AUSTRALIAN CENTRE FOR GEOMECHANICS

CSIRO Curtin University University of WA
Joint Venture

ANNUAL REPORT 2003

RESEARCH | TRAINING | TECHNOLOGY TRANSFER

contents

joint venture partners

Commonwealth Scientific and Industrial Research Organisation Australia
Division of Exploration and Mining

Curtin University of Technology
Western Australian School of Mines

Department of Industry and Resources of WA*
Mining Operations Division

University of Western Australia
Department of Civil and Resource Engineering – Geomechanics Group
Geology and Geophysics

* Discontinued JV partnership as of 1 July 2003.

Main cover photograph courtesy of Argyle Diamond Mines Pty Ltd.
Back cover photograph courtesy of Jubilee Mines NL, Cosmos Nickel Project, WA.

highlights 2003

The Australian Centre for Geomechanics team

ACG RESEARCH PROJECTS

The Centre continues to be a pioneering force in providing industry with world-class geotechnical research. Research undertaken by the ACG attracts both national and global support and the outcomes of the projects are utilised to promote safer mining practices, operating efficiencies and to meeting community expectations for sustainable development.

MINE SEISMICITY AND ROCKBURST RISK MANAGEMENT

During 2003, local industry funded a three-year continuation of the Centre's leading research project into the various challenges associated with seismicity and rockburst. Phase Two of the project aims to generate a more proactive management of mine seismicity and more informed decision making through a risk based data analysis system.

AUSTRALIAN ROCKFALL RESEARCH

Rockfall fatalities and severe injuries are arguably the most critical and recurrent safety issues faced by the underground mining industry throughout the world. With industry backing, Phase Two of this innovative ACG research project seeks to find the solutions for achieving a rockfall accident and fatality free working environment.

FACILITATING COORDINATED RESEARCH, TECHNOLOGY TRANSFER AND IMPROVED EDUCATION AND TRAINING IN THE GEOMECHANICS DISCIPLINE

MINERALS COUNCIL OF AUSTRALIA – MANAGEMENT OF ROCKFALL RISKS IN UNDERGROUND METALLIFEROUS MINES

The ACG welcomed the opportunity to collaborate with the MCA in the development of the *Management of Rockfall Risks in Underground Metalliferous Mines* and *the Industry Guideline for Rockfall Risk Management.* These publications provide underground mining personnel with a comprehensive source of technical information related to the management of rockfall hazards.

GROUND CONTROL TRAINING FOR SURFACE COAL MINE WORKERS

The Centre continued to focus on safety issues and production efficiency by developing a training video specifically designed for open pit coal mine workers. This unique training video aims to equip coal mine workers with increased knowledge and improved skills in surface mining ground control.

TRANSFER OF TECHNICAL KNOWLEDGE

One of the main objectives of the ACG is to provide specialist and advanced training and education for mining personnel and geotechnical practitioners, in the field of geomechanics associated with underground and open pit operations, as well as tailings and mine closure issues. More than 360 mining personnel attended ACG courses during 2003.

PASTE AND THICKENED TAILINGS 2003

Traditionally, the mining industry has not considered the management of waste as one of its key priorities and it is only during the past decade that it has been forced to address these issues seriously. Paste and thickened tailings technology enables industry to store tailings in a safe, stable, environmentally and aesthetically acceptable manner. Following on from a series of international seminars on this relatively new technology, the Centre hosted Paste 2003 in Melbourne that was attended by more than 150 mining professionals.

chairman's foreword

MR ANDREW GRUBB
Chairman, Australian Centre for Geomechanics

The Australian mining industry continues to be faced with the challenges presented by increased stakeholder expectations in the areas of profitability, safety, operational performance and minimising environmental impact. The move towards deeper open pits (>500 m) and mechanised underground mines being developed to 1000 m below surface, present new challenges to current geotechnical design and operating practices.

The challenges of sustainable development will only be satisfied by well-defined, focussed and relevant research projects.

For more than 10 years the ACG has been active in areas aimed at achieving operational and safety improvements and addressing issues related to the long-term storage and disposal of mine tailings.

ACG's activities continue to centre on:

- Research focussed on addressing the agreed needs of the mining industry;
- Technical transfer of knowledge to related disciplines; and
- Ongoing professional development of practitioners in the geomechanics discipline.

The success of these activities can be measured by the high level of ongoing industry support in continuing corporate membership, funding of research activities and strong attendance at the numerous short courses, seminars, workshops and symposiums. The ongoing industry funding of these programs is greatly appreciated.

I have recently had the opportunity to attend international seminars with themes of Deep and High Stress Mining and the use of Microseismic technology. Our Director, Yves Potvin, was a keynote speaker at both seminars, presenting talks based upon the research efforts of the ACG. It was pleasing to experience first hand, the high level of esteem and recognition that the ACG has established.

Continuing challenges for researchers and research stakeholders, include:

- To identify and respond to industry needs correctly;
- To be accountable for meaningful and measurable outcomes which satisfy original expectations;
- To fully utilise existing resources, both within the ACG and the Joint Venture partners;
- To balance short-term and long-term research objectives; and
- For research projects to survive and flourish they must meet the demands that will be made of their ongoing deliverables, efficiency, technology, flexibility and environmental adaptability.

The ACG Board continues to seek ways by which the ACG may be more effective in addressing its chartered objectives. A Research Co-ordination Panel will be established in 2004 to bring together, on a regular basis, senior researchers from the Joint Venture partners and key industry practitioners. This initiative is aimed at providing an effective forum for the development and prioritisation of new research activities. The ACG offices will return to the University of Western Australia campus in early 2004.

It would be amiss of me not to acknowledge the efforts of past-Chairman, Dr Ian Burston. Under the 4 years of Ian's leadership, the ACG doubled its output, established a strong credibility throughout the Australian mining industry, and developed a very efficient network of international collaboration.

With ongoing industry support, close collaboration between industry and our Joint Venture partners, and the ongoing dedication and skill of the ACG director and staff, the ACG will continue to assist industry, in achieving safety, productivity and environmental improvements in all areas covered by the geomechanics discipline.

Mr Andrew Grubb – Chairman
Australian Centre for Geomechanics

director's report

PROFESSOR YVES POTVIN
Director, Australian Centre for Geomechanics

Working in partnership with the mining industry to improve safety, and to reduce severe injuries and fatalities in our industry is, without a doubt, the main source of motivation and job satisfaction for all of us working at the Australian Centre for Geomechanics. 2003 was a very satisfying year because the Centre has made significant contributions towards this goal.

After more than a year of investigation and extensive consultation with a broad section of the underground metal mining sector, the Centre produced, under the commission of the Minerals Council of Australia, a unique *Guideline for the Management of Rockfall Risks in Underground Metal Mines*. This comprehensive guideline and reference manual have captured the essential information from textbooks and blended it with the best practices currently implemented in leading Australian mines. The guideline, presented as a user-friendly publication, is an important new tool for the industry to apply in their quest for reducing the consequences of rockfalls. Rockfalls are still the main source of severe injuries and fatalities in mines. The Centre acknowledges the outstanding contribution of Paul Nedin, Underground Mining Solutions, in developing the guideline.

The production of high quality training videos, such as "Securing the Ground" and "Down to Earth", over the past two years, have had a positive impact with regards to the level of ground awareness, especially with new employees joining the industry. This attracted the attention of the coal mining sector that approached the Centre for the development of a similar video to assist them in the management of geotechnical hazards in open pit coal operations. The video will shortly be completed and is to be released during 2004. This is the Centre's first project with the coal industry, laying the foundation for future collaboration.

In 2003, the ACG also consolidated its position as a major contributor to mining geomechanics research. The extension of the "Mine Seismicity and Rockburst Risk Management" project into its second phase is a strong endorsement of the outcomes from the project's initial phase. Under the leadership of Marty Hudyma, the ACG is currently becoming one of the world's leading institutions in microseismic technology.

Our research into rockfalls, under the leadership of Paul Nedin, received a similar endorsement with the continuation into a second phase of the study. This research focuses on the details of how rockfall injuries occur close to active faces, as well as achieving a better understanding of the less common rockfalls away from active faces that have been responsible for most rockfall fatalities in recent years.

The ACG education program continues to be successful. The annual International Seminar on Paste and Thickened Tailings was held in Melbourne and attracted over 150 international delegates. These international events have become a preferred vehicle to document emerging mining geomechanics technologies world-wide.

The role of the Centre in disseminating technology is continuously increasing and I am pleased to report that the sales of course notes, books and other geomechanics material has been substantial in 2003.

The Australian Centre for Geomechanics is a well established partner of the mining industry, recognised for the relevance of its work whether it is education, training or research. In recent years, our focus has been the underground metal mining industry. In the long-term, we are now looking forward to expanding our activities into open pit mines, the coal sector, as well as going back to our traditional area of mine tailings.

Professor Yves Potvin – Director
Australian Centre for Geomechanics

mine seismicity and rockburst risk management – phase II

Phase Two of the Mine Seismicity and Rockburst Risk Management (MSRRM) research project at the ACG commenced in January 2003. The project has been renewed for three years, with sponsorship from Barrick Gold of Australia, Gold Fields of Australia, Harmony Gold Australia, Independence Gold, Kalgoorlie Consolidated Gold Mines, the Minerals and Energy Research Institute of WA, Placer Dome Asia Pacific, and WMC Resources, Ltd.

The main technical goals of the project are very focussed in Phase Two. The central theme is the development of a computer program to evaluate real-time seismic risk. The Mine Seismicity Risk Analysis Program (MS-RAP) created at the ACG in the first Phase of the MSRRM project has been redeveloped as the platform for a real-time seismic risk evaluation tool. There are three PhD projects underway at the ACG developing the technical basis to achieve a real-time risk analysis tool. Significant progress has been achieved recently in two of the key seismic risk topics; assessing seismic hazard and quantifying the exposure of workforce to rock hazards.

AS UNDERGROUND HARDROCK MINES EXPLOIT DEEPER RESERVES, MINE SEISMICITY IS AN INCREASINGLY COMMON OCCURRENCE

The project renewal has also seen the commencement of additional PhD students with new research directions. One of the new research directions involves the use of simulated rockbursts to evaluate and contrast varying support systems, *in-situ*. A rockburst is simulated by firing explosives near the wall of a disused underground development excavation. Rockmass behaviour and support system performance to the resultant dynamic load will be evaluated for several typical support systems. Several simulated rockburst trials in Western Australian mines are planned for 2004. These trials will provide excellent field data to identify and optimise the most appropriate support systems for dynamic loading conditions in rockburst prone mines.

Daniel Heal, Marty Hudyma and Yves Potvin form the hub of the MSRRM project team

A major initiative of the MSRRM project in 2003 was to conduct a world-wide survey of mine seismicity and rockbursting experiences in underground, mechanised, hardrock mines. The goal of the survey was to identify and quantify the key factors that make an orebody and a mine seismically active. There was an outstanding response to the survey, with data received from 75 mines from 11 countries around the world. This constitutes the most comprehensive collection of mine seismicity information assembled. The results of the survey define typical profiles for seismically active mines and give valuable information about the factors conducive to seismicity and rockbursting. A report summarising the findings of the survey has recently been completed.

The mission of the MSRRM project is to develop a comprehensive understanding of seismicity in mines. Applied research and the development of mine seismicity tools at the ACG are helping staff at mining operations to respond more proactively to the hazards posed by mine seismicity and rockbursting.

Researching practical mining solutions to manage the risk posed by mine seismicity and rockburst

australian rockfall research

Professor Potvin and Paul Nedin

The challenge to reduce the occurrence of rockfalls and, more importantly, their potential severe consequences is arguably the most critical and persistent safety issue for Australian underground mines.

Why does industry face so many difficulties in tackling the problem of rockfalls? The ACG believes that although there exists a vast collective knowledge, the root of the problem is not well understood or documented. In 2001, Yves Potvin and Paul Nedin undertook research into the causes of rockfalls in Australian underground mines. They found that the highest risk of rockfall injury was posed by small rockfalls related to development mining activities less than 10 m from the working face. The project revealed that industry had made step changes in its ground control practices in the late 1990s, resulting in a significant reduction in the number of injuries and fatalities close to the face.

While much effort has been channelled into identifying the rockfall hazard (e.g. stress, poor ground, corrosion of support etc.), unfortunately industry is no closer to accurately predicting when and where a rockfall will occur, or, whether it will cause an injury. Viewing the problem within a risk management framework, it is not only important to understand the hazard, but one also needs to assess how personnel and equipment are exposed to rockfalls. This is a critical link to determine the consequence of rockfalls.

With backing from industry sponsors, Anglogold Ashanti Australia, BHP Billiton, MERIWA, Newmont Australia, Placer Dome Asia Pacific, Rio Tinto, WMC and Xstrata, the ACG undertook Phase Two of the Australian Rockfall Research project in May 2002. This phase examines the exposure of people to rockfall hazard. Early research has revealed that personnel undertaking activities close to the mining face are exposed to a higher risk of experiencing a rockfall. The key to minimising the risk is in detailing how work proceeds near a face, and how personnel engaging in their work activities are exposed to potential rockfalls, whether it is only for a few minutes or for longer periods of time. By comparing the processes from operations experiencing rockfalls with low proportion or no injuries against those that have a higher proportion causing injuries, the Centre is seeking to isolate where and when rockfalls take place. It is also hoped that this comparison will lead to solutions in terms of modifying current processes to reduce or eliminate exposing people working near the face to potential rockfalls.

RESEARCHING THE EXPOSURE OF PEOPLE TO ROCKFALL HAZARD WILL AID IN THE DEVELOPMENT OF NEW SOLUTIONS AND FURTHER IMPROVEMENT IN MINE SAFETY

The ACG is committed to work with industry to improve the safety conditions for mine workers and to reduce rockfall hazards in mines. *Photo courtesy of Jubilee Mines NL, Cosmos Nickel Project, WA*

geomechanics courses 2003

During 2003, the Centre continued to consolidate its position as a leading provider of geomechanics education, training and research. The five further education courses attracted more than 360 mining professionals from throughout Australia and overseas. The Paste 2003 International Seminar held in Melbourne, Victoria drew more than 150 delegates from the four corners of the world.

The continued high attendance at the ACG courses illustrates that many mining companies and organisations find the course content, quality and interactive format to be high calibre, relevant and of real value and benefit.

ADVANCED GEOMECHANICS: THEORY AND PRACTICE: APRIL 2003

This seminar explored the advancement of rock mechanics practices in Australian underground mines that are improving both mining economic and safety considerations.

Presenters: David Beck and Mike Sandy (AMC Consultants), Phil Dight (BFP Consultants), Ernesto Villaescusa (WA School of Mines, Curtin University), Richard Butcher (Snowden Mining Industry Consultants), Jim Joy (MISHC-UQ), Marty Hudyma and Michelle Owen (ACG), Will Bawden (University of Toronto) and Geoff Bull (SRK Consulting).

INTERNATIONAL SEMINAR ON PASTE AND THICKENED TAILINGS: MAY 2003

Paste 2003 provided a forum to discuss the world-wide technological advances in the safe and environmentally sound management, transportation and disposal of tailings. See page 8 for the seminar overview.

More than 360 local and international industry personnel attended ACG courses during 2003

Presenters: Richard Jewell (ACG), Bob Watts, Dale Luke and Brian Smith (BHP Billiton), Don Glenister and David Cooling (Alcoa World Alumina), Gary Bentel (WMC), Ted Lord (Syncrude Canada), Jean Doucet (Alcan International), David Boger, Briony Ruse and Peter Scales (PFPC, University of Melbourne), Angus Paterson and Graeme Johnson (Paterson & Cooke Consulting), Lionel Pullum (CSIRO), Malcolm Harrison (Valvtechnologies), George Shou (Pipeline Systems), Jaco Houman (De Beers Kimberley Mines), Mark Coghill (Rio Tinto), Steve Slottee and Dan Bedell (Dorr-Oliver EIMCO), Roger Smart (University of South Australia), Brian Dymond (Ciba Specialty Chemicals), Simon Gregory (Newmont Australia), Tony Grice (AMC Consultants), Chris Lee (Golder Paste Technology), James Coxon (St. Ives Gold), Jim Blum (Albian Sands), Keith Seddon (Australian Tailings Consultants), Andy Fourie (University of the Witwatersrand).

FIRST MINERALS PROCESSING AND TAILINGS RHEOLOGY WORKSHOP: MAY 2003

With laboratory experiments and a "hands-on" approach, this original and unique workshop equipped attendees with a comprehensive understanding of mineral slurry and tailings rheology.

Presenters: Richard Jewell (ACG), Mark Coghill, Nikk Vagias and Campbell Middleton (Rio Tinto), David Boger and Peter Scales (PFPC, Univerisity of Melbourne), Brad Garraway (Outokumpu Technology), Lionel Pullum (CSIRO), Pat Griffin and Tim Kealy (Rheology Solutions).

UNDERGROUND MINING GEOMECHANICS: A SHORT COURSE FOR MINE GEOLOGISTS AND ENGINEERS: SEPTEMBER 2003

Geotechnical personnel examined geomechanics systems and data collection, monitoring and risk, and mine design at this highly interactive short course.

Presenters: Yves Potvin (ACG), Doug Milne (University of Saskatchewan), Chris Langille (Northwind Enterprises) and Paul Nedin (Underground Mining Solutions).

CAVING GEOMECHANICS: OCTOBER 2003

This course advanced specific caving geomechanics competencies for geotechnical engineers, mining engineers and project managers involved in caving mining projects and operations.

Presenters: Richard Butcher and Clive Seymour (Dempers & Seymour).

TAILINGS MANAGEMENT AND DECOMMISSIONING: NOVEMBER 2003

This seminar addressed the issues facing site personnel involved in the day-to-day management of tailings storage facilities and the requirement to comply with the relevant operating standards and closure requirements.

Presenters: Richard Jewell (ACG), Hugh Jones (Golder Associates), Bill Biggs (Dept. of Industry & Resources, WA), David Elias (GHD Pty Ltd), Ron Watkins (Curtin University), Joe Dwyer (WMC), Harley Lacy (Outback Ecology), Phil Scott (Sons of Gwalia), Christoph Hinz (University of Western Australia, Soil Science), Chris Lane (Soil & Rock Engineering), John Phillips (GHD Pty Ltd), Eve Cooksen (Newmont Australia), Samantha Jarvis (Alcoa World Alumina).

Rheology workshop attendees undertaking rheology measurement and manipulation exercises

paste 2003 international seminar

Economic and environmental considerations and 'visual' preoccupations have seen industry prioritise mine residue disposal. The last few years have witnessed a growing interest in environmentally superior alternatives to conventional tailings storage and facilities. Paste and thickened tailings provides an opportunity to reduce the potential risk of an unplanned release by reducing the volume of water reporting to the tailings storages and indeed to eliminate conventional water retention in tailings storage facilities.

ECONOMIC AND ENVIRONMENTAL CONSIDERATIONS AND "VISUAL" PREOCCUPATIONS HAVE SEEN INDUSTRY PRIORITISE MINE RESIDUE DISPOSAL

Organised by the ACG, in collaboration with the Particulate Fluids Processing Centre (PFPC) of The University of Melbourne, the International Seminar on Paste and Thickened Tailings was held in May 2003. As Melbourne turned on its autumn charm, the 155 industry practitioners, consultants, researchers and suppliers were offered an introduction from lead organiser, Richard Jewell, ACG senior consultant, followed by a global overview of environmental policy implementation presented by Professor Bob Watts, chief scientist & vice president – technology, BHP Billiton Ltd.

Day one focussed on the environmental advantages that the evolution of paste and thickened tailings has generated. Gary Bentel (WMC Resources Ltd) and Don Glenister (Alcoa Alumina) presented detailed overviews of environmental technology in practice at their respective operations. Paste technology has the potential to generate enormous benefits and reduced risks in the key areas of mine safety, environmental issues and production costs. A sound understanding of the composition, transportation and deposition of mine tailings is crucial for each operation's unique disposal and storage facility.

Mark Coghill (Rio Tinto Technical Services) presented a keynote address outlining the dominant concern in the industry regarding water saving and the challenges industry faces to implement thickener technology. Coghill said that many

150 mining professionals enjoyed the networking opportunities at the three-day seminar

universities and government organisations expect the mining industry to continue funding their research requirements without really understanding its needs, time frame or the deliverables. "This failure has delayed the implementation of technology and can lead to reductions in future research funding."

Day two continued with further examination of case studies from Pajingo Joint Venture, Albian Sands (Alberta) and BHP Cannington. The topical issues of the development of equipment and chemical additives and state-of-the-art backfill technology were explored. Some 14 highly relevant case studies highlighting various aspects of P&TT technology were presented during the seminar.

The presentations on the final day included an evaluation of the real costs and benefits of paste technology. Those attending departed to the four corners of the world having gained a shared knowledge and further insight into the tailings interests of their industry and research peers. The seminar succeeded in increasing the awareness of paste technology by introducing many attendees to the strengths and limitations of this relatively new technology.

BALANCE SHEET AS AT 31 DECEMBER 2003

	2003 $	2002 $
Cash	323,350	247,889
Receivables	45,223	73,866
Total Current Assets	368,573	321,755
Plant & Equipment	30,516	37,183
Total Non Current Assets	30,516	37,183
Total Assets	**399,089**	**358,938**
Creditors and Borrowings	7,179	1,295
Provisions	45,000	42,000
Total Current Liabilities	52,179	43,295
Net Assets	**346,910**	**315,643**
Shareholder's Equity		
Partner Contributions	243,980	243,980
Retained Profits/Acc (Losses)	102,930	71,663
Total Shareholder's Equity	**346,910**	**315,643**

The balance sheet should be read in conjunction with the accompanying notes.

PROFIT & LOSS FOR THE YEAR ENDED 31 DECEMBER 2003

	2003 $	2002 $
Income		
Affiliate Membership Fees	53,000	57,000
Project Administration	43,130	51,750
Project Income – Staff Time	69,000	59,500
Course Fees & Sponsorships	471,894	473,049
Publications	64,373	74,047
Publications Sponsorships	20,000	0
Government Grants	0	50,000
Interest	2,402	3,662
Profit on Sale of Vehicle	0	0
Professorial Position, WASM	0	0
UWA Contribution to Students	35,843	66,366
Total income	**759,642**	**835,374**
Expenses		
Personnel	309,866	292,857
Provisions – Personnel	45,000	42,000
Office Space	51,045	44,089
Project related expenses	7,500	50,934
Courses	232,767	264,664
UWA Infrastructure Charges	0	4,258
Travel & Allowances	12,903	6,838
Conferences	69	3,194
Operating Overheads	56,295	43,226
Professional Services	25,200	25,200
Depreciation	13,379	15,278
Government Fund to JV Partner	0	0
Student related expenses	20,378	24,956
Total expenses	**774,402**	**817,494**
Net profit/ (loss)	**(14,760)**	**17,880**
Opening retained earnings	(5,372)	(23,252)
Closing retained earnings	(20,132)	(5,372)

The profit & loss account should be read in conjunction with the accompanying notes.

STATEMENT OF CASH FLOWS YEAR ENDED 31 DECEMBER 2003

	2003 $	2002 $
Cash flows from operating activities		
Receipts from customers	785,883	712,846
Payments to suppliers and employees	(710,139)	(759,245)
Government grants	0	50,000
Interest received	2,402	3,662
Net cash flows from/ (used in) Operating activities	78,146	7,263
Cash flows from investing activities Acquisition of plant & equipment	(2,685)	(3,900)
Net cash flows from/(used in) investing activities	(2,685)	(3,900)
Cash flows from financing activities Partners contributions	0	0
Net cash flows from/(used in) financing activities	0	0
Net increase/(decrease) in cash held	75,461	3,363
Add: Opening cash brought forward	247,889	244,526
Closing cash carried forward	**323,350**	**247,889**

The statement of cash flows should be read in conjunction with the accompanying notes.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS AT 31 DECEMBER 2003

1 Summary of Significant Accounting Policies

The financial statements have been prepared in accordance with the historical cost convention. Cost in relation to assets represents the cash amount paid or the fair value of the asset given in exchange.

The financial statements have been made out in accordance with applicable accounting standards.

The accounting policies adopted are consistent with those of the previous year unless otherwise specified.

(a) Depreciation

Depreciation is provided on a straight line basis on all tangible fixed assets, other than freehold land, at rates calculated to allocate their cost or valuation less estimated residual value, against the revenue derived over their estimated useful lives.

(b) Income Tax

Tax effect accounting procedures are not applied as the Australian Centre for Geomechanics is a tax free research and education centre run on a not for profit basis.

(c) Income Recognition

Government grants are recorded as income when received.

Membership fees are recognised as income in line with the membership period covered in the subscription.

(d) Employee Entitlements

Provision is made for long service leave and annual leave estimated to be payable to employees on the basis of statutory and contractual requirements. Vested entitlements are classified as current and non-current liabilities. The contributions made to superannuation funds by the entity are charged against profit.

		2003 $	2002 $
2	**Operating Profit/(Loss)**		
	(i) The operating profit/(loss) before income tax is arrived at after charging/(crediting) the following items		
	Depreciation – plant & equipment	13,379	15,278
	Provision for employee entitlements	45,000	42,000
	(ii) Included in the operating profit/ (loss) are the following items of operating revenue		
	Affiliate membership fees	53,000	57,000
	Government grants	0	50,000
	Project administration and staff time	112,130	111,250
	Course fees	471,894	473,049
	Publications	64,373	74,047
	Interest – other persons/ corporations	2,402	3,662
	Profit on sale of vehicle	0	0
	Revenue from Publication Sponsorships	20,000	0
	UWA Postgraduate Student Support	35,843	66,366
	Total revenue	759,642	835,374
3	**Receivables**		
	Other debtors	45,223	73,866
	Partners receivables	0	0
	Total receivables	45,223	73,866
4	**Plant & Equipment**		
	At cost	104,543	104,162
	Provision for depreciation	(74,027)	(66,979)
	Total plant & equipment	30,516	37,183
5	**Creditors & Borrowings (current)**		
	Trade creditors and accruals	7,179	1,295
6	**Provisions (current)**		
	Employee entitlements	45,000	42,000

		2003 $	2002 $
7	**Partner Contributions**		
	Partner contributions	243,980	243,980
	Movements for year		
	CSIRO		
	Opening balance	60,320	60,320
	Contribution for year		
	Closing balance	60,320	60,320
	WASM		
	Opening balance	60,320	60,320
	Contribution for year		
	Closing balance	60,320	60,320
	UWA Geomechanics		
	Opening balance	60,520	60,520
	Contribution for year		
	Closing balance	60,520	60,520
	DME (contribution mainly provided in-kind)		
	Opening balance	2,500	2,500
	Contribution for year		
	Closing balance	2,500	2,500
	*UWA Geology***		
	Opening balance	60,320	60,320
	Contribution for year		
	Closing balance	60,320	60,320
8	**Statement of Cash Flows**		
	Reconciliation of net profit/(loss) to the net cash flow from operations		
	Net profit/(loss)	(14,760)	17,880
	Changes in assets & liabilities		
	– Other debtors	28,643	(68,865)
	– Trade creditors and accruals	5,884	970
	– Employee entitlements provisions	45,000	42,000
	Depreciation	13,379	15,278
	Profit on sale of vehicle	0	0
	Loss on sale of office furniture	0	0
	Net cash flow from operating activities	78,146	7,263

We gratefully acknowledge the support of Ms Felicity Hughes – Business Analyst, Sons of Gwalia Limited, who provided support in the preparation of the Financial Statement. Sons of Gwalia are a valued corporate affiliate member of the Centre.

acg publications 2003

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Influence of Faulting on a Mine Shaft – A Case Study: Part 1 – Background and Instrumentation. Bruneau, G., Tyler, D.B., Hadjigeorgiou, J., and **Potvin,** Y., International Journal of Rock Mechanics and Mining Sciences 40, 2003, pp. 95 – 111.

Influence of Faulting on a Mine Shaft – A Case Study: Part 2 – Numerical Modelling. Bruneau, G., **Hudyma**, M.R., Hadjigeorgiou, J., and **Potvin,** Y., International Journal of Rock Mechanics and Mining Sciences 40, 2003, pp. 113 – 125.

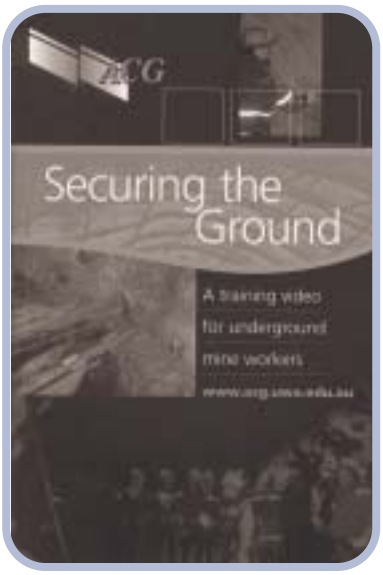
advancing a safer industry through unique geotechnical training materials

The ACG continues to respond to industry demand for high quality, informative and state-of-the-art training materials. The Centre's training products provide industry with the necessary aids to ensure that safety is not simply a top priority on par with productivity, but, more specifically, is an ethic that guides everything.

The ACG has firmly established itself as a leading supplier of training videos that provide mine workers with the skills and knowledge to identify, manage and respond appropriately to the unique geomechanics hazards found in underground and open pit mining environments. Language support and assessment materials accompany the video to allow trainers to monitor comprehension levels.

SECURING THE GROUND – A TRAINING VIDEO FOR UNDERGROUND MINE WORKERS

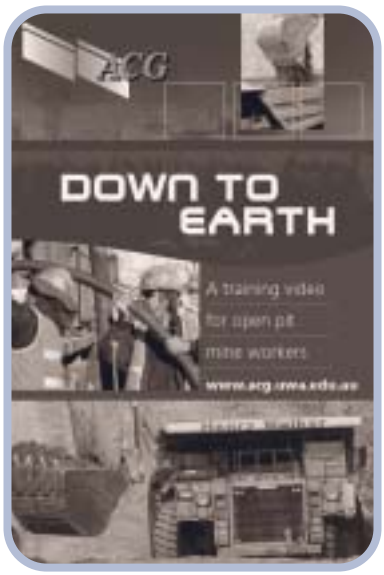
Since December 2001, more than 40 copies of the video have been distributed to local and global mining operations and organisations.



DOWN TO EARTH – A TRAINING VIDEO FOR OPEN PIT MINE WORKERS

During 2003, over 100 copies of this comprehensive training package were purchased by various companies.

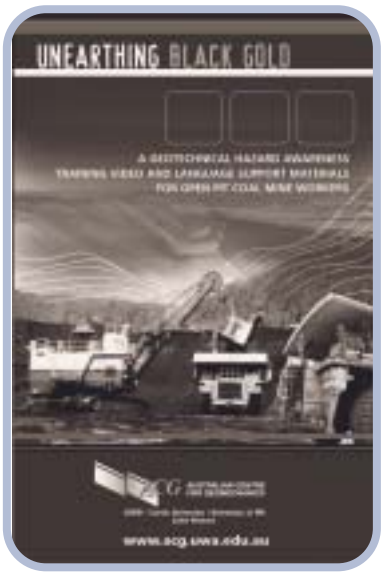
Industry remains very open in its collaboration with the Centre to seek solutions to minimise the hazards associated with poor ground. The falling trend of lost time injury frequency rates can be attributed to a number of factors, including; improved operation of mines through better understanding and management of risk, coupled with relevant mining legislation and the establishment of national competency based training standards.



THE ACG'S TRAINING PLATFORM IS DESIGNED TO ENHANCE THE COMPETENCY, KNOWLEDGE AND SKILL BASE OF THE MINING WORKFORCE

However, the injury severity rate for both open pit coal and underground coal mining activities remains the highest across all sectors of the extractive minerals industry (see Figure 1). To assist industry to reduce this rate, the ACG looks forward to launching in 2004, *Unearthing Black Coal* – a geotechnical hazard awareness training video and language support materials for open pit mine workers.

Industry backing and collaboration both consolidates and validates the ACG's role in the development of safety training materials. Through this spirit of cooperation, the Centre continues to work with mining stakeholders and research organisations towards the common vision of creating a safer working environment within the Australian minerals industry.



SEVERITY RATE BY SECTOR 1998-99 TO 2002-03

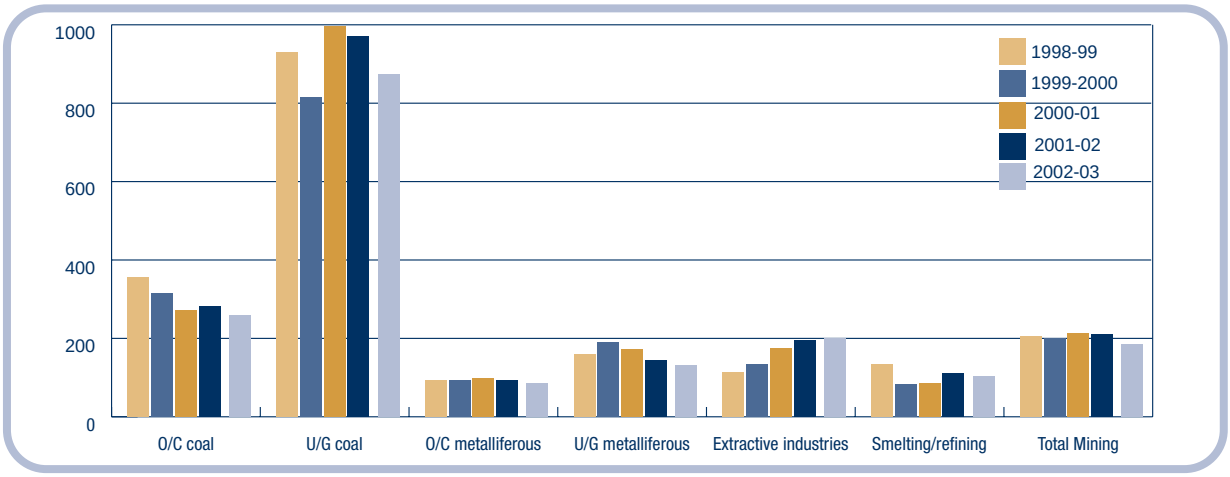


FIGURE 1: Injury severity rate by sector – Australian Minerals Industry (1998-99 to 2002-03)

Source: Minerals Council of Australia

acg membership

During 2003, the Australian Centre for Geomechanics welcomed onboard Mr Peter Cooper as our latest Technical Affiliate, and Placer Dome Asia Pacific and SRK Consulting as the newest members of our Corporate Affiliate program. Corporate and technical affiliate members assist the ACG to provide research excellence, training and education in the geomechanics discipline. These memberships are fundamental in alerting funding bodies of the need to support the Centre. Contributions by affiliates are used by the Centre to promote research excellence, education and training in Geomechanics areas.

The ACG was delighted to have 14 Corporate and Technical Affiliate Members for 2003.

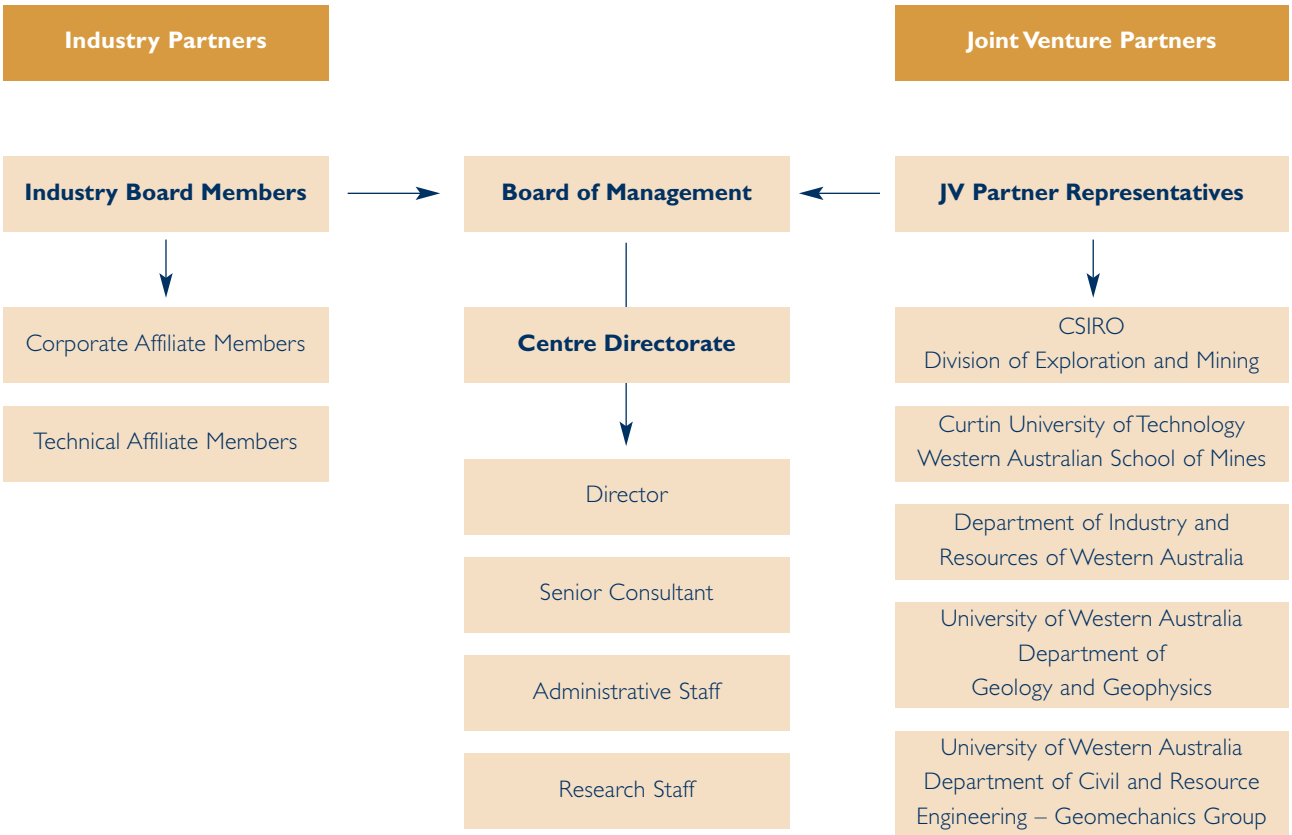
CORPORATE AFFILIATES

AngloGold Ashanti Limited
Argyle Diamond Mines Pty Limited
Barrick Gold of Australia Limited
BHP Iron Ore Pty Limited
Henry Walker Eltin Limited
Kalgoorlie Consolidated Gold Mines Pty Limited
Newmont Australia Limited
Placer Dome Asia Pacific
Sons of Gwalia Limited
SRK Consulting
WMC Resources Limited

TECHNICAL AFFILIATES

Mr P. Cooper (CGC Dredging Pty Ltd)
Mr C. Lane (Soil & Rock Engineering Pty Limited)
Mr M. Sandy (AMC Consultants)

management structure



* Discontinued JV partnership as of 1 July 2003

board of management

The Australian Centre for Geomechanics Board of Management comprises of an independent Chairman, Director of the Centre and industry and joint venture partner representatives. The Board meets four times a year to present strategic direction for the Centre, review and approve activities and operations and to provide counsel.

AUSTRALIAN CENTRE FOR GEOMECHANICS BOARD OF MANAGEMENT

JV Partner Representatives (5)		Industry Representatives (up to 4)
Dr John Read (CSIRO DEM)	**Chair (from Industry)** Dr Ian Burston/Mr Andrew Grubb	Mr John Turney (Barrick Gold of Australia)
Professor Peter Lilly (Curtin – WASM)	**Centre Director (Non-Voting)** Professor Yves Potvin (ACG)	Mr Mark Adams (Sons of Gwalia Ltd)
Mr Martin Knee (Dept of Industry and Resources WA.)*		Mr Andrew Grubb (AngloGold Ashanti Ltd)
Professor Mark Bush (UWA – Civil & Resource Eng. and Geology & Geophysics)		

* Discontinued JV partnership as of 1 July 2003

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Administrative Assistant	Miss Melissa McFetridge