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IEEE Canadian Review

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Robotics/Automation in Mining
IEEE, Region 7 and CSECE
Speaking Out

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IEEE Canadian Review General Information

The ***IEEE Canadian Review*** is published three times per year - Spring, Fall and Winter. The ***IEEE Canadian Review's*** principal objective is to project an **image** of the Canadian electrical, electronics, communications and computer engineering professions and their associated academic and business communities to :

(i) Canadian members of IEEE;
(ii) Canadian members of the profession and community who are non-members of IEEE;
(iii) the associated academic (i.e. universities, colleges, secondary schools), government and business communities in Canada.

In this context, the ***IEEE Canadian Review*** serves as a forum to express views on issues of broad interest to its targeted audience. These issues, while not necessarily technologically-oriented, are chosen on the basis of their anticipated impact on engineers, their profession, the academic, business and industrial community, or society in general.

To ensure that the ***IEEE Canadian Review*** has the desired breadth and depth, Associate Editors are responsible for identifying issues and screening articles submitted to the ***IEEE Canadian Review*** according to the following general themes :

1- National Affairs
2- International Affairs
3- Industry
4- Education
5- Power
6- Communications
7- Computers

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Information for Authors

Authors are invited to contribute to the ***IEEE Canadian Review***. Submissions in electronic form are especially welcomed. Please contact the appropriate Associate Editor or Paul Freedman, Managing Editor, at freedman@crim.ca (for complete address see below).

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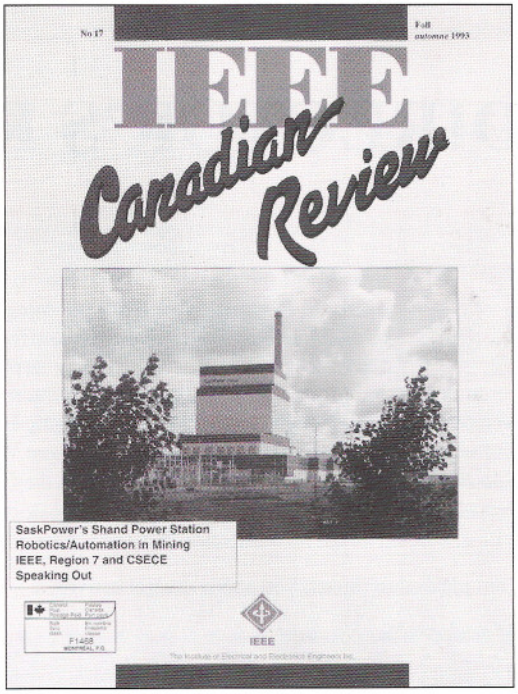
IEEE Canadian Review

Cover picture

Shand, Canada's most environmentally advanced coal fired power station, blends into the prairie landscape of Saskatchewan. The 300 megawatt station is one of the 14 generating stations operated by the province's electrical utility - SaskPower.

Tableau couverture

Shand, l'installation électrique à charbon la plus avancée au Canada sur le plan environnemental avec pour toile de fond les prairies de la Saskatchewan. Ce centre de 300 mégawatt est l'un des 14 centres du réseau SaskPower, la corporation génératrice et distributrice d'électricité en Saskatchewan.



CONTENTS / *SOMMAIRE*

Perspective / *Perspectives*

Director's report
by **Vijay Bhargava** *4*

IEEE Canada : the decision is yours
by **B. John Plant, Tony R. Eastham, Robert T. H. Alden, Raymond D. Findlay** *5*

Power / *Électrotechnique*

Activity heats up at the Shand Power Station
by **Colleen Lavendar** *8*

International Affairs / *Affaires internationales*

Robotics and Automation in Mining
by **Ahmad Hemani** *11*

Communications / *Communication*

Speaking Out
by **Louise Peacock** *16*

Perspective / *Perspectives*

A few words from the incoming Managing Editor
by **Paul Freedman** *19*

DIRECTOR'S REPORT

by Vijay K.. Bhargava
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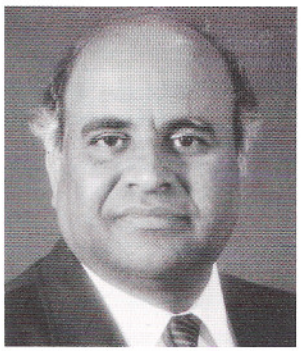

On behalf of the Region, I would like to express our sincere thanks to ***Professor Ted Wildi*** for doing an outstanding job as the Managing Editor of the Review for the past two years. Under his leadership the Review has flourished and his commitment and professionalism has been inspirational to all of us. We welcome ***Dr. Paul Freedman*** as the New Managing Editor of the Review and wish him the very best in this new assignment.We congratulate ***Dr. Bob Burridge*** on his election as the President of the Canadian Council of Professional Engineers. This is a demanding position and as such, Bob will step down as the R7 Education Activities Chair.

I am pleased to inform you about several activities.

Membership Survey

Regarding out membership survey, about 14,500 forms were mailed and 633 were returned. Almost 15% of respondents were or have been section/chapter/branch/region officers. The main findings of the survey, compiled by Pierre Allard, can be summarized as follows:

- 38% of respondents were not aware that R7 has an office (even though it has been in existence since 1972).
- 58% were not aware of the IEEE Toll free number.
- 67% were in favour of closing the R7 office
- 74% never used the services of R7 office.
- 26% did use the office : (i)13% did so because they were not satisfied with IEEE Field Services and (ii) 94% were satisfied by the services provided by R7 office.
- Electronic Bulletin Board, Job Postings, Continuing Education, E-mail, Political Influence, ... were identified as some of the additional services to consider in the future.

Region Office

The Region 7 office closed on June 30, 1993. Since January 1, 1993, the Manager was requested to log all telephone calls, fax messages, services provided, and to compile documented evidence of members having trouble obtaining services from Piscataway. There were only two such cases. In one instance, this writer personally communicated the problem to Piscataway - it was resolved in two days!

A preliminary analysis of the telephone calls and service provided indicates that only a handful of volunteers (and rarely members) used the services of the office. Another major user appears to have been student members dealing with the IEEE Canadian Foundation through the R7 office.

IEEE Milestone Dedication at Shirley's Bay

On the afternoon of Thursday, May 13th, about 200 invited guests witnessed the unveiling of two bronze plaques (one in English and one in French) at the Shirley's Bay Research Centre designating the **Alouette/ ISIS** scientific Satellite program to be a Milestone of Electrical Engineering (see issue no. 14 of this magazine).

The milestone designation was accepted by **M. Marc Rochon** (Deputy Minister, Department of Communications), **Dr. Roland Doré** (President, Canadian Space Agency) and **Admiral J.R. Anderson** (Chief of the Defence Staff, Department of National Defence). It was a glorious afternoon, and your Director felt honoured to be a part of the celebration of IEEE's recognition of Canada's accomplishments in space science and technology.

Membership

The membership growth in the IEEE inside the United States and in Region 7 (Canada) is negative. I urge you to give full attention to this undesirable situation and help to turn it around as soon as possible. Region 5 Director **Jim Leonard** has made several suggestions to me which I would like to try in R7. I urge you to renew your membership and sign up just one new member for the new year. You may renew your membership by calling **1-800-678-IEEE** . The IEEE can be your lifetime companion. Technically, IEEE "Spectrum" is the premier publication and the 37 IEEE Societies will assist you in maintaining your technical edge.

Phone your local section chair (see listing on the inside front cover). Find out when the next meeting is being held and attend. Use the extensive network available locally. For a positive benefit to your career, get involved. Rejoin (join) IEEE now!

Finances

IEEE offered us US $15,000 for a part of our paid up inventory of IEEE Standards valued at US $47,000. This is the stock that sells well. The paid up inventory in 1987 was US $17,678! In spite of this setback, we were able to invest US $55,200 with IEEE on April 1, 1993. Eventually, we hope to create a reserve of $100,000 so that we can hold our assessment constant for a few years.

Significant Anniversaries

Queen's University at Kingston is celebrating its 100th anniversary of Engineering education, **Université Laval** in Quebec City is celebrating the 50th anniversary of Electrical Engineering education while the **University of Victoria** is celebrating the 10th anniversary of the establishment of the Department of Electrical Engineering. Plaques commemorating these events have been presented on behalf of IEEE Canada.

Volunteer/Member Support

For all your needs not served by IEEE Operations Centre in Piscataway, please contact me by mail, phone, fax or e-mail at the address shown above.

IEEE CANADA :

The decision is yours

by *B. John Plant, Tony R. Eastham, Robert, T. H. Alden, Raymond D. Findlay*

1993 promises to be a very significant year for electrical and computer engineering in Canada. As most of you know, we have been working towards a merger of IEEE Region 7 and the Canadian Society for Electrical and Computer Engineering (CSECE) to form a single organization under the name IEEE CANADA, that will be better able to serve the technical and professional needs of electrical and computer engineers in Canada. This new organization will be recognized simultaneously as the Canadian Region (7) of the IEEE by the transnational IEEE and as the Society representing the interests of Canadian electrical and computer engineers by the Engineering Institute of Canada (EIC). The lights appear to be green--the merger has been approved in principle by the Regional Committee of IEEE Region 7, by the IEEE Board of Directors, by the CSECE Board of Directors, and by the 1992 Annual Meeting of CSECE. However, the members have the final say. This article includes a ballot seeking your approval of the merger. In order to proceed towards amalgamation, we need a majority of those eligible IEEE Region 7 members who choose to vote. With the mandate provided by a favorable vote, we will enter into final discussions with IEEE and EIC with a view to having IEEE CANADA effectively operational on January 1, 1994--although it may take a year longer to complete the necessary legal steps. ***We urge you to vote and to vote yes for the merger***.

L'année 1993, s'annonce très significative pour le génie électrique et informatique au Canada. Depuis un certain temps, IEEE Canada et la Société canadienne de génie électrique et informatique (CSECE) étudient leur fusion dans le but de mettre sur pied en 1994, un seul organisme pour servir la communauté de génie électrique et informatique. Ce nouvel organisme sera à la fois reconnu comme Région 7 de IEEE et une société membre de l'Institut canadien des ingénieurs (EIC). Cet article porte sur les réflexions du comité "Blue Ribbon" IEEE R7/CSECE et fait valoir la nécessité d'une telle fusion pour mieux servir la communauté de génie électrique et informatique. Le comité a organisé un sondage par voie de scrutin auprès des membres IEEE. Vous trouverez à la fin de l'article le bulletin de vote. Pour que la fusion reçoive l'approbation de IEEE R7, il faut que **la majorité des membres IEEE R7 ait voté «oui»**.

Background and Process

Back in September 1991, **Vijay Bhargava**, then Director-Elect of IEEE Region 7, and **Jean-Rémi Giroux**, the incoming President of the Canadian Society for Electrical and Computer Engineering (CSECE) asked **Tony Eastham**, the outgoing Director of IEEE Region 7, and **John Plant**, the outgoing President of CSECE, to form a "blue ribbon committee" to review the relationship between IEEE Region 7 and CSECE and to prepare a discussion paper for consideration by the Regional Committee of Region 7 and by the Board of Directors of CSECE.

Tony Eastham and John Plant considered the situation for about six months and identified three options:

1. To maintain a clear separation between IEEE Region 7 and CSECE, with each organization pursuing its own programs for the benefit of its own members.
2. To develop collaboration and to engage in cooperative programs and ventures. Specific examples considered were cosponsoring the Annual Canadian Conference on Electrical and Computer Engineering, a joint medal banquet and prize presentations, joint student paper competitions, and reciprocal invitations to the organization's Regional or Board meetings.
3. To amalgamate IEEE Region 7 and CSECE to form one organization that could better serve the needs of Canadian electrical and computer engineers.

Tony Eastham and John Plant considered that Option 1 was undesirable and that, as a result of an evolving cooperative relationship, the two organizations were (in 1992) effectively operating under Option 2. However, they were convinced that Option 3 was in the best interests of electrical and computer engineering in Canada.

The "blue ribbon committee" presented its discussion paper to the Board of Directors of CSECE and to the Executive Committee of IEEE Region 7 at their spring meetings in May 1992. Both bodies responded positively to the recommendations of the committee, and both passed motions to the effect that a move towards amalgamation be approved, in principle, pending preparation of an analysis of the financial and operational impacts of the proposed merger and consultation with the members.

In order to inform the memberships about the prospect of amalgamation, John Plant and Tony Eastham prepared an article for the fall 1992 issue of the IEEE Canadian Review, under the title "IEEE Region 7 and CSECE: Is a Merger Desirable and Feasible?". This article concluded with an invitation for readers to submit comments. While not many letters were received, those readers who did respond were very supportive of the merger initiative.

The issue was then taken to the Regional Meeting of IEEE Region 7 and to the Annual Meeting of CSECE, in September 1992. Both meetings endorsed the amalgamation of IEEE Region 7 and CSECE, in principle, and authorized the "blue ribbon committee" to enter into discussions with the parent organizations, IEEE and the Engineering Institute of Canada (EIC).

At the beginning of 1993, a Working Group for the amalgamation of IEEE Region 7 and CSECE was formed by the addition to the

original "blue ribbon committee" of Bob Alden, a past Director of Region 7 and past Vice President (Regional Activities) of IEEE, and Ray Findlay, Director-Elect of IEEE Region 7. Members of the Working Group entered into discussions with the Presidents and Executive Directors of IEEE and EIC. All were supportive of the initiative and agreed to assist in the development of detailed operational plans for the merger.

The proposal was presented to the Transnational Committee (TC) and to the Regional Activities Board (RAB) of IEEE in February 1993 and the following motion was passed:

> TC, RAB welcomes and supports the initiative to merge IEEE Region 7 with the CSECE and urges IEEE to work with CSECE towards detemining ways and means to bring about this merger by January 1, 1994.

The Working Group has proposed that the new organization be called IEEE CANADA. Draft bylaws and a detailed budget for 1994, the first year of operation of IEEE CANADA, have been prepared. This information was presented to the Regional Meeting of IEEE Region 7 in St. John's, Newfoundland in May 1993 and was subsequently sent to all Section Chairs for discussion with their local Section Committees and members.

It was agreed in St. John's that it was necessary to seek the approval of the membership of IEEE Region 7 in order to proceed towards the merger. The Working Group has therefore prepared this article to appear in the fall 1993 issue of the IEEE Canadian Review. In order to proceed, a majority of those eligible members of IEEE Region 7 who choose to vote is needed. This process, whereby the members of Region 7 express their opinions about the merger, was approved both by the Executive Committee of IEEE and by the Board of Directors of IEEE inAugust 1993.

Why Merge CSECE and IEEE Region 7?

We believe that CSECE and IEEE Region 7 should be merged for a number of reasons:

- to create one strong Canadian organization that will more effectively serve and represent the interests of electrical and computer engineers in Canada
- to combine complementary activities of CSECE and IEEE Region 7 and to eliminate duplication of efforts, thus providing more cost effective member services and volunteer support
- to preserve a unique Canadian identity, and to better promote and recognize engineering excellence in Canada
- to promote more effective collaboration with other members of the engineering profession and of other learned societies in Canada through EIC, including efforts to improve the continuing education of engineers
- to give electrical and computer engineers a greater voice in relevant policy issues in Canada
- to make IEEE CANADA a leader in the establishment of technical and professional partnerships, both domestically and internationally.

Features and Budget of IEEE CANADA

IEEE Canada will be a single organization, recognized simultaneously as a constituent society of the EIC and as Region 7 by IEEE..

IEEE CANADA will have a set of bylaws which are consistent with IEEE and EIC requirements. All Region 7 Section Chairs have received a draft copy of these bylaws for review and discussion. The new organization will not attempt to establish its own database, membership renewal and election procedures, but will continue to utilize the services of IEEE.

Membership fees for IEEE CANADA will comprise basic IEEE dues plus a Canadian fee equivalent to that which IEEE Region 7 members have paid as a regional assessment. We share members' concerns about costs in these recessionary times, and it is our intent that there should be no increase in the Canadian component of membership fees for a period of four years, 1993-1996.

IEEE CANADA will be established with the combined reserves of IEEE Region 7 and CSECE. In addition, the IEEE Canadian Foundation, which was established as a separately incorporated body in 1993, has substantial resources which will continue to be used to support student and educational activities, including McNaughton Centres and scholarships, and other special ventures benefiting electrical and computer engineering in Canada.

A 1994 budget for IEEE CANADA has been prepared and, after amendment, was approved by the Regional meeting in Vancouver in September 1993. This budget shows an income of $339,000, assuming that all current IEEE Region 7 members renew their membership under IEEE CANADA. Budgeted expenditures total $301,000, for a surplus in the year of $38,000.

Both the IEEE Canaddian Review and the CSECE Journal will be retained by IEEE CANADA, as they are complementary in nature. Both publications now have new Managing Editors and a detailed study of costs has shown that substantial economies can be achieved without significant compromise in quality. The fall issues of these publications utilize these changes in production techniques and demonstrate the achievability of the costs budgeted for 1994.

IEEE CANADA will have an office for volunteer support and for those membership services which cannot be adequately provided by IEEE or by EIC. The Office will replace, at substantially lower costs, the Office which served IEEE Region 7 and which was closed at the end of June 1993.

As a member Society, IEEE CANADA will pay EIC an affiliation fee. This amount is still under discussion but is likely to be of the order of $2 per member.

CSECE Decision Process

The process by which CSECE members will decide upon the merger is different from the referendum for IEEE Region 7 members. CSECE is incorporated in Canada as a stand-alone learned society. Accordingly, a special general meeting of the membership has been called for November 6, 1993 in Montreal. At this meeting, motions will be offered to the effect that CSECE be dissolved and its assets transferred to IEEE CANADA, on condition that the members of Region 7 and the IEEE Board of Directors approve the merger. It will be further moved that, pending completion of the necessary legal steps, approval be given for Region 7 and CSECE to amalgamate activities and behave as IEEE CANADA with effect from January 1, 1994.

Referendum

The Working Group believes that the establishment of IEEE CANADA is in the best interests of electrical and computer engineers in Canada. No legal or operational impediments have been identified. If the members agree, IEEE CANADA can be operational in 1994.

There remain some details and legal matters to be resolved, including the location of the Office and the question of whether IEEE CANADA should be separately incorporated as a non-profit organization in Canada. Legal advice is being sought on this matter.

At this stage, it is necessary and appropriate for the members of IEEE Region 7 to express their opinion on the merger in a referendum. The ballot shown provides you with the opportunity to vote. For the merger

to be approved, we need a majority of those members of IEEE Region 7 who choose to vote. Only Members, Senior Members, Fellows and Life Members of IEEE are eligible to vote.

In order to validate the ballot, it is necessary to ensure that all who vote are members in good standing. Region 7 voters must therefore be identified by IEEE membership number. Please be assured that no individual will be identified by the way in which he/she votes.

The President of the Ottawa-Carleton Research Institute (OCRI) has agreed to receive the votes, by fax or mail, and to act as official teller. The Chair of the IEEE Ottawa Section has agreed to act as observer. The result of the vote will be reported to the Director of IEEE Region 7, Vijay Bhargava.

The authors urge you to vote **YES** for the merger of IEEE Region 7 and CSECE to form IEEE CANADA. Please note that the deadline for receipt of your vote is November 15, 1993.■

IEEE CANADA - BALLOT

From:

IEEE Region 7 Member No. . . . . .

(Note: Only Members, Senior Members, Fellows and Life Members of IEEE are eligible to vote.)

To:

By Mail: IEEE Region 7/CSECE Merger Ballot
Ottawa-Carleton Research Institute (OCRI)
340 March Road, 4th Floor,
Kanata, Ontario. K2K 2E4

By Fax: (613) 592-8163

I am in favour of the merger of IEEE Region 7 and CSECE to form IEEE CANADA. **Yes** ☐ **No** ☐

Deadline for receipt of ballots is November 15, 1993.

IEEE PRESIDENT MARTHA SLOAN RECEIVES HONORARY DEGREE

New York, June 30. Dr. Martha Sloan, Professor of electrical engineering at Michigan Technological University and President of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), recently received an honorary Doctor of Laws degree from Concordia University in Montréal, Québec.

Dr. Sloan was recognized at the University's 1993 Spring Convocation on June 4, for her contributions to the field of engineering and computer science, and her ground-breaking achievement as the first woman president of the IEEE. The Institute is the world's largest technical professional society with 320,000 members in 150 countries.

In bestowing the honorary degree, Concordia University "affirms its objective of encouraging women to become professional engineers", said Vice-Chancellor **Patrick Kenniff**. "Your work, as both teacher and engineer, have garnered you the esteem and respect of your peers and colleagues", he told Dr. Sloan.

In her remarks, Dr. Sloan noted that women's progress in engineering is related to how society views the profession. "More young women will pursue technology-related careers when society begins holding engineers in higher esteem", she said.

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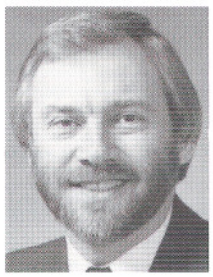

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Activity heats up at Shand Sub:

Canada's most environmentally advanced coal-fired power station goes into operation

by Colleen Lavender

SaskPower's SHAND power station is Canada's most environmentally advanced coal-fired source of electricity. In this article, we briefly describe some of SHAND's state-or-the art technologies, including the computerized control and the on-site greenhouse.

Le centre électrique SHAND de SaskPower est l'intallation à charbon la plus avancée sur le plan environnemental au Canada. Dans cet article, nous passons en revue quelques unes de ses technologies à la fine pointe de l'électrotechnique, y compris le contrôle informatisé et la serre aménagée sur le même site.

Four bands of deep-water green highlight the Shand Power Station in southern Saskatchewan. The stripes, visible from a distance of several kilometres on the flat prairie landscape, are appropriately colored: SaskPower's newest source of electricity is also Canada's most environmentally advanced coal-fired power station. The green on the outside of the building signals the environmental technology within the state-of the-art facility.

The plant was built on time and on budget. In 1986, SaskPower officials announced Shand would be built to meet Saskatchewan's growing need for electricity. Six years later, only two weeks short of its intended start date, the plant was into commercial production to help serve the province's more than 400,000 customers.

The price tag attached to Shand was $516 million dollars, and the effort expended in building the plant totalled 365,965 people days. It has created 150 permanent jobs both in the plant itself and in the associated coal industry.

A tour of the 300 megawatt (MW) power plant leads inevitably to a litany of its environmentally responsible features. And the list is impressive. While every source of electrical generation has its negative and unavoidable effects on the environment - from the dams at hydro sites to the large areas of land required for wind farms - Shand is Canada's first coal-fired plant built to meet new national air emissions guidelines.

Shand: state-of-the-art technology

Lauren Carlson, vice-president of Major Projects at SaskPower, knows the Shand Power Station very well. "After building a power station like this one, you could almost forget what the end goal is - to produce electricity. This plant has many features you can't find anywhere else, because we developed them ourselves."

The cooling technology, for example, is different from any other in Canada. A zero-discharge water management system means that no water leaves the site, except through evaporation, so potential contaminants can not enter surrounding water systems. A tailor-made water treatment plant eliminates some of the hardware problems traditionally associated with water treatment plants, because SaskPower and a consultant designed and built it from small components, rather than buying one complete system from a supplier as is customary. A cooling tower rounds out the water management system; it is the sole source of cooling. This too is unheard of among Canadian electrical utilities where towers are generally used in conjunction with cooling ponds.

To keep the air emissions in line with national guidelines, a system known as LIFAC is in place at Shand. Lime Injection into the Furnace and reActivation of unreacted Calcium is a combination of Finnish and SaskPower technologies which significantly reduces the sulphur dioxide (S02) in flue gas emissions.

In this process, fine limestone powder is converted to lime in the high temperatures of the furnace. Part of the lime reacts with $S0_2$ to form calcium sulfate, and this compound is carried along with the flyash to a humidifier reactor.

Back end humidification, the second stage in the LIFAC process, uses water spray to reactivate lime particles and capture $S0_2$ from the gas, in a separate vertical reactor. Again, the $S0_2$ becomes part of the flyash, rather than leaving the stack in the flue gases.

Computer controls: smaller, faster

Shand's state-of-the-art microprocessors control the environmental features as well as the boilers and turbines. Microprocessors have replaced the old analog electronic and hard wired relay controls which exist in other plants. Plant operators at Shand have been involved with the new computer technology from the earliest design stages. **John Lebersback**, manager, Control and Instrumentation in Generation Engineering at SaskPower, says it was important that operators be involved from the very beginning, because they know what they need out of a system. "Operators know what they want to see on each screen, and how series of related functions can be executed quickly and efficiently," says Lebersback.

There are two control rooms at Shand. Two work stations in one room monitor the water treatment system, and the main room, with six work stations, controls the remainder of the plant's operations. From this central location, operators are able to track the emissions leaving the stack, and make any necessary adjustments in the operation of the boiler, in order to meet the air emission guidelines.

Short and long term reports of atmospheric gases are registered from the plant site, and data is gathered at registration points in the town of Estevan a few kilometres away. There are two ambient air monitoring stations noting ground level concentrations of atmospheric contaminants, and SaskPower also monitors stack gases as emissions exit the plant.

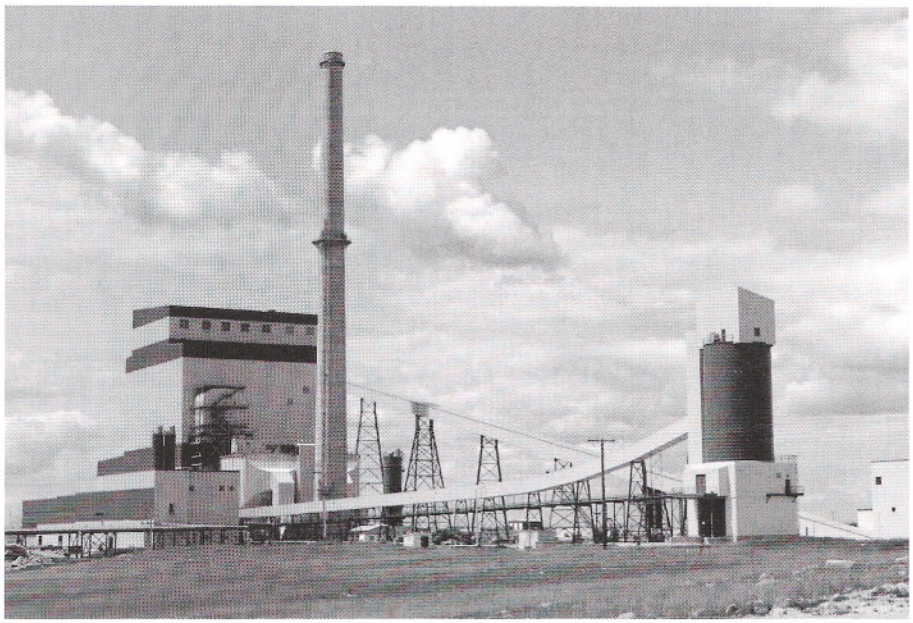


Figure 1. Shand power station features include the Finnish LIFAC System to reduce sulphur dioxide emissions by as much as 70 per cent; air and temperature controlled burners to reduce nitrogen oxide formation, thereby reducing emissions to the atmosphere; an electrostatic precipitator to capture 99.7 per cent of fly ash from stack emissions; and a zero-discharge system to prevent all but evaporated water from escaping to the environment.

The information is fed directly into the computers, so operators immediately know the air quality at and beyond the plant itself. The new computers help SaskPower live up to its claim as Canada's most environmentally advanced coal-fired power station.

Figure 2. Shand has two control rooms: one to monitor the water treatment system and the other, made up of six work stations (above), controls the remainer of the station's operations.

Rooting for the environment - the greenhouse

A more tangible environmental feature at Shand is the on-site greenhouse. One of North America's most advanced growing facilities, the Shand greenhouse can produce up to one million tree seedlings each year.

Trees and shrubs play a vital role in our environment. They have obvious aesthetic benefits, but they also provide many things we take for granted - shade, protection from wind, shelter and food for wildlife and they slow the process of soil erosion. More specific to the production of coal-fired electricity, trees remove carbon dioxide from the atmosphere while they produce oxygen; this is one more way SaskPower acknowledges its responsibility to the environment.

A large variety of species are grown, and the majority are native to the prairie provinces. In most cases, the species are grown from either seeds or cuttings collected within 500 kilometres of the green house. Shand greenhouse is one of the first facilities in Canada to undertake the large-scale production of deciduous species (shed leaves seasonally) native and adapted to the prairies.

Figure 3. Growing toward the annual target of one million seedlings, Shand Greenhouse expects to grow 660,000 seedlings in the 1993 crop year.

Looking to the future

Large capital projects like Shand require years of planning study, and construction. In that sense, this new building is almost a decade old. SaskPower officials, though pleased with Shand, are now examining other ways to reduce the corporation's impact on the environment, and trying to postpone the addition of more generation facilities to the system.

Other options currently under examination include non-utility generation (power is produced by outside companies and is either sold to the power corporation or used at the source) and demand side management (reduced consumption of electricity by residential, industrial and commercial users). Demand side management, or DSM, will mean educating consumers about the power they use, and helping them not only change their habits, but perhaps the way they do business. Retailers can help by stocking new products on their shelves, including everything from compact fluorescent light bulbs to timers for car plug-ins to energy efficient motors.

For now, Shand's 300 MW unit 1 gives the corporation a bit of breathing space, allowing for repairs and upgrades on other units around the province. Shand is a new cornerstone at SaskPower, and opens the door to a new age of coal-fired plant technology.

SaskPower receives international recognition

SaskPower's Shand Power Station was a winner of the 1993 Powerplant Award, given annually by the internationally renowned Power magazine.

The Powerplant award is presented to facilities that "have demonstrated technologies that are important to produce thermal and electric energy in a fuel-efficient, environmentally sound manner -a perfect description for the Shand Power Station", according to **Robert Schwieger**, Editorial Director of **Power**.

In presenting the award to Carole Bryant, executive vice president, Corporate Affairs, Schwieger commended Shand for being the first commercial plant to use a limestone infection system which captures acid rain-causing sulphur dioxide before it enters the atmosphere. Shand was also cited for its unique closed-loop, zero-discharge water management system. No water is discharged from the plant except through evaporation.

Six contractors who provided the technical consulting expertise and construction services at Shandwere also honored by **Power magazine** - Babcock and Wilcox, Tampella Power, SaskMont Engineering, Resources Conservation Company, Bailey Canada Inc. and Hitachi.

About the author

Colleen Lavender is a writer who lives and works in Regina, Saskatchewan. As former editor of SaskPower's employee magazine, Colleen is very familiar with the Shand Power Station and its place in Saskatchewan's future.

1993 COUNCIL MERIT AWARDS

We are pleased to announce the following 1993 Council Merit Awards:

Eastern Canada

JOHN E. QUAICOE received the B.Sc.(Engr.) degree from the University of Science and Technology, Kumasi, Ghana in 1973, and the M.A.Sc. and Ph.D. degrees from the University of Toronto, Toronto, Canada in 1977 and 1982, respectively.
Since 1982, Mr. Quaicoe has been with Memorial University of Newfoundland, St. John's, Canada, where in addition to his current duties as the Chairman of the Electrical Engineering Discipline, he is the IEEE Student Branch Counsellor.
He has been a keen participant in IEEE activities, and has been active in the Executive Committee of IEEE Newfoundland and Labrador section since 1988, serving as Acting Chair (1988), Chairman (1989-1990), Chairman of the Membership Development Committee (1991), Co-Chairman of NECEC'92, a major section activity which brings together for a one-day conference, electrical and computer engineers in the province, and as a member of the organizing committee of NECEC'93. He is a registered Professional Engineer in Newfoundland and a Senior Member of IEEE.

Central Canada

AJIT BAPAT is present lMarket Manager, Projects in the Electrical Distribution Business of Schneider Canada. He holds a Master's Degree in Business Administration and Electrical Engineering, specializing in power systems and power system protection and has particular interest in Group Fault Protection Digital Metering Systems, microprocessor based integrated systems for protection, metering monitoring and control of power distribution systems.
He is a registered Professional Engineer in the Province of Ontario and a member of IEEE.
He has been involved with IEEE since 1962, initially in Region 10 and since 1967, in Region 7. He was Toronto Section Chairman 1979 and 1980, Member - at large of the IAS Executive board 1986-1990. Central Canada Council chairman in 1987 and 1988 and 1993, Chairman of the Industry Application Society Annual Meeting, held in Toronto in 1985 and the Treasurer of the PCIC meeting held in Toronto in 1991.

Western Canada

JEAN-PIERRE RATUSZ,, P. Eng. received his B. Sc. in Electrical Engineering from the University of Alberta in 1975. He joined Edmonton Power in 1977, and currently is the Senior System Planning Engineer in the Transmission & Substation Planning Group. He got involved with the IEEE in 1984, with the formation of the Power Engineering Society Chapter within the Northern Canada Section. Since then he served in various chapter & executive roles including chairman for both chapter and the section. He has also twice served as co-chairman of the Annual Alberta Conference & exposition on Power Quality, which has been a joint effort of the IEEE Alberta Sections, several of the Alberta Electrical Utilities as well as the major Alberta Telephone & Telecommunication utility and the Canadian Electrical 1 Association. He also has acted as Chapter Representative for the Power Engineering society in Western Canada.

Robotics and Automation in Mining

Making things easier in a hostile environment

by Ahmad Hemami
Canadian Centre for Automation and Robotics in Mining, École Polytechnique, Montréal, Québec

The capabilities of new technologies are starting to expand, reaching the more conservative industries, such as mining. Out of necessity, in order to adapt the new technologies to mining industry requirements some major research programs have already started or are going to take place. In what follows, after a brief introduction about mines and their processes, the present level of automation in mining is described. This is better illustrated through examples of current research and what the prospects are for future research in mining automation. What the expectations are and what the role of robotics is in the future of mining are discussed. Mining Automation is a task; robots and their expertise are useful tools that can be employed in mining operations.

Les possibilités des nouvelles technologies commencent à rejoindre et à percer les secteurs industriels traditionnels tels que les mines. Pour que ces technologies soient adaptées à ce milieu, des programmes de R-D sont ou seront mis en place sous peu. Dans cet article, nous passons en revue l'état technologique du secteur minier à l'heure actuelle ainsi que les efforts de R-D. Par la suite, nous abordons les possibilités apportées par l'automatisation et la robotique minière dans l'avenir.

Introduction

Mines are the sources of many raw materials that are used in manufacturing, construction, chemical and other industries, by humans and for humans. The mining industry covers the total activities leading to the excavation and processing of the minerals. Mining has traditionally been very labour intensive; because of this, like all other industries, safety of the workers as well as the efficiency of operations in the form of higher productivity are becoming more and more significant. Other issues like the protection of the environment also call for additional concerns and changes in the various processes which, in the beginning at least, imply more cost to the mining operations. Efficiency, thus, becomes a major issue. Automation, robotics, artificial intelligence, expert systems and the like are the means employed so far by other industries to improve the quality, raise the speed, increase the productivity, and in fact stay in the marketplace.

Robots in mining! It would be very nice to sit back in the office and watch on a television screen human-like robots carry out all the hard jobs that are currently performed in mining excavations. Not so, however, at least for another hundred years, as long as the capability of autonomous human-like robots are concerned. That would be more likely after all the minerals have run out. By that time, nevertheless, maybe we do not need them in mining any more.

In fact, what is meant by robotics in mining is trying to benefit from their capabilities in the same way that other industries have benefited from robotics and the related expertise and know how, all of which are coming as tools for automation. The state of the art in the field of robotics is at a level that can be regarded as advanced; and that is because of all the work on automatic control, the results of some forty years of research and implementation of theories, and the noticeable amount of recent work that has been employed or adapted for industrial robots. Thanks, also, to the remarkable progress in electronics and digital processing. Now, if this advanced knowledge is utilized in an industry that, to some extent, lags behind the others because of the undeniable complexities, then that may change the scenario.

While the purpose of this article is not to describe about the various processes and methods in mining, a very brief explanation of the mining technology is unavoidable in order to give the reader a general knowledge of the mining technologies and the terms that may be used within the text.

This article is the second part of a series of articles started by "Robotics in the 1990's" by Paul Freedman, in the winter 1993 issue of the IEEE Canadian Review.

Mining Processes

There are about 7000 mines currently in operation around the world and new mines are being developed. Each mine is somehow different from other mines, because of a number of factors, from geological and geophysical points of views to size and methods of excavation. However, in a broad sense, mines can be categorized into a number of classes; the differences govern the methods of excavation which are almost completely different for each class. In the first place we have surface and underground mines. Secondly, the rock deposits are hard or soft; hard rock deposits generally are lenticular or vein-like bodies of metallic minerals, whereas, soft rocks are like salt or coal; while the latter rocks can be easily broken into smaller pieces the former are very strong and need much more effort to fragment.

The ore deposit is usually in the form of a layer; this layer can be thin, say for instance one metre thick, or thicker, for example 5 metres thick; it can be more or less horizontal or at an angle; the width and length of the deposit can be small or large. It can be on the surface or up to thousands of metres under ground. All of these factors influence the excavation method and the way it is planned for the extraction of almost all the ore in a mine (until the excavation operations are no longer economical). In this sense, mining operations fall into four major categories, based on whether on the surface or underground, and whether the ore deposit is hard or soft rock.

Before continuing further, we must remark upon a number of points. In all the excavation operations the excavated material contains certain percentage of impurities, that is, soil and rocks other than those containing the ore. The unwanted impurities can be due to a number of reasons. The ore-waste interface is not necessarily regular, and also it is possible to make mistakes in judging the location of the interface and the deviation of the ore deposit. To access the ore, no matter whether in an

underground tunnel or in a surface mine, in order to keep the ground from falling or to keep the form of a tunnel, extra ground or rock must also be removed. It is not possible to exactly control the surface of breakage of the rock so that only the ore is fragmented, leaving behind the unwanted material, even if there exists a sharp and clear interface between the two; The extra excavated rock, which is addressed as dilution, must necessarily be transported out of the site.

Hard rock mining, in both surface mines (open pit) and underground mines, requires loosening; this has been so far achieved by rock fragmentation by means of explosives. In this way, the mine operation becomes cyclic, in the form of fragmenting the rock, collecting and transporting the broken ore, drilling and setting the explosives for the next explosion. The size of the explosion and the magnitude of broken ore depend on the size and the type of a mine, its specifications, the planned operation, and some other factors. The ore is transported into crushers where it is broken into much smaller pieces before going to the mills as a step before concentration. At this stage the concentrated ore is the raw material for the process of extraction of the minerals.

The operations for soft rock mining are quite different. In the olden days, the miners used simpler hand held excavation tools; these have been gradually replaced by more sophisticated mechanical tools, and finally huge machines, operated by a human, that can scrape great quantities of mineral from the wall face. The excavated ore then is transported by appropriate means for further processing. In this sense, when these machines are used, the excavation process is of a continuous nature; for this reason such machines are called continuous mining machines.

In underground mining, it is almost always necessary to support the roof. In the case of hard rock mines, it is also essential to avoid the danger of rocks that are loose and can eventually fall down. These are responsible for about 20% of the fatal accidents in underground mines. This is done by bolting them to the rest of the rocks. The tunnels and passages in underground mines are normally not illuminated, not very wide and open, and not necessarily straight; the ground is not paved and there may be water carried in ditches on the floor. Moreover, explosions in coal mines are not uncommon; a permanent threat which takes many lives each year, like the recent accident in the Westray coal mine in Nova Scotia. In a similar accident in Kozlu, Turkey, 300 workers were killed after an explosion 560 metres underground in March 1992.

In the case of surface mining the story is completely different. In general, one can say that the mines are bigger and more people are involved in the operations. There is no question of ventilation and almost no narrow passages. However, slope stability becomes a problem and it often happens that the walls must be supported in order to avoid falling. Drilling is done on a different scale, in a different way and with quite different machines. In an open pit mine, the process of excavation for recovery of minerals is, indeed, equivalent to moving a mountain from one location to another. In the course of this process, the minerals are separated from the rest of the bulk of the rock which is displaced. The whole of operation takes a long time, say for instance, 20 years; that is the period the mine will last. Huge mining machinery, like power shovels and large trucks of up to 350 tons are employed, and depending on the scale of operation the number of these trucks in each particular site varies. These vehicles operate on a continuous basis and move the earth many kilometres in each journey.

The above paragraphs provide just a few insights into mines and mining, just until the crushed ore is delivered to mills. What can be automated, and what would be offered by robotics for the above mentioned processes are the subjects of the following sections. Figure 1 shows a summary of mining processes.

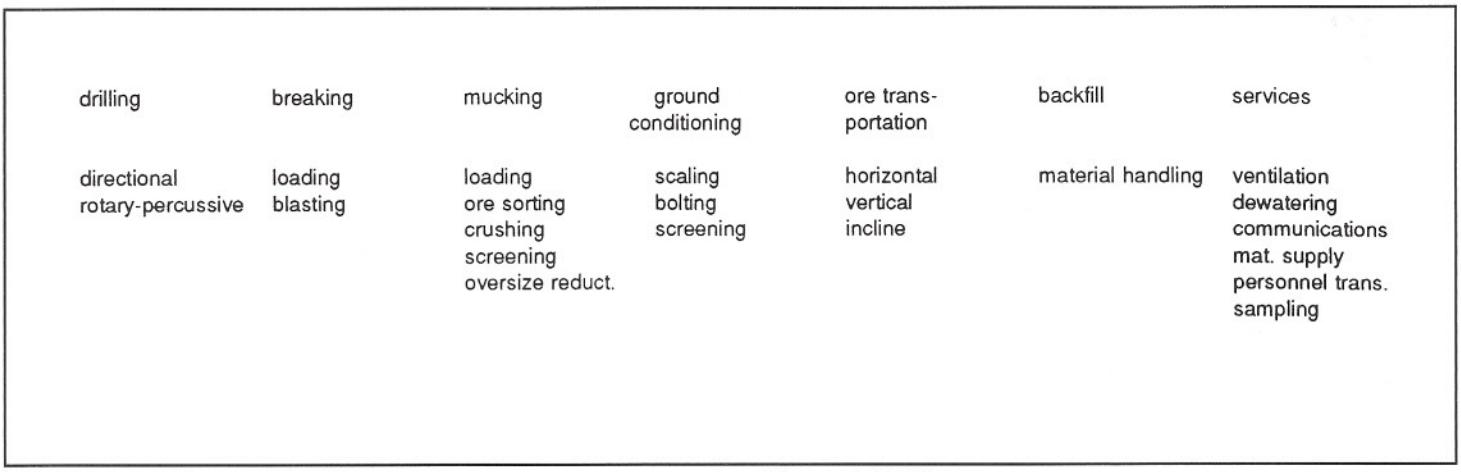


Figure 1. Mining processes

Mining Automation

Based on what was said before, the processes used in mining depend on the type of mine and are different. For each type of mine, depending on the machinery and the size and the mining processes, various automation levels can exist. This would be based on the objective for automation. Usually two main reasons justify the automation of a process: economic reasons and the safety of workers. An example of the latter, for instance, in the case of underground mines is the inspection of the elevator cables carrying the ore/workers in the main shaft. This inspection must be done more frequently because of the hostile environment. Automation of such a task, which at first may not seem to be that important, is in fact quite critical because in this way the condition of the cable can be constantly monitored. These types of project, or for instance an electronic non-contact system to measure the dust thickness and/or density where required, are novel technologies to serve and improve the traditional mining practices. On the other end, finding practical ways of reducing the dilution or its associated costs, or changing the traditional method of hard rock mining, as outlined above, and employing new ideas such as plasma blasting imply larger scales of mining automation. A number of mining or mining related companies, research centres and government financed organizations in Canada as well as other countries are currently working on different projects for better, safer, more efficient and more intelligent mining. This is reflected in an increasing number of international conferences and symposia on mining automation.

In Canada there are a number of research centres active in mining related studies. The Canadian Centre for Automation and Robotics in Mining (CCARM) in Montréal was officially opened in June 1988; its mandate is to perform fundamental research towards the automation of mining processes and to investigate and develop new methods and concepts in

this regard. Two Montréal-based universities, Ecole Polytechnique and McGill University are associated with this centre. The Canada Centre for Minerals and Energy Technology (CANMET) in Ottawa is another government-based organization for research and development services for Canadian mining companies. With a government financing of about 14 million dollars a major part of which is devoted to mine automation research they have recently converted an abandoned underground gallery in Val d'Or to a laboratory for field research on underground mining. In the United States, the US Bureau of mines is the government body associated with mining research and development.

To name just a few of the projects or the typical subjects of research, under investigation or completed by government or private research organizations, the Noranda Technology Centre in Pointe-Claire, Québec, is working on plasma blasting; this is an alternative to blasting by explosives (chemical blasting) with the expected advantages of not having fumes and capable of being integrated with an automated machine for continuous hard rock excavation. Also, in collaboration with CCARM they have already completed a project on the automated guidance of Load-Haul-Dump machines (known as LHD loaders) inside underground tunnels, using a camera as the sensor and reflected tape as the guide line. Figure 2 illustrates such a concept. If the above projects are combined with Automatic loading and unloading of LHD's, and necessarily the obstacle avoidance for safe work of the machine, then a significant change can be expected in the way that underground excavation takes place. The latter two projects are among the current work of CCARM, using the state of the art in robotics and its associated expertise, like vision and force sensing. Automation of the operation of large capacity dump trucks using GPS (Global Positioning System), a positioning system based on the information received from a number of satellites specially launched for this purpose, exemplifies the automation practice in open pit mines. In CMU's (Carnegie Mellon University, Pittsburgh) FASTNAV project such a technology has been tested for the navigation of a 150 ton Caterpillar dump truck.

With gradual success at all such preliminary stages, the bigger dreams of intelligent mining, such as remotely supervising all the activities of underground operations, may eventually come true. This is in fact the aim of multi million dollar projects such as the Intelligent Mine Technology Programme in Finland, a four year programme with 12,000,000 $ (Canadian) budget, and an expected five year PRECARN project with a budget of about 20,000,000 $ (Canadian), and current and under way research projects at Carnegie Mellon University in the United States. The PRECARN project promises to be the biggest Canadian project so far financed; called the Mining Automation Project (MAP), it covers a number of projects in underground and surface mining, from drill monitoring and control in directional drilling to energy management and optimization for heating and ventilation. An emphasis is given to modelling and computer aided drafting (CAD) techniques; that is, in a way, bringing the mining process of ore delineation to the computer laboratory for analysis and decision making.

One of the major issues in underground mining is communications. In order to automate any machine and monitor it from a control centre, reliable means of communication in the form of digital, data, visual, audio and so on, are essential. Without effective communication, not much can be done with regard to remote sensing and feedback, the principle elements of automation or its lower level of tele-operation. Many organizations, including CCARM, have worked on the subject, which bears importance in other applications such as mobile communication for underground trains, sewerage systems, etc.

While we cannot mention all that is going on in terms of automation in mining, what each individual organization is doing, what their contribution is in this respect, in this rather introductory paper, before looking at the levels of automation in surface mining we may add a few words about other items that are worth mentioning. In all underground

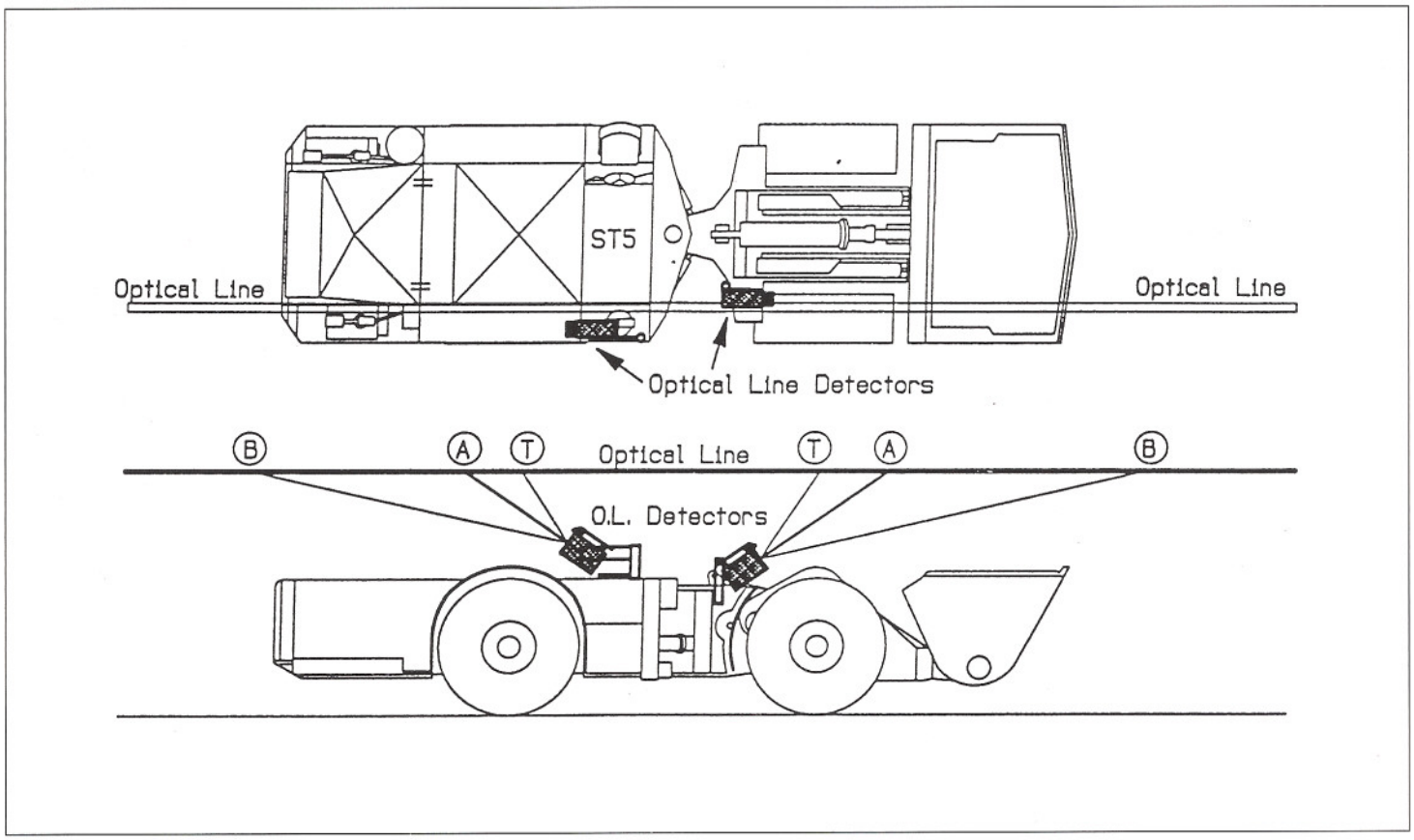


Figure 2. Underground navigation for LHD loader employing reflecting tape and camera

mines the circulation of air and ventilation is quite important. The cost of electricity for warming and circulating the fresh air is enormous. CANMET is working on the research for better and more efficient management of energy in mines, by using expert systems.

Another good example of optimization practice in mining operations is the haulage system in open pit mines. The large capacity power shovels and the dump trucks are very costly; their operation, therefore, must be very efficient. In almost all modern surface mining operations, the process of job allocation to these machines (dispatch system) is automated and computerized. In cold regions, where foggy days are more frequent, auxiliary ways of navigation and path finding will help the drivers continue working without the dangers of getting lost and colliding, etc. At the present time, operations must stop. The FASTNAV project mentioned earlier aims towards the same type of objective, to identify the location of a truck for navigation purposes. At a lower level, among other tasks that can be done for improving the efficiency of operations is to optimize, automate, and finally computerize the functions of the power shovels, which consume a very large amount of energy in the form of electricity.

Robotics in Mining

The progress made in the last two decades in the employment of industrial robots in manufacturing systems makes them good candidates to be considered for the laborious, tiresome and operator-hazardous jobs in other industries. Most of the tasks assigned to robots have a repetitive nature. After all, robots are mechanical machines that can be programmed and controlled by a computer. Due to this, they are excellent for repeating the same set of motions again and again with almost the same accuracy. If they can be utilized wisely, then they are very useful for stationary work, in particular if the task to be performed is boring, unhealthy or dangerous to a human operator. With the

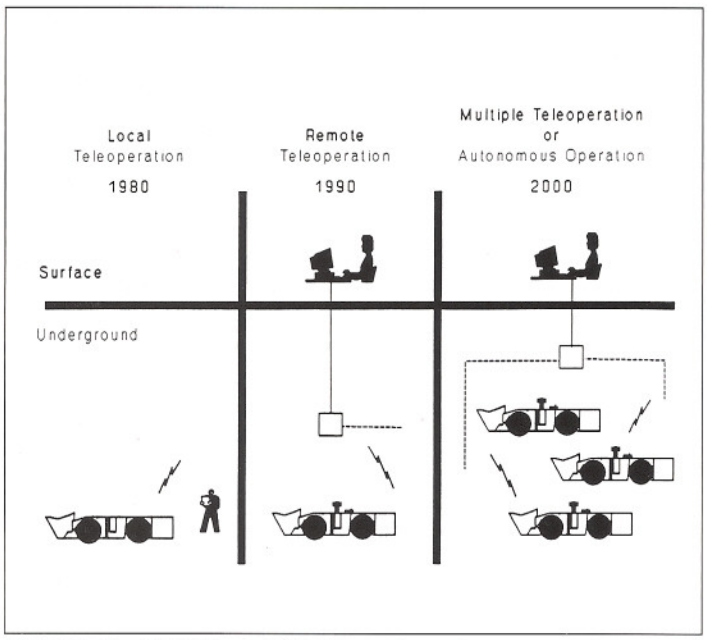


Figure 3. Optical guidance system for an underground mining vehicle.

technological progress in artificial vision, force sensing and so on, as the add-on capabilities to robots, robotic manipulators can be combined with mobile robots in order to interact with dynamic environments too. Nevertheless, this capability is not yet advanced enough, because of the cost, cost effectiveness, and technical complications for the sorts of tasks to be performed, though in applications such as nuclear power stations and the like such a capability is quite desirable.

A mine is a dynamic environment in the sense that its physical size and shape, particularly in the work zone, change continuously. Moreover, a mine site is a hazardous environment. The state-of-the-art in robotics, undoubtedly, can be fully utilized in the mining industry. The fact that mining automation is in its infancy illustrates that it will be some time before robots are deployed in mining activities as fruitful tools. The adoption, however, has already started; it is a matter of time, more research, and technology transfer. Automatic navigation in underground mines is an example that very soon will be followed in surface mines. At the present time, in addition to using reflected tape and ordinary light, and coded tape with a laser source, INCO (Sudbury, Ontario) has brought to reality a novel idea of using the overhead cables carrying electricity to supply power for an automated haulage truck (called AHT) as the guidance reference. They have put into service a 70 ton truck for transfer of ore at 1200 ft. below the surface.

Ideally automation in an underground mine implies automatic recognition of the ore body, cutting or fragmenting the ore body with minimum waste (dilution) and automatic transport of the broken ore to the surface. All operation is continuously monitored and controlled by a supervisory computer. Human operators can monitor the events to verify and make sure everything is going on well. Such a concept and its envisaged date of coming to reality is shown in figure 3 which also illustrates the evolution of such a capability. Obviously, before arriving at such a stage, much research on subjects both directly and indirectly involved in mining will be necessary. As for example, taking the problem of loose rock detection mentioned earlier, HDRK has worked on a device to detect the loose rocks from the remote; ultimately this will lead to automatic detection of loose rocks in mines, which would be necessary even in a mine where only the machines work.

Among the efforts towards the development of autonomous mining machines are the research projects in progress at different laboratories of the US Bureau of mines. Their work is mostly focused on coal mines for which continuous mining machines can be used. Automation of such machines involves the same expertise employed in robotics, such as vision, force feedback, mobile robot technology and so forth. Similar activities are going on in Europe and South Africa. Down the road, when such a machine is fully automated, that is when it can use its enhanced capabilities and artificial intelligence to find its way and move towards the excavation zone and use its vision system to logically decide when and where to cut, we are one step ahead in terms of monitoring from our above ground control room what is going on under ground. The same sort of capability is envisaged for hard rock mines; an autonomous intelligent continuous miner which is capable of breaking the hard rock, transfer it to haulage trucks, correct its working zone position and area of action, and finally transmit all the information to the supervisory computer. This would be the miner of the future, but not until another decade, at least, and provided that the research work is continued and supported by the mining companies, the governments, research organizations and the people. Figure 4 indicates an artist view of such a machine at work.

Summary

Automation in mining implies taking the human operator away from the more dangerous areas, increasing the work speed and the productivity, eliminating or minimizing unnecessary or costly installations/ equipments, reducing waste in energy, etc. This implies employing more advanced technologies like robotics and associated expertise for serving the mining industries. It may require a significant innovation in changing the ways certain methods have been used and certain tasks have been

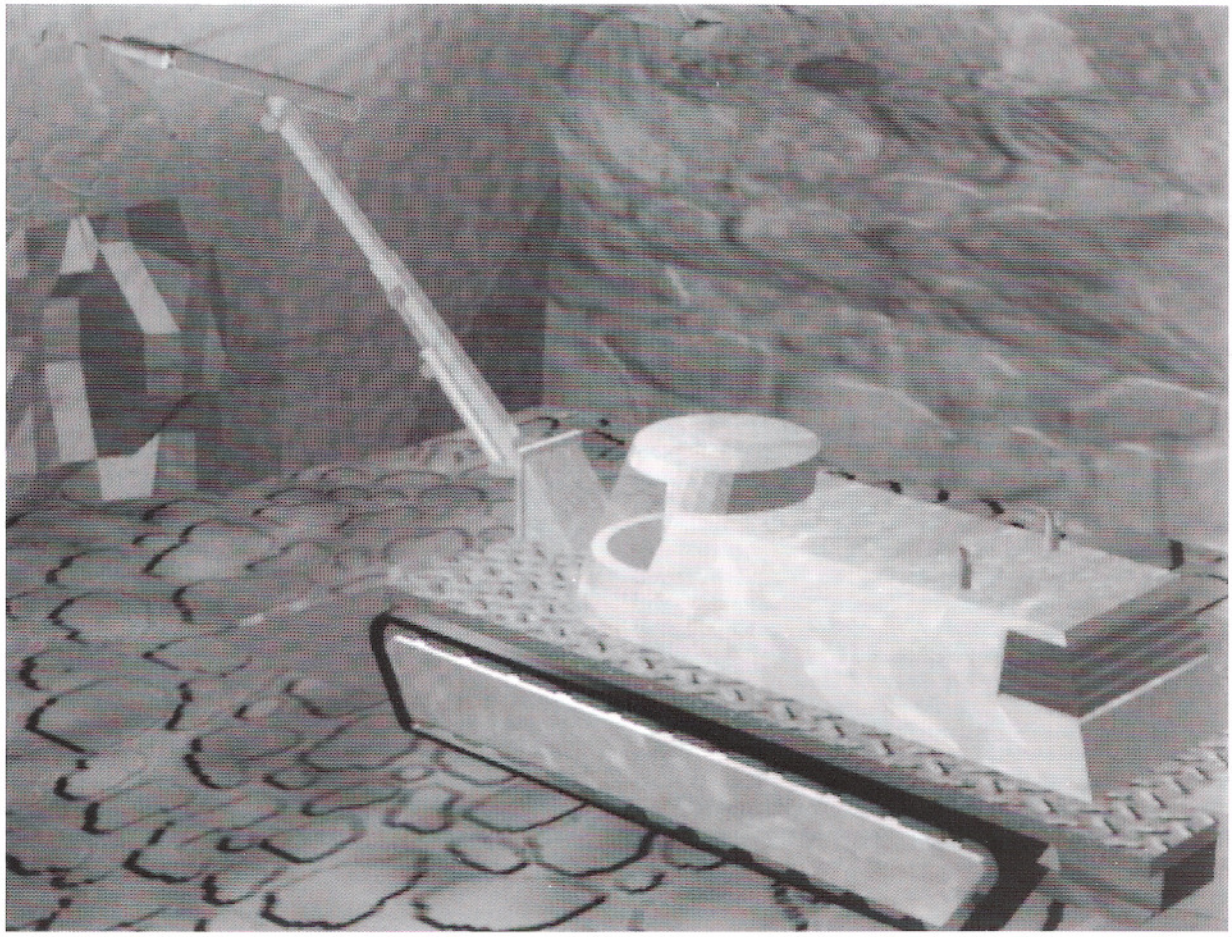


Figure. 4 A futuristic continuous mining vehicle for hard rock mines based on plasma blasting Technology (PBT) developed by Noranda (courtesy of Centre de Technologie Noranda).

practiced so far. Automation is a must for the mining industry, in order to stay profitable and competent in the international market.

Acknowledgment

The author wants to thank Dr. Paul Freedman (CRIM), Professor Malcolm Scobel (McGill University), and Professor Denis Gill (Ecole polytechnique) for their fruitful remarks on the article.

Bibliography and Further Reading

The following publications indicate some sources of information about mining and the current level of automation in mining. The first one gives a general idea about the mining processes and various aspects of mining as an industry for those who are interested, with particular facts about Canadian mines. The others are conferences/symposia on mining automation.

MINING EXPLAINED, A Guide to Prospecting and Mining (ISBN 0-919336-31-1), 1990, published by The Northern Miner, Toronto

1st IFAC Workshop on Advances in Automation of Underground Hard Rock Mining, Sept. 1988, L'Estérel, Québec.

1st Int. Symp. on Mine Mechanization And Automation, 1991, Golden, Colorado.

U.S. Bureau of Mines Open Industry Briefing on COMPUTER-ASSISTED MINING, April 1992, Charleston, West Virginia.

The 11th WVU Int. Mining Electrotechnology Conf.., July 1992, Morgantown, West Virginia.

5th Canadian Symp. on Mining Automation, Sept. 1992, Vancouver, BC.

About the author

Ahmad Hemami received the B.Sc. degree in mechanical engineering in 1969, from the University of Teheran. He then worked as a plant engineer in a petrochemical complex until 1975. In 1981, he received his Ph.D. in system dynamics and control, from the Department of Aeronautical and Mechanical Engineering, University of Salfrod, UK. He has been a professor of engineering at Concordia University in Montreal until 1991, when he joined the Canadian Centre for Automation and Robotics in Mining at École Polytechnique, Montréal, as a senior scientist. He has several years of industrial and academic experience, and has authored numerous technical journal and conference papers. His areas of research are : linear control systems, robot manipulator kinematics, dynamics and control, mobile robots and multi-arm robots.

Speaking Out

When you have to say a few words ...

by Louise Peacock

At some point during your lifetime, either for personal reasons or for career reasons, you will be asked to "say a few words". Whether you are addressing guests at a family occasion or a large crowd at a business dinner, you will have been asked to perform Public Speaking. This article is about public speaking, some of the problems it may bring, and what you can do to overcome them.

Un jour viendra où, pour des raisons personnelles ou pour l'épanouissement de votre carrière, on vous demandera de "dire quelques mots". Que vous vous adressiez aux invités lors d'une réunion de famille ou à une large assemblée lors d'un repas d'affaire, on vous demandera de prononcer Un Discours. Cet article explore le sujet du discours public, certains problèmes que cela peut occasionner, et la façon de les surmonter.

Many people find the idea of standing up and addressing a group of people a very traumatic and intimidating event. We all envy the smooth relaxed after-dinner speaker who stands there confidently, joking and smiling, apparently with no effort. This individual seems to be able to keep the audience's attention riveted on his or her words. This ease and confidence may come naturally, but chances are the speaker has spent a lot of time and energy in preparing for the moment.

Your first exposure to public speaking may have been when you were at school. If so, you surely remember the time you had to stand up in front of the whole class and read something. The experience may not have been an encouraging one, and as you proceed through life, you may tend to remember how much you disliked having to do it.

Today, you may find that your position requires you to address groups, or that you have a particular field of expertise that is much in demand, causing you to receive many invitations as an after-dinner speaker. You may never enjoy it, and you may never be a "natural", but you *can* learn to stand up and "say a few words" without going into a panic. You can do this by following a few easy rules.

Determining your Audience

What you present in your speech will be very much audience-determined. No matter what the group or what the occasion, try to find out as much as you can about the potential audience so that you can gear your speech to that particular group. You can usually get information about the audience from the program co-ordinator, or the person asking you to make the speech. You need to know what the audience expects from your speech, what special audience customs or rules exist, and if there are topics you should avoid.

Speech Types

Speeches can be divided into two main categories: Prepared and Impromptu. In either case, you will be provided with a topic or (and this is the hardest call), you will have to select a topic of your own.

Prepared Speech

When you know in advance that you are giving a speech, you will have time to select a topic and prepare your material. You can spend time writing and reviewing your outline and, if applicable, you can prepare flip charts, slides and transparencies. Advance notice gives you a better opportunity to practice the speech and to get the "bugs" out of it.

Impromptu Speech

The impromptu speech is dreaded by most people. You are at an event, perhaps a company dinner, a wedding or a birthday, and someone suddenly says "Would you say a few words about..." You may be asked to introduce a speaker, to congratulate a winner, to be a judge, or just to make some pleasant remarks about a guest.

Rather than assuming "it will never happen to me", always have some little anecdote or story handy (preferably on index cards) when you go to any gathering where there is a remote chance that you may be asked to speak. Any time you give a talk, save your notes and cards for future use; you can always adapt an old talk to a new situation.

Selecting a Topic

Choosing a suitable topic can be challenging, even if you are given ample time to prepare. It is very important to determine your audience so that you can speak on a subject that will appeal to them. If you have been asked to give an after-dinner speech at the Rotary Club, you will not want to plan a technical presentation on Aerophysics. However, you might find that a few anecdotes about your experiences in that field would be well received.

Skimming through the newspaper or a recent issue of a magazine may help to stimulate your imagination. You may see a topic that is of particular interest to you and one which is general enough to present to a mixed audience. Or, perhaps you have recently been on a canoe trip through a national park, or a hiking trip through some remote part of Northern Canada. Often, something that you take for granted as an interest or hobby, can be very intriguing to others.

Preparing your Speech

Keep the following points in mind when you are writing your speech:

1) Tell them what you are going to say. (The opening should summarize the points you plan to discuss.)

2) Tell them about it. (The body of the speech elaborates and discusses your main points.)

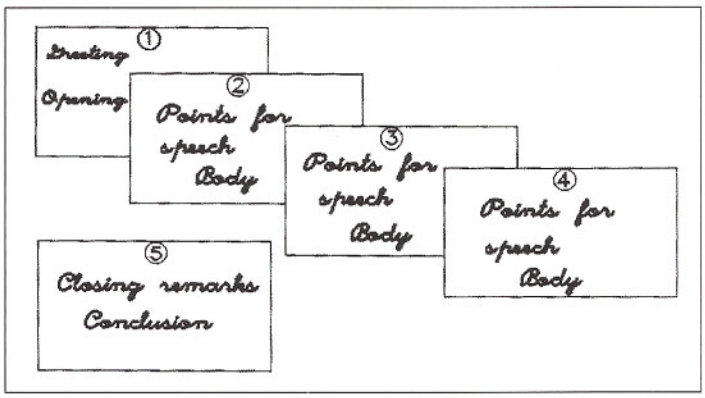
3) Tell them what you told them. (The closing should summarize what you talked about.)

Write an outline covering your main points. Review the outline and fill in the details under the various points. Make notes on reference material you may wish to use, or points that you wish to illustrate using slides, overheads or other aids.

Once your speech is written, and you are ready to prepare the final version, use palm-sized index cards as reminders of main points. Based on my experience, many speakers consider the index card method beneficial.

For example, if you plan to give a five minute talk, use five cards. (If the speech is longer, you could jot down more points on your cards, and make each card carry two minutes of your speech.) Number the cards clearly so that you can easily keep them in sequence. Use the first card for opening points, the middle three cards for the body of the speech and the fifth card to list your closing remarks.

Using small index cards allows you to hold them unobtrusively in your hand if there is no podium. Or, if you are using a podium, the cards can be placed on the top and turned over as each minute of speech is finished. Listing the principal points on the cards helps you to focus on and keep track of where you are in the speech. Your eyes can quickly find the next point, or return to the previous one. If you have the speech written in full on regular sheets of paper, you may be tempted to read it rather than speak it. Loose or stapled pages can cause other annoyances, such as flapping about and rustling loudly when you turn them. Also, if the pages are loose, you must shuffle paper to get to the next page while ensuring that the pages are still in sequence. Pages may escape from the bundle and fall on the floor. In addition, there is the matter of losing your place in the notes. Using index cards can solve all these problems for you.



Index cards will help you through your speech.

Speech Length

Once you have started to prepare the talk, you need to determine its length. Often the length of the speech is pre-determined by the requester, but there are times when you are given free reign. You may think your subject the most fascinating in the world, but remember that the audience may not, so make sure that you keep to the pre-announced speech length. An impromptu speech can be 2 to 10 minutes in length; a prepared speech, 10 to 20 minutes maximum. A fellow speaking-club member used to tell me: "Leave your audience feeling as though they would have liked to hear more, rather than hoping to sneak out unseen".

If appropriate, allow enough time at the end of your talk to give people a chance to ask questions, but remain within the allotted time. If you are the only speaker or the last speaker, this is not so crucial, but it if there are other speakers to follow, courtesy requires that you not run into overtime.

Practice your Speech

Practising your speech is crucial to the success of your presentation. While you practice, you will have the opportunity to check things like timing, nervous tics or habits and facial expressions. If possible, practice in front of someone. If you feel uncomfortable practising in front of family or friends, use a mirror, a timer and a tape recorder. Be relentless in picking holes in your own speech. If you find your own presentation long and boring, and your facial expressions and speaking habits annoying (coin jingling, nose pulling, pacing, saying "umm", etc.), imagine how your audience will feel. Find out if a podium is available. If so, find a piece of furniture of approximately the same height and practice in front of that.

Pause at significant points in your talk. Keep an eye on the timer, but do not start to rush if you find that you are running out of time. Instead, bring your speech to a conclusion sooner, by chopping verbiage, if you can.

Time yourself. If you plan to give a 10 minute speech, set your timer to 10 minutes and begin your speech. You will probably find that you are finished a lot sooner than you expected. Repeat the process until you have the speaking speed and appropriate pauses correctly judged. Timing yourself and recording the speech will also give you the opportunity to find out where you need to make changes. Practise your speech until you can say it by heart; you will have one thing less to worry about when the big date arrives.

When you have completed the body of your speech, pause momentarily, then move to the conclusion. Pause for a moment, acknowledge applause if it is forthcoming, then leave the podium.

When your speech is word perfect, work on refining your presentation. Practice greeting the audience. Greeting the audience in an appropriate manner adds a professional touch. It also gives you precious moments in which to finish composing yourself, to test your voice and most importantly, to establish eye to eye contact. In addition, while you are greeting them, they get a chance to get settled. If the event is fairly informal, you can simply say "good evening, ladies and gentlemen." If the occasion is more formal and a coordinator or organizer is on hand to introduce you, you can address that person first, e.g. "Mr. President, Madam Vice-President and gracious members".

Eye to Eye Contact

When you stand up to talk, you are in front of a sea of blurred faces. Even if these are people you know, from behind the podium you may get the feeling that they are unfriendly faces. You must search the crowd for a friendly one, and make eye to eye contact with that person. Move your eyes around to different parts of the crowd. Moving your eyes around gives people the feeling that you are talking *to* them, rather than *at* them.

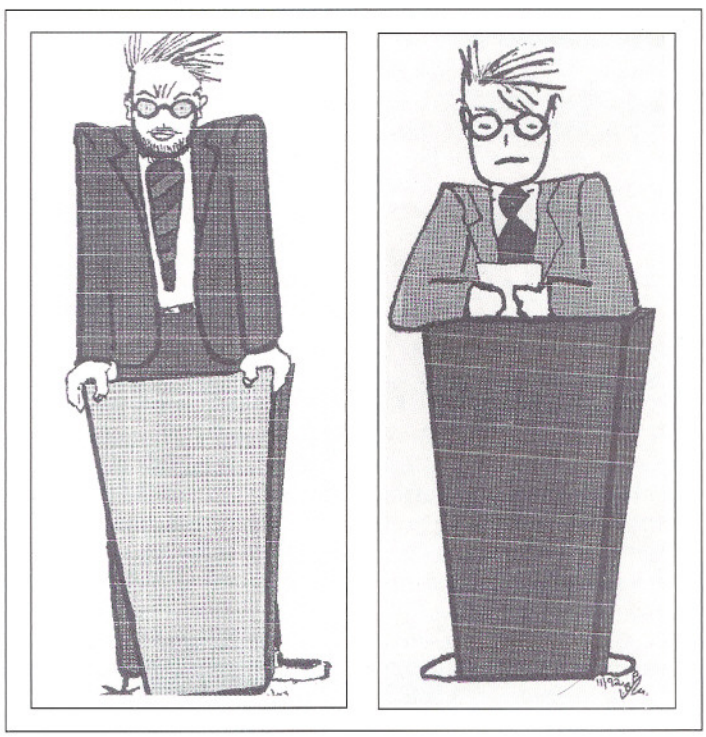
Find several people in different locations throughout the audience. When you begin your speech, you will be able to look directly at one of your "contacts". Looking at a friendly face will help you deliver your speech or talk in a more relaxed manner, because now you are talking "person to person". In this regard, the index cards previously mentioned help you to carry out the eye to eye contact that is so important in giving a talk.

Speaking Tips, and Habits to Avoid

There are a number of things that people tend to do when addressing a group that may distract the audience and spoil the speech. While you are practising, be alert for nervous habits and check the list of Do's and Don'ts shown in the box.

Selecting your Wardrobe

Last, but definitely not least, you need to select appropriate attire. It is vital that the audience should not be distracted by your clothing. Neatness and comfort are the most important considerations and you should try to wear something lightweight because the room will probably be quite warm. The sort of occasion you are attending, will of course, help to determine what sort of clothing would be appropriate, but avoid something that is either too bright or too outlandish. Jewelry may be worn, but avoid large or bulky items. Have a "dress rehearsal". You will soon find out if there is something uncomfortable or inappropriate about your chosen outfit.



Don't lean on or grip the podium.

Giving the Speech

This is the moment you have been dreading, the practice is over, the mirror is gone and you are about to step out into the spotlight to face a group of people and give a talk. Take a few deep breaths, glance quickly through your cards, make sure they are still in order. Stand up straight, put your shoulders back, pull your stomach in and walk firmly and confidently out to the podium. Look out at the audience and give them a friendly smile, as you place your preset timer, and your speech cards on the podium. While you do this, you are scanning the audience for those friendly faces we talked about. Greet the audience, fix on someone, and give your talk.

You will discover that there is really no reason why giving a talk should intimidate you, provided you take the proper steps. It is just like any other procedure; if you follow the steps in the proper sequence, you will find that the task is much easier than expected. As **Alex Mair** says in *How to Speak in Public*: "Before you know it, you are down to the bottom of the last page and a familiar voice is saying something about thank you very much. The voice is familiar because it's yours, and everything has gone very smoothly."

So, go ahead, say a few words, and enjoy the thrill of being acclaimed. ■

About the author

Educated in Europe, **Louise Peacock** is a professional Technical Communicator, and has spent the past 8 years writing and producing user documentation for computer hardware and software. Future projects include a gardening hand-book; a book about life in Portugal as a child; and a pet owners handbook, to be written in concert with two veterinary surgeons. Active in the community, she works hard to bring change and improvement in her neighborhood. Louise is working toward degrees in English and in Horticulture.

SPEAKING TIPS – AND HABITS TO AVOID

DO practice your speech	DON'T speak too quickly
DO take a few deep breaths your before speech	DON'T dig your hands into your pockets and jingle coins around
DO arrive a few minutes early	DON'T drink alcohol before the event
DO make eye to eye contact	DON'T lean on or grip the podium
DO use simple, clear language	DON'T riffle through your notes
DO smile at the audience	DON'T chew gum
DO pause after a major point	DON'T say "umm". (Take a deep breath instead.)
DO dress neatly & comfortably	DON'T pace around
DO take a sip of water if your throat gets dry	DON'T fiddle with spectacles, jewelry, or clothing
DO stand up straight	DON'T panic

The Public Library is an excellent source of videos, cassette tapes and books on public speaking. Of the many excellent publications dealing with public speaking, the author's three favorites are:

Cook, Jeff Scott 1989. The Elements *of Speechwriting and Public Speaking*. Macmillan Publishing Co. New York.

Davies, Don and **Wheeler, Bern** 1981. *Standing Ovation or Polite Applause?* St. George Press. London, Ontario.

Mair, Alex 1985. *How to Speak in Public*. Hurtig Publishers. Edmonton, Alta.

Arabella Bengston, President of Ontario Speakers Association recommends these books:

Montalbo, Thomas 1984. *The Power of Eloquence*. Toronto. Available from Toastmasters.

Peoples, David A. 1988. *Presentation Plus*. John Wiley and Sons, Toronto.

Public Speaking Clubs and Organizations

You do not have to join a speaking club in order to acquire public speaking skills, but it certainly helps. Most clubs hold regular meetings and all those attending are given ample opportunity to "practice". Competitions are held regularly and members are encouraged to join in. There are always plenty of visitors, and members make them feel very welcome. With over 5000 clubs, **ToastMasters International** is the largest and most reputable speaking organization in the world, and has chapters in most Canadian cities. If you are interested in taking courses to become a professional speaker, National Speakers Association, a U.S. based organization, operates in Canada under the name of **The Ontario Speakers Association** and is located in Toronto.

A few words from the incoming Managing Editor

A changing of the guard always merits explanation. Just who is this Paul Freedman and how did he come to be the new Managing Editor?

Well, my professional story begins at the University of Toronto with a B.A.Sc. in Engineering Science in 1978. After almost three years working in building automation (computerized energy management systems) for the The E.C.E. Group and then A.D.T. Energy Systems in Toronto, I moved to Vancouver to pursue graduate studies at UBC in Electrical Engineering. Then it was east to Montréal to earn a Ph.D. at McGill University in robotics, followed by almost three years at the Laboratoire d'automatique et d'analyse des systèmes (LAAS) du CNRS in Toulouse, France. Since 1991, I am a senior member of the research staff at the Centre de recherche informatique de Montréal (CRIM), an Adjunct Professor in Electrical Engineering at McGill University, and a member of the Ordre des ingénieurs du Québec.

Well, so much for my credentials. But it's really thanks to almost two years of volunteer work as Associate Editor that I came to know and care about the IEEE Canadian Review. Ted Wildi, the outgoing Managing Editor, deserves much credit for the work he has done. And although my appointment was official as of September 1st, this Fall '93 issue is really a joint effort with Ted looking over my shoulder. But this is the first time that true desktop publishing software was used (thanks to CRIM!) and in this way, our printing costs will be substantially reduced.

IEEE Canada is meant, after all, to provide services to IEEE members living in Canada. In part, that means thinking carefully about what should be appear in the IEEE Canadian Review. Unlike IEEE Spectrum which boasts a professional staff of well-qualified journalists, the IEEE Canadian Review depends upon its Associate Editors and the Managing Editor (yours truly) for:

- identifying suitable topics;
- tracking down potential authors;
- persuading these people to steal time from other things to draft an article;
- editing manuscripts;

all this, in order to publish articles which, I believe, should be **topical, technically informative, and somehow Canadian.**

De plus, je m'engage à travailler pour que le ***IEEE Canadian Review*** s'ouvre davantage sur le monde francophone. C'est pourquoi, je lance un appel bilingue pour des adjoints à la rédaction.

I would also like to remind scholarly-inclined readers that our "Sister" publication, the Canadian Journal of Electrical and Computer Engineering, continues to serve as the Canadian forum for peer-reviewed technical papers in the field of electrical and computer engineering.

And while I can't promise that future issues of the IEEE Canadian Review will please everyone, I do hope that they won't simply be tossed aside. After all, part of your IEEE dues are on bottom the line. So if you're happy or unhappy with what you read, please find the time to let me know. I prefer electronic mail, but I haven't forgotten (yet) how to open envelopes. Every now and then, I even send out some paper mail myself.

By Paul Freedman
Managing Editor

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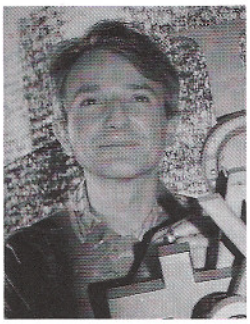

«C'est en forgeant qu'on devient forgeron.»

Appel pour Adjoints à la rédaction

La rédaction du ***IEEE Canadian Review*** pose de nombreux défis car les 16,000 lecteurs ont une formation technique avancée et se trouvent en industrie, au gouvernement et dans la communauté de recherche au Canada. Le nouveau rédacteur en chef est présentement à la recherche de bénévoles au poste d'adjoint à la rédaction. Les candidats doivent posséder une grande connaissance d'au moins deux des sept domaines d'intérêt affichés à l'endos de la page couverture. De plus, ils seront censés proposer quatre ou cinq sujets pour des articles futurs, identifier des auteurs potentiels et travailler sur la préparation des manuscripts à soumettre par la suite au rédacteur en chef. Les engagements sont d'une durée de deux ans. Les personnes intéressées sont invitées à faire parvenir leur curriculum vitae au rédacteur en chef à l'adresse indiquée à l'endos de la page couverture.

Call for Associate Editors

The ***IEEE Canadian Review*** has a large and well educated readership of over 16,000 people occupying important positions in industry, governement, and the research community in Canada. The publication of the Review represents a challenging experience. The incoming Managing Editor is now seeking volunteers to take on the responsibilities of Associate Editor. Volunteers should be particularly familiar with at least two of the seven areas of interest listed on the inside front cover, and be prepared to eventually suggest four or five topics for future articles, seek out possible authors, and work with them to prepare manuscripts for submission to the Managing Editor. Appointments are for two year terms. Candidates are asked to submit their curriculum vitae to the Managing Editor at the address shown on the inside front cover.

Ray Bartnikas named 1993 IEEE McNaughton Gold Medallist

Ray Bartnikas received his early education at St.Michael's College School in Toronto, Ontario. He obtained the B.A.Sc. degree in Electrical Engineering from the University of Toronto in 1958, and the M.Eng. and Ph.D. degrees from McGill University in 1962 and 1964 respectively, also in Electrical Engineering.

In 1958, Dr. Bartnikas joined the Cable Development Laboratories, Northern Electric Company (now Northern Telecom), Lachine, Québec, where he carried out work on ionization discharges in cavities and on dielectric losses in cable insulating systems. In 1963, he joined the Northern Electric Research and Development Laboratories (now Bell Northern Laboratories), Ottawa, where he continued his work on discharges and dielectrics, becoming increasingly involved in thin film dielectrics with application to integrated circuits and semiconductor devices. In 1968, he joined the Institut de Recherche d'Hydro-Québec and held the position of Scientific Director of the Materials Science Department. He presently holds the position of Maître de Recherche and is engaged in research on partial discharge phenomena and on dielectric materials with application to cables, transformers and rotating machines.

Dr. Bartnikas is the author of many papers in the area of dielectrics, gaseous discharges and associated measurement techniques. He is the editor of the ASTM monograph/book series Engineering Dielectrics and two books entitled Elements of Cable Engineering and Power Cable Engineering. He is an Adjunct Professor at the University of Waterloo, École Polytechnique of Montréal, and McGill University.

Dr. Bartnikas is a recipient of many scientific awards; he is a Fellow of ASTM, the IEEE, the Institute of Physics (UK) and the Royal Society of Canada (Academy of Sciences Division). He held the position of Chairman of the ASTM Committee on Electrical and Electronic Insulating Materials from 1979 to 1985. He also served as President of the IEEE Dielectrics and Electrical Insulation Society, and is currently a member of the IEEE Energy Committee and the IEEE Insulated Conductors Committee. He is a member of the committees on electrical insulating materials of the Canadian Standards Association (CSA) and the International Electrotechnical Commission (IEC).

Mr. Ray Bartnikas, winner of the 1993 McNaughton Gold Medal

IEEE CANADA E-MAIL NEWSLETTER

Starting in October 1993, the IEEE Canada E-mail Newsletter is available (monthly) via e-mail from IEEE Canada. It will provide information by, and about IEEE members across Canada and other like-minded parties.

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