Energy, Mines and Resources Canada
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CANMET

Canada Centre for Mineral and Energy Technology
Centre canadien de la technologie des minéraux et de l'énergie

Mining Research Laboratories
Laboratoires de recherche minière

CANMET - UNIVERSITY PROGRAMS IN MINING INNOVATION *

N. Billette, R. Sage, M.D. Everell and G. Herget

MRL 89-109 (J) E (Revision of MRL 89-27(OP) E

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ABSTRACT

CANMET has been operating as a Government Technology Centre for two years. Many of CANMET's programs involve long-term research and require special expertise, often available at Canadian universities. CANMET's involvement with universities ranges from research grants and contracts to exchanges of scientists and joint use of research facilities. Examples of CANMET–university cooperation in mining are presented.

Introduction

In the last two years or so CANMET has undergone a significant metamorphosis, resulting in greater emphasis on applied research to enhance Canada's industrial capability. CANMET's new mandate is reflected in the types of projects undertaken and their categorization, Fig. 1. Emphasis is being placed on two project categories: strategic R&D, to enable CANMET to serve the changing technological needs of the industry; and incremental R&D, to serve the more immediate industry needs through modifications to existing technologies and knowledge. The balance of CANMET's effort is devoted to providing Mandated and Specialized Services, and to Exploratory Research.

large

short term		long term
	INCREMENTAL R AND D (35%)	STRATEGIC R AND D (45%)
	MANDATED AND SPECIALIZED SERVICES (10%)	EXPLORATORY RESEARCH (10%)

small

Fig. 1: CANMET's Project Categories

* *Ce texte est également disponible en français.*

CANMET interaction with universities can involve one of several available vehicles: contracts, research grants, exchanges of scientists, student employment and nomination of professors on CANMET's advisory council. Instances of key university technical support to CANMET mining projects are highlighted.

Interaction modes

Because of the importance CANMET attaches to providing support to the mining industry, priority is given to projects having an industrial partner ready to contribute either through funding or by performing part of the research. This partnership emphasis has led to criticism that CANMET is neglecting long-term research, and the contribution that Canada's universities can make to the development of Canada's mineral and energy industries. In spite of this impression, joint endeavours with universities will continue to be a vital part of CANMET's total R&D program. Major modes of interaction are as follows:

Contracts

In fiscal year 1988-89 – from April 1, 1988 to March 31, 1989 – CANMET awarded research contracts worth nearly $15 million, on the basis of their relevance to CANMET's mission and the contractor's expertise and knowledge. More than $3.5 million, or 24% of the total contract budget, was allocated to 80 contracts with Canadian universities. In addition, universities often act as specialist subcontractors to CANMET's main contractors. The value is estimated at $1.5 million in 1988-89. Thus, about one third of CANMET's 1988-89 contract funds were spent at universities.

Research and development contracts/subcontracts are awarded to universities through three main Federal Government programs: CANMET Contracts, Mineral Development Agreements, Industrial Research Assistance Programs administered by the National Research Council of Canada. CANMET direct contract funds are being used to replace the funds no longer available from the now defunct Unsolicited Proposal Program. Table I lists CANMET managed university contracts and subcontracts in mining at the end of October 1989.

Research Grants

The Natural Sciences and Engineering Research Council (NSERC) is the major source of university research grants. CANMET participates in the work of NSERC by evaluating proposals and by providing liaison officers to monitor performance, particularly under the NSERC university-industry program. CANMET also allocates a

TABLE I: MRL Contracts and Subcontracts to Universities

CONTRACTS

ESTABLISHMENT	CONTENT	PERFORMER
Technical University of Nova Scotia	Coal Dust Explosibility in Cape Breton	P. Amyotte
Université Laval	Mining Technologies For Underground Narrow Vein Metal Mining	C. Bourgoin
McGill University	Underground Mines Backfill Feasibility	F. Hassani
Laurentian University	Dust Physics Associated With Frozen Coal Dust Hazard at Quintette, B.C.	B. Kaye
Queen's University	Coal Dust Explosibility of Quintette Coal, B.C.	T. Katsabanis
Queen's University	Seismic Characterization of Surface Crown Pillars in Three Dimensions	P. Young

SUBCONTRACTS

ESTABLISHMENT	CONTENT	PERFORMER
University of British Columbia	Sulphide Dust Explosion R/D at Westmin	A. Hall
Laurentian University	Compact Underground Borer Mechanical Performance Links with Rock Properties	P. Kaiser
University of Waterloo	Potash Mining Sequence and Rock Properties Numerical Modelling	M. Dussault
Université Laval	Underground Productivity of Selected Québec Underground Operations	J.L. Collins
University of New Brunswick	Subsidence Monitoring and Finite Element Analysis	A. Chrzanowski

portion of its research funds to University Research agreements administered by Energy, Mines and Resources Canada. Although the funds available to CANMET are

modest - $400,000 for 1988-89 - they are used to seed important university research. Unlike contracts, research grants are not tied firmly to deliverables, and thus allow the recipient considerable flexibility in directing the course of his or her research. In 1988-89 CANMET's direct research grants supported work at 41 Canadian universities.

Mining related projects account for $135,000 or 33.8% of CANMET research grants. In most cases, projects are not quite suitable to receive NSERC funding and too preliminary to receive industry assistance. Projects are normally subsidized for two to three years. In 1988-89, projects covered most aspects of mining activities: drilling, fragmentation, rock mechanics, backfill, hoisting, ventilation, operation automation, selection of mining methods.

TABLE II: 1988-89 Research Agreement Program involving university mining research groups

APPLICANT AFFILIATION	TITLE OF PROJECT	CONTACT OFFICER	FUNDS IN ($) AWARDED
V.K. Garga Ottawa	Application of hybrid district boundary element analysis on jointed rock masses to near-surface mine openings and related surface crown pillars	S. Vongpaisal	9,500
D.J. Gendzwill Saskatchewan	Natural and induced seismicity in Saskatchewan	D.G. Hedley	15,000
T.S. Golosinski Alberta	Investigating into continuous selective surface mining technology	R.K. Singal	13,000
A.E.Hall British Columbia	Study to investigate the feasibility of introducing controlled recirculation of air ventilation in Canadian underground potash and metal mines	S.G. Hardcastle	20,000
A. Piché Polytechnique	Automatisation de l'opération d'un brise-roches par rétroaction visuelle	N.R. Billette	13,000
G.A. Rubin Laurentian	Weakening and fragmentation of hardrock by high power sonic or ultrasonic resonance	J. Pathak	20,000
M.J. Scoble McGill	Evaluation of design criteria for delayed backfill consolidation in underground mines	S. Vongpaisal	19,000
M.J. Scoble McGill	Application of automated blasthole drill monitoring to blast design in surface coal mines	D.B. Stewart	12,000

University Exchanges

CANMET staff are very active in teaching at universities, and in supervising graduate students. Typically at any time, there is 15 to 20 graduate students doing masters or doctoral thesis work at CANMET's laboratories, under the guidance of CANMET scientists. Many of these scientists are university associates; currently (spring 1989) CANMET scientists hold adjunct professorships and teach part time at 11 universities. Many other CANMET staff teach short courses and give seminars. However, only one or two professors at a time spend their sabbatical leave in CANMET's laboratories, or work there on secondment. The cross-fertilization of ideas that comes with such exchanges is very valuable to CANMET and the University Laboratory involved.

Student Employment

In recent years CANMET has increasingly participated in cooperative student programs by providing term employment to students enrolled in cooperative study programs. Because of the concentrated work experience, gained at the same time as they complete their formal studies, co-op students form a particularly valuable pool of future researchers, both for CANMET and other Canadian research laboratories. In recent years CANMET has hosted co-op students from universities in Vancouver, Victoria, Sherbrooke, Laval, Waterloo, and Halifax, amongst other cities. In 1988-89, 197 students – including co-op, summer and graduate students – from 24 Canadian universities worked in CANMET's laboratories for periods ranging from one month to a year.

CANMET's Advisory Council

CANMET receives formal advice and guidance on its research programs from specialist committees that make up the Minister's National Advisory Council to CANMET (MNACC). While the majority of the members of MNACC are drawn from industry, reflecting CANMET's principal objective of supporting technology development in industry, academia plays an important role. As of December 1988 the committees included ten full time university professors among the 69 members.

Conclusion

The preceeding overview of CANMET's involvement with universities across Canada has shown that its basic research mission is still very much alive and healthy. Several ways are available for universities to associate with CANMET on basic research

and technology transfer. Interaction modes range from student employment and researcher exchange to research grants and contracts. Sharing of expertise may be as much in fundamental research as in applied research and technology development.

In the past, universities and CANMET have cooperated in research and development to better serve the mineral and energy industries. University specialists are a reservoir of ideas in a number of technological areas of value to CANMET's technology mandate. In future, CANMET intends to maintain its privileged links with universities, for improving technologies used or needed in the mineral and energy industrial sectors.