role to play in ensuring positive social, environmental and economical development. However, the development of suitable technologies is unlikely to emerge

from typical, incrementally focused research; Future research programmes must be organised and coordinated on an integrated collaborative RTD scale and be supported by relevant stakeholders.

MIRO has established the International Mining Industry Future Technologies Initiative (FTI) to provide a co-ordinated mechanism for promoting and supporting development of new technologies and applications to meet the longer-term needs of the international minerals sector.

The initiative, which is responsive to the priorities of the global mineral/mining companies, will be implemented through a medium term strategic programme that will seek to gain maximum advantage from public sector funding opportunities and optimise the potential for cross-sectorial technology transfer. It is anticipated that the FTI will be implemented through a number of thematic programmes that have been defined during the initial development phase of the initiative.

# development

## Consultation & Information Acquisition Programme

This initial global consultation and information acquisition programme was undertaken to support formal establishment of the Future Technologies Initiative.

The main objectives of the consultation and information acquisition programme were to:

- Define international mining industry research and technology development priorities.
- Review technology provider capabilities and emerging technologies worldwide.
- Define international co-funding programmes and research opportunities world wide.
- Build stronger links with Global mineral / mining companies and discuss future R&D collaboration.

MIRO met and engaged with a broad base of individuals and organisations including:

### 1. Governmental, Funding Agencies & Mining Associations

[World Bank](#)  
[Natural Resource Canada](#)  
[The European Commission](#)  
[The Mining Association of Canada](#)  
[Ministry of Northern Development and Mines](#)  
[Canadian institute of Mining, Metallurgy and Petroleum \(CIM\)](#)

### 2. Mining & Mineral Processing Companies

[Rio Tinto](#)  
[Placer Dome](#)  
[Teckcominco](#)  
[INCO](#)  
[Noranda Inc. / Falconbridge Ltd](#)  
[ISCOR](#)

[BHP billiton](#)  
[Ango-American](#)  
[Anglo Platinum](#)  
[Boliden](#)

### 3. RTD Organisations

[MIRARCO](#)  
[CANMET](#)  
[CAMIRO](#)  
[CSIR MININGTEK](#)  
[MINTEK](#)  
[MEFOS](#)

### 4. Specialised Universities

[University of British Columbia](#)  
[University of Witwatersrand/ COMPS](#)  
[MiMeR \(Lulea University\)](#)

### Consultation & Information Acquisition Programme Outcomes

Outputs from the initial consultation and information acquisition programme will be the delivery of a comprehensive FTI consultation document, work-programme and medium term strategic plan. It is anticipated that the FTI consultation document will be of significant interest to all mineral related companies. The document will be designed to present clear and concise information regarding medium to long-term RTD in the global mining and minerals sector, and will detail three key areas:

- Overview of the global mineral industry RTD priorities.
- Overview of global research provider capabilities.
- A summary of global funding programme opportunities.

It is anticipated that the process of developing and agreeing the work plan will be completed at a Round Table Workshop for an invited

audience of mining industry executives from which a steering committee for FTI will be formed.

### FTI Outcomes

The potential to access significant co-funding from a wide range of national and international funding programmes provides the scope for high level gearing of industrial R&D expenditure. In this context the benefits that will be delivered through FTI will include:

- A well resourced facility for global co-ordination and development of prioritised R&D activity.
- A mechanism for engagement with national & international co-funding programmes to optimise gearing on industry RTD expenditure.
- A forum for discussion and development of leading edge technologies with potential application in the mining & minerals sector.
- Development of a programme with a level of credibility and critical mass suitable for high level engagement with international organisations and government agencies.

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# news & comment

*A new MSc course in Mineral Economics, Finance and Management has been validated at the University of Staffordshire. This distance learning programme will commence in January 2005.*

## *MIRO Opens New Meeting Room At Atlas House*

### ***NEW MSc: Mineral Economics, Finance & Management***

Gordon Riddler was a member of a panel which has recently validated a post graduate programme in Mineral Economics, Finance and Management at Staffordshire University. This is a unique award as first of all, it combines inputs from both the technology base and the business school at the university, and secondly it is specifically targeted at aspiring decision makers in the minerals industry who face high levels of risk and uncertainty associated with business development as careers develop.

The course aims to provide the tools for corporate decision making

based on the assessment of business opportunities and their limitations in the minerals sector, which includes aggregates, industrial minerals, metals and solid fuels.

This Postgraduate Programme will commence in January 2005 and will be conducted through distance learning allowing participants to continue full time employment whilst studying for an award. The programme will include the use of virtual discussion rooms and two residential workshops. It is structured to award a Post Graduate Certificate after Year 1, a Post Graduate Diploma after Year 2 and

a Masters degree after Year 3, each annual learning stage building on the previous one.

The comprehensive, practical course content has received widespread support from senior industry figures including MIRO members in UK and overseas and should attract strong international interest.

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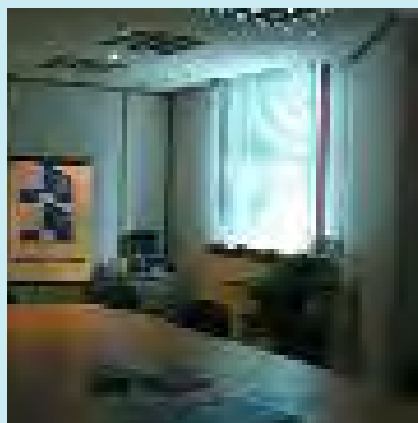
### ***New Corporate Meeting Room At Atlas House***

***MIRO has commissioned its new meeting room at Atlas House, MIRO's new Head Office in Leeds.***

It has a seating capacity for 20 theatre style, and 16 board room style. It is equipped with digital projection facilities and writing and display boards.

This facility is free for members and can be hired by non-members at competitive rates. Catering can be supplied at cost.

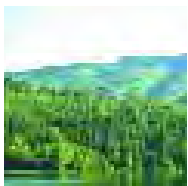
For further information and to make booking please contact: [gemma.stead@miro.co.uk](mailto:gemma.stead@miro.co.uk)



# projects



*MIRO & the INWATCO team have recently carried out the second INWATCO project mission to Romania*



## *Romanian Mission, June 2004*

The main aim of the Romanian mission was to establish a mine-water monitoring and demonstration programme at a coal mine-site in Petrosani, Jiu Valley, Romania; MIRO also used this opportunity to build strong links with relevant individuals and organisations in the mineral and mining fields, and discuss future collaboration in EU research.

MIRO met with a wide range of organisations whilst in Romania, including:

- 1. British Embassy - Bucharest*
- 2. DFID - Department for International Development (Mining)*
- 3. Ministry of Economy and Trade*
- 4. Ministry of Economy and Commerce*
- 5. National Hard Coal Company*
- 6. A number of senior representatives from Romanian mining industries*
- 7. The World Bank - Romania*
- 8. Delegation of the European Commission in Romania*

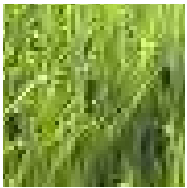
MIRO and the INWATCO team spent time in Petrosani, one of the largest coal mining regions, studying issues surrounding coal

mining and its impacts. The Environmental Manager of The National Hard Coal Company gave MIRO a guided tour of the Petrosani area and all relevant industrial sites.

Within the first mission to Romania (March 2003) project partners identified the Mina Dalja mine site as the main INWATCO demonstration site; however due to the national mine closure programme and access issues this mine site is unavailable for the study. On this secondary mission partners identified another suitable mine-site for demonstration activities in the same region, where detailed mine-water and environmental monitoring works will be carried out over the next 12 months.

The main environmental problem arising from the coal mining industry in Petrosani has been identified as suspended solids in the local water courses. These suspended solids are the result of coal washing emissions and tailing/spoil heaps; even though the solids seem to be inert they are still causing problems in terms of water treatment, tourism and wildlife.

The World Bank has undertaken major coal mine closure in Romania over the last five years, dealing with the environmental and



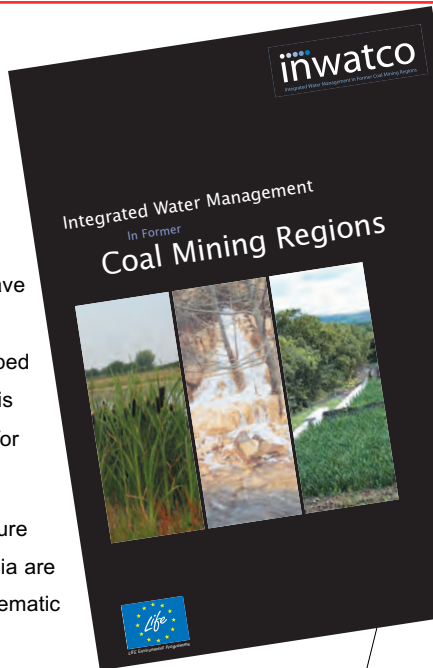
## Mineral Industry Research Organisation

socio-economical impacts. In Petrosani alone many mine sites have been closed and are in the process of being decommissioned. All of the mines, that have undergone closure, are being covered and capped permanently and there is little provision in place for future mining of coal.

MIRO identified that future R&D projects in Romania are likely to be in certain thematic categories such as:

- Mineral land reclamation, remediation and restoration.
- Water management technologies (especially in metal mining areas).
- Waste recovery and secondary resource optimisation.
- Energy efficiency optimisation.
- New technologies for processing Lignite and low rank coal for energy.
- Socio-economic mitigation measures for mining workforce and local communities.

Most mining operations in Romania are undertaken and owned by the state / government, there seems to be very little external or privately owned mines; therefore the best contacts for the INWATCO project and future MIRO business will be the Romanian Government. It is recommended that MIRO maintain strong links with the mining related Ministries in Bucharest and Romanian mining companies.



INWATCO Brochure



MIRO have recently published the updated INWATCO information brochure. For a copy of this brochure or for more information regarding INWATCO/Romanian activities please contact Mark Harrison, International Development Co-ordinator.

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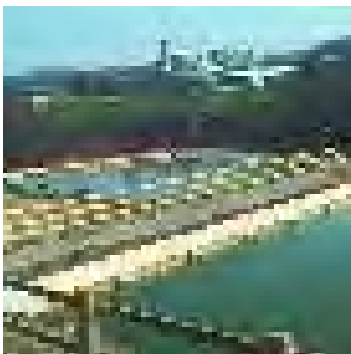
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# proposal

*MIRO and the National Coal Mining Museum for England are working with several UK universities on conceptual proposals for the development of a major new research facility to be located at the museum site.*

## *Centre For Research Large Scale Minewater Management Systems*

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*The facility would provide a focus for research related to the assessment and management of large scale minewater drainage systems and their relationship to other aspects of the hydrological cycle.*

The potential to incorporate several 'field laboratories' and to benefit from access to underground systems would create the opportunity for development of a facility that is internationally unique and capable of promoting advancement of knowledge in areas of increasing European significance.

Management of minewater is an issue of increasing significance at a European level as a direct consequence of two factors;

1. The implementation of the Water Framework Directive and the needs for all Member States to develop River Basin Management Plans that incorporate procedures for management of surface and groundwater resources at a catchment scale, and
2. Enlargement of the EU to include new Member States that have a very significant mining sector with a future need to develop approaches and technologies to deal with long term minewater management issues related to operation and restructuring of mining sectors.

The Water Framework Directive (WFD) has introduced a responsibility for all Member States to develop catchment scale river basin management plans for all water resource systems within national boundaries. At present undefined large scale underground drainage networks such as those represented by minewater drainage

systems are not generally included in consideration of integrated water resource management strategies due to poor understanding of their physical and chemical characteristics and a general lack of knowledge regarding interaction with other components of the surface water and groundwater regime in an area.

Whilst the focus of the proposed research centre is advancement of knowledge related to assessment and management of large scale underground drainage systems this should not be limited to study of relevance to former mine workings. Throughout many parts of Europe groundwater obtained from karstic limestone aquifers is of major importance, providing a high proportion of water for public supply. Karstic systems have many similarities with mine drainage networks due to the solubility of limestone formations and the development of extensive networks of conduits along which groundwater can be transmitted. It is anticipated that the proposed

# proposals

facility would provide an opportunity to improve understanding of karstic drainage systems and associated underground drainage mechanisms.



To date there has not been any facility available to support advancement of research activities at a scale or level of detail that would allow development of technologies, tools, procedures, approaches and strategies for full and effective integration of large scale underground systems into strategic resource planning. The proposed facility would provide an opportunity for development of new science and technology in a number of key fields including:

- Approaches to management integration of large scale underground drainage systems into water resource management strategies.
- In-situ research into relationships between rainfall recharge, subsurface physical, chemical & biological processes and minewater chemistry with regard to potential contamination and environmental risk.
- Relationships between active water management strategies and water quality, treatment options and environmental impact.

- Mechanisms of structural evolution in subsurface systems and its influence on fluid flow and hydrochemistry

The proposed facility would provide an opportunity to advance understanding in all these areas by providing access to full-scale field laboratory capabilities, supported by detailed real-time data monitoring and analytical facilities and fully operational active and passive treatment systems. More specifically the proposed facility will provide opportunity for advanced research and development activities in a number of areas for which there is currently no similar capability anywhere in Europe. Such opportunities will include:

- Meteorological, hydrological, hydrochemical and biological studies related to mechanisms and processes that influence recharge characteristics and the generation of contaminants in water draining through the soil and unsaturated groundwater zones.
- Micro-hydrogeochemical processes in the unsaturated zone and the generation of leachates.
- Real-time hydrological response of large scale underground drainage systems to short and long term climatic variation.
- Development of hydroecological understanding related to the functioning and performance of a range of passive water treatment technologies under real operational conditions.

- Geotechnical analysis of subsurface structures, their stability and functioning in relation to fluid movement and hydrostatic pressure variation.

The scale of the facility would offer a wide range of new opportunities for multi-disciplinary research bringing together research from a wide range of different perspectives and backgrounds. It is anticipated that the centre would be actively linked to a number of existing university courses and research programmes for which it would provide a large scale field laboratory.



In addition it is anticipated that the centre would develop its own programme of research and critical mass for pursuit of R&D funding from a wide range of national and international sources.

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# concept

*Technical IT applications in the mining and quarrying industry are very variable in terms of quality, capabilities and price and in many cases fail to meet the requirements of large sectors of the industry. A study is proposed of the costs and economic benefits of IT applications nationally and internationally.*

## *Mining IT Research*

In some fields such as deposit modelling and open pit planning there are several suppliers who have been in the market for many years with a range of (now) very familiar software products to choose from. In other fields such as exploration, pit optimisation, scheduling, stockpile management and blending there are few suppliers and some of these are independent from the main software companies. In mineral processing a small number of suppliers offer products with relatively limited applicability. Other areas of IT, such as data capture (instrumentation, logging, and analysis), database, archiving and IT services, are supplied as stand alone solutions or as bespoke proprietary applications with little general applicability across industry. There is little or no information about the economic effectiveness of the application of IT in the minerals industry nor in some cases is the technical effectiveness fully established.

Resources Computing International Ltd. (RCI) has proposed an international study of the costs and benefits of technical (engineering/geological) IT applications within the mining and quarrying industry. The study will take nine months to

complete and look at applications in various sectors of the industry with inputs from a network of experienced, independent technical specialists from across the industry. Specific areas where the use of IT has contributed to corporate profits or has been less successful or where products are lacking will be identified.

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# concept

*High Polished Stone Value (High - PSV) sandstone aggregate for road surfacing applications is a key mineral product which is in increasing demand. The British Geological Survey (Exeter Office) has submitted an outline proposal to prepare a report on Devon to include geology, a preliminary assessment of the high-PSV resources in key target areas and any major planning constraints that may affect these areas.*

## *Defining High PSV Sandstone Resources In Devon*

The aim of the proposed project is to identify and delimit areas underlain by thick sequences of turbidite sandstone with low waste content (shale, siltstone, soft-weathering sandstone), to explore and report on the geological structure within those areas with special emphasis on structures controlling the distributions of high-PSV sandstones, and to take into consideration and report on any major planning constraints which may affect the areas identified.

The project will be undertaken in three stages:

**A scoping study** comprising a desk study of Geological Survey Maps and records, external publications, borehole data and a limited amount of fieldwork to eliminate unsuitable target areas.

**Field surveys** of target areas involving checking of existing 1:10,000 maps and the addition of details relevant to the identification of High PSV sandstone resources, together with some new 1:10,000 mapping in the Tiverton Sheet area to be co-funded with the current mapping programme.

Assessment of planning constraints for all target areas will be carried out.

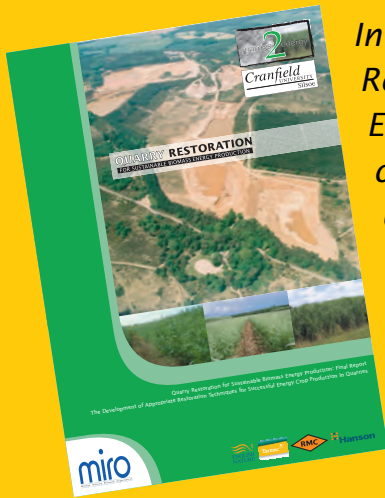
**The preliminary assessment of high-PSV resources** in key target areas including the drilling of a number of cored boreholes (or part cored, part open hole) with downhole geophysical logging to indicate the tenor of resources in key areas. Sample testing for PSV and AAV would be completed.

Deliverables will include for Stage 1, a detailed report identifying key target areas, geology and planning constraints, for Stage 2, reports for each target area including 1:10,000 scale maps, with stratigraphy and structure detailed recommendation and drilling prognosis, and for Stage 3, a report on the drilling, logging and testing. An overview summary report would also be prepared.

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# reviews



*In April 2004 MIRO published the 'Quarry Restoration for Sustainable Biomass Energy Production' report which is based on research undertaken by Cranfield University, Institute of Water and Environment, with specific input from MIRO, English Nature, Tarmac, RMC and Hanson.*

## ***Quarry Restoration: For Sustainable Biomass Energy Production***

This report is a review of the potential for growing biomass crops in quarries and identifies and, where possible, quantifies the likely constraints to production. It brings together a range of information and places this in the context of restoration routes for quarries.

The major energy crops in the UK are currently willow SRC and Miscanthus. Other species have been suggested and tested to a limited extent but are not at a stage where they will form an important component of the biomass energy portfolio.

The key environmental benefits accruing from quarry restoration to energy crops include:

- Substitution for fossil fuels in heat and power production;
- Carbon sequestration through organic matter accumulation in soils;
- Enhanced biodiversity compared to alternative agricultural end uses; and
- Opportunities for conjunctive use of land for biomass production and dirty water, sludge and other high carbon solid waste disposal (e.g. paper waste or green waste compost).

The opportunities for enhancing biodiversity during the restoration process are, however, much broader than simply planting energy crops and an approach that results in multiple end uses is most likely to be successful. There are also possibilities for greater vertical integration of energy crop production into the corporate structure.

This review suggests that, given the right cultural conditions, energy crops could be successfully cultivated on restored aggregate quarries. A demonstration project is needed to show the performance of energy crops and to test alternative restoration designs to achieve the desired balance between commercial biomass production and biodiversity enhancement.

A hard copy of the publication is available from MIRO Head Office for £50 plus postage and packaging. Requests, including a complete postal address, should be e-mailed to the address shown below or faxed to 0113 245 7451.

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# events

*The NESMI project organised a workshop on 'Market and Competitiveness' at the Central Mining Institute (GIG) in Katowice from 21 to 23 April.*

*Katowice is at the heart of the Silesian coal fields, mining has been downscaled by about 50% since socialist times due to subsidence.*

## *Space Technology & The Minerals Industry: NESMI (Network For European Sustainable Minerals Industry)*

Martin Rossmann (Deutsche Steinkohle AG) and Piet van der Kleijn (Department of Geotechnology, TU Delft) opened the meeting, observing that it was time for the minerals industry to bring in new technology, in particular in the fields of automation and communications technology. Canada, for example, set up federal strategies on these topics during the 1980s.

Geoffrey Liggins (C-CORE, St John's, Canada) summarised recent collaboration with the European Space Agency which analysed the feasibility of transferring space technology to the minerals industry. In 1997 Canada commenced a programme 'The miner and the astronaut' as part of its federal Harsh Environments Initiative. C-CORE and associates drew up a list of 169 space technologies, evaluated 117 of them and eventually succeeded in transferring a total of 24 technologies to the minerals industry.

The study concluded that in general:

- Space needs one version of each technology; mining needs many versions tailored to individual operations.
- Space needs higher precision technology than mining.
- Space needs reliability over a 30-year period while mining needs high robustness.
- Space demands short-term high exposure to stress; mining demands lower but more continuous exposure.

The study found that some technologies of manufacturing and robotics transferred successfully to mining, giving potential for reducing the need for human operator intervention and thus improving compliance with health and safety requirements in routine extraction and maintenance operations.

Examples of these technologies include:

- Digital fragmentation analysis systems to determine the optimum fragment sizes to be obtained from blasting different lithologies.
- Automated loading of production up-holes, using a machine programmed to request operator intervention only when essential.
- Automated loading of extracted product.
- Programming of remote, wireless detonation of blasting using flash bulbs as triggers
- Automation of hoist rope inspection.
- Crack inspection software, for use in metal fatigue monitoring or particle fatigue imaging.
- Use of SAR (synthetic aperture radar) for monitoring of ground subsidence, the integrity of buried pipelines or pit wall stability monitoring.

# events

Holger Joosten (Fraunhofer Institute of Production Technology and Automation (IPA), Stuttgart) gave an overview of experimentation on the types of sensors and actuators needed in mining. Systems designed for traffic engineering and security which use durable sensors and contactless, fully integrated wireless communication such as LAN, Bluetooth, Zig Bee and Radio Frequency Identification, are promising. IPA has also developed a robot arm for remote engineering work involving arc welding or cutting and also a 'digital assistant' controlled by gesture and speech recognition.

Other delegates cited examples of automated 'loading process supervisors' and an underground mining operation in Quebec (Canada) in which the jumbos, fitted with more processing units (CPUs) than a spacecraft, are operated remotely online by an engineer in front of a desk top PC in Australia.

The shape of things to come was further outlined by Christoph Mueller (Embignce GmbH) which specialises in networked communications, multimedia solutions and embedded intelligent systems in industrial plant. He outlined some trends likely to influence future communication needs and opportunities in the minerals industry:

- Increased machine availability.
- Increased use of contractors in the core activities of mining.

- Increased purchasing of equipment covered by full service contracts.
- Extensive data exchange capabilities of equipment, particularly where it incorporates a server.
- Reduced workforces on site and increased use of multifunctional personnel.
- Limited access to specialist personnel.
- Satellite mining by means of small, short-life, remotely controlled mines.
- Use of 'just in time' management information for decision support.

Promising as these developments are, Sverker Hartwig (Atlas Copco Rock Drills AB) estimated that over the last 30 years new technology developments by Atlas Copco had achieved only about 4% higher productivity but had made impressive advances in mine health and safety conditions. He recommended that the mining industry should now strive to develop an open software standard for the operation of machines such as jumbos.

Chris Cross (Rio Tinto Technology) outlined the diverse research strategy of Rio Tinto, centred on a global exploration programme for large, high-grade, low cost mines to extract aluminium, copper, coal, diamonds, industrial minerals and gold. The vision for future mining involves limited use of land and

minimal disturbance of the surface, enabling easy return of land to sustainable and beneficial use and keeping activities consistent with local development policies.

The methods required will involve deeper-level mining, including mass mining methods such as block caving. Comminution methods will reduce both the energy used and the dust produced and separation methods will be based on dry concentration of increased efficiency. New, more efficient extraction processes will be used, such as heap leaching and HIs melt, which makes direct use of iron ore fines. Attention to environmental issues will include: containment; remediation; reduction of greenhouse gases; safety and sustainability. Planned pre-competitive work on sustainability will investigate closure and legacy issues, how to deal with large volume waste as well as parts per million waste, and watershed management.

Cross also gave a video presentation of Rio Tinto's current use of underground block caving at Argyle Diamonds (Northern Australia) where roof blocks 100 metres across are dropped in sequence by precision-controlled underground blasting programmes operated over an extraction period of several years.

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# events

## *13<sup>th</sup> Extractive Industry Geology Conference*

MIRO is one among several sponsors for the 13th Extractive Industry Geology Conference to be held 1 - 4 September 2004 in Leeds, England. The conference includes the Ansel Dunham Lecture, thematic sessions covering industry issues, geotechnics, environment, communications, resource development, recycling and after-use, a workshop on the highly successful MIRO FIESTA project which developed an integrated approach to exploration and understanding of limestone hosted mineralization, a session on the results of the first MIST Programme projects and two field visits. This all adds up to exceptional value for the price of the package offered for Thursday 2 and Friday 3 September, which includes the Conference Dinner, bed & breakfast (Thursday night), coffees, teas and lunches for £175.00. The proceedings of this conference will be published by MIRO.

For further information visit and registration visit: [www.eigconference.org](http://www.eigconference.org)

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## *Earth Science & Mining Graduates - Addressing a diminishing resource*

Relating to the Chancellor's Spending review, the issue of supply of relevant geoscience and mining graduates is also exercising the Earth Science Education Forum (ESEF). This is an organisation that has been set up to co-ordinate information and communication concerning the teaching of Earth Science (including mining engineering) and the provision of graduates in the future in view of the decline in candidates and courses in the UK. The importance of the issue is reflected in an increasing membership of the ESEF, which now has over 30 participating organisations, including MIRO. ESEF plans to hold a conference at Parliament in London in Autumn 2004 with senior figures from government, academia, schools education, and industry to debate the issues and to identify barriers to the choice of geosciences and mining as a career. This is an open forum and has already attracted support from MIRO members.

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# members



## Brunner Mond

*MIRO Welcomes New Member.*

### *Brunner Mond*

MIRO is pleased to announce that Brunner Mond took up membership in July. Brunner Mond is amongst the five largest producers of soda ash in the world, with more than 1,500 customers worldwide and manufacturing capability in the UK, The Netherlands (Delfzijl) and Kenya plus a terminal facility in Durban, South Africa. Many industries and processes rely directly on Brunner Mond, from the manufacture of glass, carpets, detergents and biscuits to the production of life-saving dialysis treatments and the purification of drinking water, a huge range of household and personal care preparations depend upon Brunner Mond products. They include refined sodium carbonate (soda ash) in a range of particle sizes for use in pharmaceutical, food, technical and animal feed products; calcium hydroxide (milk of lime) for the production of precipitated calcium carbonate; sodium sesquicarbonate; sodium bicarbonate for explosion suppression and animal feed; and a corrosion-inhibiting calcium chloride solution.

The original Brunner Mond & Company was formed in 1873 by John Brunner and Ludwig Mond who built Winnington Works at Northwich, Cheshire, producing their first

soda ash from the local Triassic beds in 1874. In 1924 the company acquired the Magadi Soda Company of Kenya where sodium carbonate crystallizes naturally in the form of trona during solar evaporation of the water of Lake Magadi - a sustainable, self-renewing mineral deposit. In 1926 Brunner Mond merged with three other British chemical companies to form Imperial Chemical Industries (ICI) which grew into one of the UK's largest and most successful companies. Brunner Mond Holdings Limited was formed in 1991 by the acquisition of the UK and Kenyan soda ash businesses from ICI and the heart of the original Brunner Mond was re-created as an independent company and listed on the London Stock Exchange as Brunner Mond plc in 1996. It has since returned to private company status as Brunner Mond Group Limited and in 1998 acquired the soda ash activities of Akzo Nobel in The Netherlands where Brunner Mond B.V. is now a wholly owned subsidiary company of the Group.

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