

INNOVATION

Spring 1989

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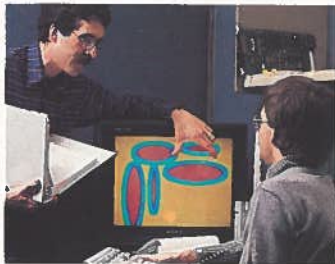


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INNOVATION

This is a reader's magazine, open to ideas and information from its readers. Offers and requests of technology transfers must come from our readers in Canada to match those supplied from abroad.

You can contact us at:

INNOVATION, Technology Transfer Service (J011), Technology Liaison Directorate, Industry, Science and Technology Canada, 235 Queen Street, Ottawa, Ontario K1A 0H5
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(Également publié en français)

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Minister of State (Small Businesses
and Tourism)



Innovation is not, repeat not, dead! It is very much alive and with prospects of becoming even better. Of course, we speak not just of this magazine (which has had its problems) but of the innovative, entrepreneurial spirit that exists in this country.

This issue of *Innovation* magazine reflects that spirit in the articles and information we have included. And we intend that future issues will continue in that regard and, in addition, present the aims, programs and services to Canada's business and industrial communities of our new department, Industry, Science and Technology Canada.

Ongoing Involvement

The department's ongoing involvement is shown in the presentation of some of its programs — TECHNOLOGY OUTREACH PROGRAM (TOP), TECHNOLOGY OUTREACH PROGRAM/ADVANCED INDUSTRIAL MATERIALS (TOP/AIM), SECTOR COMPETITIVENESS INITIATIVES and STRATEGIC TECHNOLOGIES PROGRAM. All have been designed to assist in furthering high technology in Canada.

Articles on the Canadian Plastics Institute, Inno-Centre Québec and the Halifax-based Applied Microelectronics Institute describe how federal and provincial governments as well as private institutions have and continue to encourage and help Canadian industries across the country.

The Innovative Spirit

Two examples of the innovative spirit can be seen in the articles on Glacem Inc., of St-Lambert, Quebec, and R.A.D. Service and Instruments Ltd. of Scarborough, Ontario.

Only about two years old, Glacem Inc. has already revolutionized the sport of sliding on ice and snow — tobogganing and lugeing. It has developed a method of keeping the ice on sliding tracks, such as luge runs, frozen to the best state for fun even when temperatures rise to near melting point.

R.A.D. Service and Instruments Ltd., long a leader in the development and production of radiation monitoring devices, has developed a method of monitoring the harmful radiation decay products of the radioactive gas radon. In many countries, these decay products, called "radon daughters", constitute a major part of the natural radiation dose to human beings.

Further examples of these innovative and inventive spirits are reflected in the article on the winners of the 1988 Canada Awards for Business Excellence in the *Innovation* and *Invention* categories — Alcan International Limited and Virtual Prototypes Inc., both of Montréal.

Alcan won the Gold Award in the *Invention* category for developing a safe, compact and highly efficient source of standby electric power. Virtual Prototypes' Gold Award for *Innovation* was for designing an easily used software for complex computer control and display systems such as used in aircraft cockpits, car dashboards and monitoring workstations.

Our regular features will continue to describe opportunities in the transfer of technology as well as special events of note around the world.

So innovation lives in Canada and we believe it will prosper as long as Canadians continue to have the will and enterprise not only to dream but to bring their dreams to reality.

NEW DEPARTMENT (ISTC) – NEW PROGRAMS

Industry, Science and Technology Canada (formerly the Department of Regional Industrial Expansion) provides a number of programs that reflect its new mandate. Among the newest are the Technology Outreach Program (TOP), its offshoot the Technology Outreach Program/Advanced Industrial Materials (TOP/AIM), the Sector Competitiveness Initiatives and the Strategic Technologies Program.

• **Technology Outreach Program (TOP)**

• The primary aim of TOP is to improve the productivity and competitiveness of Canadian industry by providing financial support for the acquisition, development and diffusion of technology and training, especially to small and medium-sized businesses.

• This will be achieved by granting start-up and, in some cases, sustaining assistance to non-profit organizations established to provide technology development and diffusion as well as training to support industry in Canada. Included are industry associations, provincial research organizations, technology centres affiliated with universities and other educational institutions.

• Under TOP, start-up assistance can be provided up to 50 percent of the forecast operating costs, averaged over a five-year start-up period. Assistance can be up to 100 percent of the operating costs in the first years but will decrease as revenues from other sources increase.

• Sustaining assistance may be provided after the start-up period to provide services that are not completely cost-recoverable, such as technology awareness, training, visits to small businesses, international liaison. Centres will have to demonstrate that such activities are of direct benefit to their clientele.

• Over all, centres will be expected to support at least 50 percent of the costs of their services through eligible contract and contribution revenues earned from domestic, non-government clients.

• **Technology Outreach Program/Advanced Industrial Materials (TOP/AIM)**

• Extensive consultations on advanced industrial materials (AIM) have established that Canada's efforts in the field were fragmented.

• The consultations were carried out between the federal government and makers and users of AIM, industry associations, universities and key public and private industry researchers.

• All were concerned with the lack of technological and market intelligence and inadequate communications between sectors and regions.

TOP/AIM has been created to support private industry initiatives to address these problems through support for national networks to facilitate co-operative activities among scientists, engineers and industrials in advanced industrial materials.

The networks will undertake a variety of co-operative activities in advanced industrial materials technologies and their applications. Among other activities, they will exchange information; perform joint R&D planning; foster collaboration through the brokerage of alliances; facilitate information exchanges; and carry out studies of markets and technologies.

ISTC financial support in the form of non-repayable contributions up to 50 percent of eligible costs is available for discrete networking activities leading to the formation of such national networks in existing or emerging areas of need. Support may also be available for initial studies to determine the feasibility and appropriate organizational requirements of new networks and services.

Sector Competitiveness Initiatives

Sector Competitive Initiatives are aimed at increasing the international competitiveness of Canadian industry.

Where analysis and consultations with particular industries indicate that focused initiatives would be effective in improving competitiveness, action plans for co-ordinated implementation will be developed by ISTC in concert with the industry concerned and other interested departments and agencies.

These plans could include such elements as special in-depth analyses and diagnostic studies, export or investment promotion activities, and promotion of technology enhancement or transfer.

Strategic Technologies Program

The Strategic Technologies Program ranges across a number of traditional and high-technology industries, including such new fields as information technologies, biotechnology and advanced materials which are essential for Canada's competitiveness and future prosperity.

In co-operation with the private sector and universities, the federal government will provide support to help industry develop, acquire or apply these technologies. In particular, firms will be encouraged to make alliances and create networks to share the costs and risks of accelerating the development and application of the technologies.

For further information, please contact:

Technology Outreach Program:

Technology Liaison Directorate (JPCI)

Tel: (613) 954-3468 or 954-3466

Technology Outreach Program/Advanced

Industrial Materials:

Advanced Industrial Materials

Resource Processing Industries Branch (IRPI)

Tel: (613) 954-3114

Sector Competitive Initiatives

Planning, Co-ordination and

Control Branch (JCPI)

Tel: (613) 954-2897

Strategic Technologies Program

Biotechnology and advanced industrial materials:

Resource Processing Industries Branch (IRPI)

Tel: (613) 954-3080

Information technologies:

Information Technologies Industry Branch

(IITI)

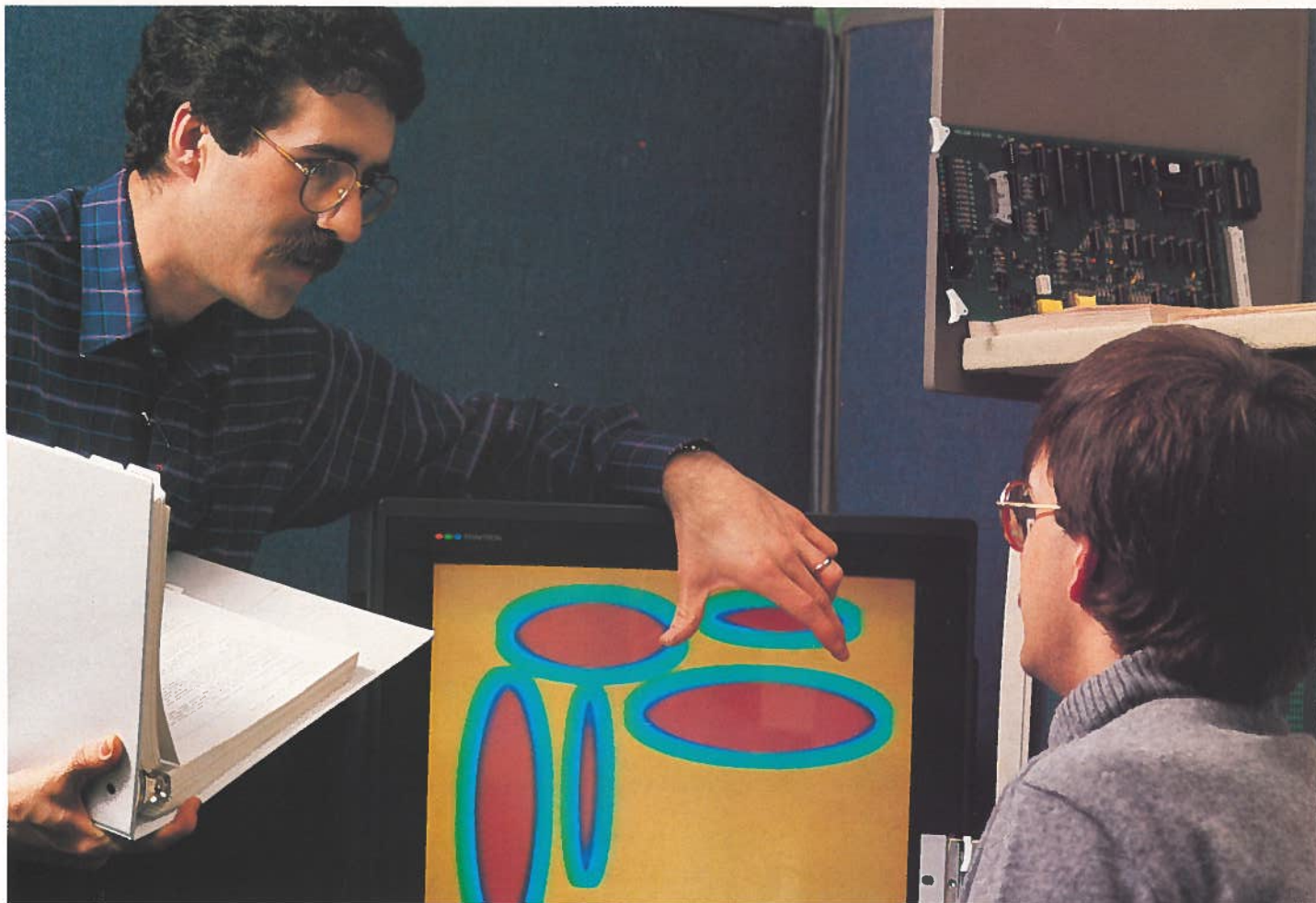
Tel: (613) 954-0599

Industry, Science and Technology Canada

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John Campbell (left) and Glen Loomer study an AMI-developed coloured elliptical graph on a monitor.

Applied Microelectronics Institute It Can Be Done Here

Who would have believed it? Nova Scotia businesses beating American giants on their own turf. . . and in the high-tech field. . . a business that does not show you the door when you come to its president with an idea that deserves further study. . . better still, a business that ENCOURAGES people to do this?

Have we all entered the Age of Utopia, which can only mean the end of the Age of Reason?

But the Age of Reason is flourishing, and with it, the spirit of entrepreneurship. The work done by the Halifax-based Applied Microelectronics Institute (AMI) and its assistance to firms throughout Canada is ample proof of this.

Lavalin's MacLaren Plansearch Division, using research carried out by AMI, won a design contest for the new STAR 4 weather satellite receiver graphic processor for the Atlanta-based Weather Channel. Research proposals had been submitted by a half-dozen American firms, including the originator of the old STAR 3 satellite receiver. AMI's design won on the basis of quality and price.

When the manufacturing was put out to tender, the contract was won by an Amherst, Nova Scotia, firm which gives full credit for the design's success to AMI and its president, Dr. Doug Pincock. Again, one of the competitors was the American firm that had created STAR 3, and the Canadian proposal won because of its higher quality and lower price.

The current project includes a real-time graphics generator being developed for the new television weather channel. This generator will produce outstanding images, which will enable the weather channel to make its programming all the more interesting, and for a longer time, since STAR 4 will remain on the leading edge of technology until digital television becomes a reality.

In a lighter vein, AMI has just produced a prototype for an ordinary horse-racing fan who walked in off the street with an idea for calculating odds. The calculator-like prototype advises bettors on how much to wager. The product is being marketed throughout North America and Asia, after a manufacturer was found (with AMI assistance).

This clearly reflects the institute's avowed policy of encouraging people to design new advanced technology applications. AMI Marketing Vice-President Murray Vandewater will discuss any good idea with anyone.

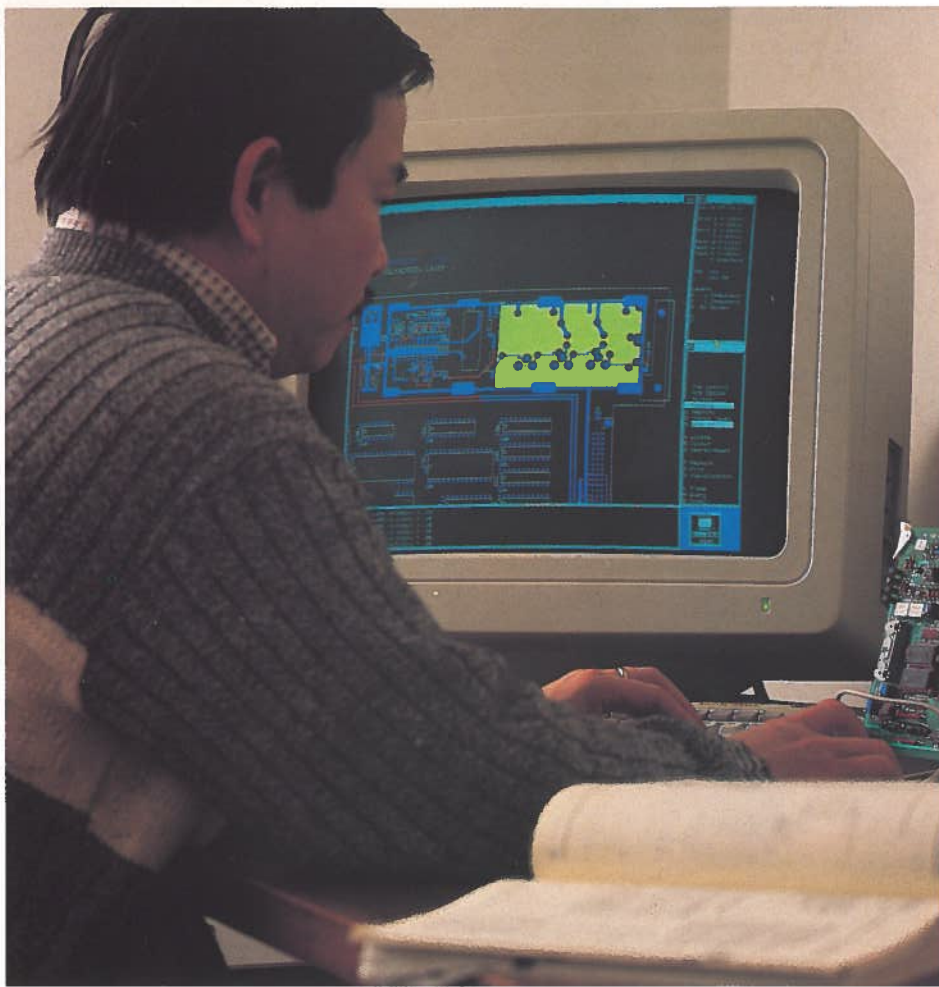
Microelectronics includes small electronic components, integrated circuits and microprocessors. Until recently, only large companies, based in major centres, could afford to create these components for their own products. They were a very, very limited elite group.

However, since AMI's founding in 1981, many businesses throughout Canada have used the services offered by this independent private company, which specializes in the design, creation, development, testing and production of microelectronic components and systems of all types. Last year alone, 20 businesses were able to explore the potential of advanced electronics in this way.

AMI grew out of the Technical University of Nova Scotia and received support in its early days from the Nova Scotia Research Foundation Corporation Ltd. and Dalhousie University. From these early beginnings, it has not only developed into a valuable company in its own right, it has also become an engine of growth for other high-tech companies. It is a living proof that a university base can be used to generate growth outside the Ontario-Quebec region.

AMI has done several million dollars' worth of business and this figure has increased every year since the company's inception. As Dr. Pincock points out, "Electronics is a fundamental part of business right now."

AMI also provides marketing assistance, risk assessment, product development assistance and planning, as well as computer-aided design (CAD) of circuit boards, software development, signal processing, simulation and non-destructive testing for companies wishing to use this technology. AMI's prime product is contract research and development for industrial clients and it also collaborates in research and teaching with local universities.



AMI is now in the process of implementing Nova Scotia's first commercial design service for application specific integrated circuits (ASICs). These tiny silicon chips, which are the equivalent of circuit boards with thousands of components, are made in only a few places in the world but can be designed locally, using special CAD facilities developed by AMI.

Another AMI specialty is the complex CAD design of printed circuits. AMI has gradually introduced computer-aided electronics engineering and simulation throughout the province. It has helped local companies develop hardware and advanced software ranging from a microprocessor control for an automated underwater camera to a microelectronic remote instrumentation diagnostic system, thus killing two birds with one stone by demonstrating that it can be done here.

The company is a leader in the design and application of electronic technologies and now, having concentrated its initial efforts on research and development, it is "looking at the... commercialization of everything" it does.

At the outset, AMI was subsidized by the then Department of Regional Economic Expansion programs, but now less than 15 percent of its funding comes through government sources, which is average for high-tech companies.

AMI-developed printed circuit board CAD layout being processed on a monitor by Nhan Le.



Another AMI project is an electric parking meter displayed by Andrew Reid (left) and Don Church.

For example, the STAR 4 project did not receive any subsidy or preferential government loans, and the costs were established before the free-trade issue raised public concern; there was no reliance on tariff barriers to achieve profits. Lavalin is rubbing its hands in glee over the amount to be saved thanks to freer trade.

AMI has been successful because of its ability to provide clients with a complete range of services: design (specialized CAD or software development tools for signal processing); prototype development (microprocessors, sensors, signal processing systems); mass manufacturing; and product testing.

Its projects have included the development of technology for monitoring the behaviour of aquatic animals; the development of sensors and monitoring devices for use during heart surgery; systolic/wavefront architecture for signal processing with the long-term aim of a standard chip set to support digital signal processing techniques in Very Large Scale Integration (VLSI); improved design automation aids at the symbolic layout level and investigation of algorithms for the generation of symbolic layout from a net-list style circuit description; and a data compression technique based on the estimation of conditional input probabilities.

Dr. Pincock sees maintaining a viable organization that is both stable and significant as a major challenge in an industry where technical renewal is necessary every two or three years.

Dr. Pincock and Mr. Vandewater are particularly proud of AMI's staff. From the outset, the emphasis has been on the building of skills and a high level of technical expertise. The 30-member technical staff now consists of an Engineering group to ensure the integrity of the design and production processes, and a complementary Software Engineering group.

These people represent the most impressive collection of knowledge and qualifications in Canada. Their expertise sets AMI apart from other players on Canada's microelectronics scene, in areas including multiple microprocessor applications, ASICs, system integration, multi-task software, analog/digital signal processing, telemetry, radar, voice compression, data communications networks and electronic engineering design tools.

In the administrative field, AMI helps its clients design business proposals and manage their technical activities. The company is also able to help promote products and stimulate sales, if assistance is required.

AMI has an impressive range of available equipment, and clients can reserve time and space in ultra-modern laboratories, in addition to using the well-stocked technical library.

AMI is now tackling the international market, where there is a great demand for its products. As Mr. Vandewater says, "When you look at the scale of technological development you have to look at world standards." By concentrating on the world market, AMI hopes to make world-class capabilities available in its home province.

Although Mr. Vandewater is concerned that "Nova Scotia companies won't take up the challenge of technology", AMI is ready and willing to respond to any innovative, challenging ideas.

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Inno-Centre Québec

Business Mentoring: An Innovation That's Paying Off

New businesses are often doomed to failure. Very few remain afloat after the first three to five years of operation. Is the business world strictly "sink or swim"? Inno-Centre Québec thinks not. This start-up centre for innovative new firms provides essential support to those who would not have been able to keep their heads above water without some help.

"Business failures are usually due to a lack of information," explains Serge Bragdon, the volunteer chairman of Inno-Centre's board of directors. "New entrepreneurs refrain from getting expert advice in order to try and save money. But that kind of decision can be very costly. At Inno-Centre, we offer a handful of companies the specialized assistance which most of them wouldn't have sought otherwise."

Located in Boucherville and coming soon to Montréal, Inno-Centre Québec is a non-profit organization which encourages new entrepreneurs to go into business.

Over the past two years, the Centre has helped launch six new outfits: three in Boucherville, housed in the Centre's building, and three other North Shore concerns that preferred to remain on their original premises, which are better adapted to their operations.

These six firms are not all in high-tech fields. "Their common denominator is their competitiveness," reveals the Executive Director of the Centre, Claude Martel. "We're interested in enterprises which are either developing new types of components, processes which are difficult to imitate, or products which have an assured market."

Unlike conventional business "incubators", Inno-Centre is not involved in product research and development. Its role commences after that stage. "We're not the type of centre which, as the term «incubator» would suggest, «gives birth to» new products and the resulting companies," Serge Bragdon explains. "Entrepreneurs come to us with a technical project which is ready to be marketed. We're more of a business consultant than a technological incubator." A businessman himself, Mr. Bragdon is now vice-president and general manager of Catelli.

A Key Component of Economic Renewal

The concept of "incubating" new businesses originated during the recession which hit western economies in the early 1970s. At that time, oil shortages were ravaging organizations which were unprepared for such a predicament.

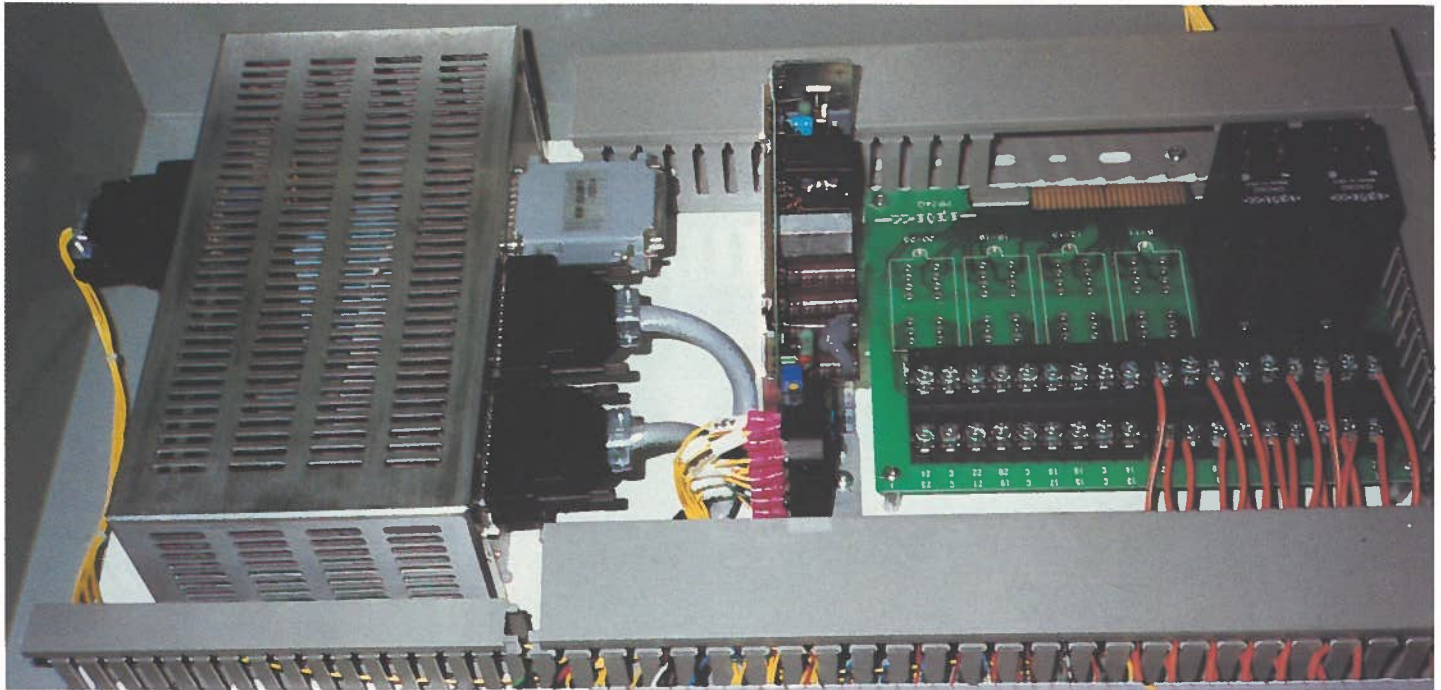
European countries and the United States searched for viable solutions to curtail the recession. Schumacher wrote his book entitled *Small is Beautiful*. Other people founded communes and co-operatives.

The incubator arose from this need for mutual assistance and economic renewal. Today, there are several hundred incubators in the United States, and Canada boasts 50.

"We believe in the creativity of entrepreneurs. At Inno-Centre, they find a multidisciplinary team from the research and business world to guide them and help them along the way while they start up their new venture, for a period of one, two, or even three years if necessary," continues Bragdon.

The Centre offers many valuable resources, including various services provided at cost. These include office space and equipment, secretarial help, a business plan, a network of contacts, and a management committee which plays a strictly consultative role.

"The most valuable thing we give them is credibility. Our support, and that of the Inno-Centre network of experts, opens doors for them. Once they have that essential foundation, it's up to them to prove themselves," Chairman of the Board Bragdon explains.



Inner works of the control console for Autolog's repositioning equipment.

Serge Bragdon, Inno-Centre Québec's chairman of the Board of Directors.



Taking the Plunge

With the help of Inno-Centre, several endeavours started to make headway in just a few months. *Monitrol* is a good example. This small business was started 18 months ago by three young engineering graduates, one from *École Polytechnique* and two from *Université de Sherbrooke*. Their product — a system which monitors atmospheric conditions in greenhouses and food warehouses. They came to Inno-Centre for help. "We needed all kinds of advice," confides Nizar Barrou, the partner responsible for sales. "Our product had already been invented, but everything else remained to be done."

The business development process demands a broad range of skills and expertise. Inno-Centre starts by carefully analyzing the needs of the new firm, and formulating a business plan. Then, the director of Inno-Centre, Claude Martel, forms a management committee to oversee the new member firm. The four or five members of the committee become "mentors" for the new enterprise, and provide direction — without interference.

One of the key experts is Michel Prieur, a highly regarded agronomist. Over the coming months, this specialist will help the young entrepreneurs adapt their product to the specific needs of future customers. Little by little, a new product for small and medium-sized greenhouses will take shape: a mini-computer which monitors over 16 parameters in the soil and air, such as CO₂, pH, salinity, humidity, and the speed and direction of the wind.

Until now, this kind of equipment was made only for large greenhouses, and required an outlay of \$90 000. *Monitrol* is selling its system for \$8000. Finally, this type of system will be well within the reach of smaller purchasers.

André Nadeau is one of three computer scientists who, barely into their twenties, founded *Autolog*. "We were the very first to join Inno-Centre, which was itself just starting up at the time. Everyone was taking a risk. But it sure has paid off!" affirms Nadeau.

This venture, which manufactures automated equipment and control systems for the forestry industry, plans to achieve a million dollars in sales in just two years. Within the next few months, it will be commencing the actual production stage.

"By pointing us in the right direction, Inno-Centre has helped us save time and money. It cost us \$50 000 to set up the company, but it would have cost three times as much if we had to pay for all the services and advice we received. Our fixed costs were low, but even more important, they remained stable," says the young entrepreneur.

Beyond purely monetary concerns, quality service is also of prime importance. André Nadeau explains that the network of specialists created by Inno-Centre is second to none. "These days, it's hard to find a good business lawyer or a good accountant. Their fees are often too high. We've been given the opportunity to deal with experts who take the time to explain all the problems we'd be facing."

At the offices of Inno-Centre, the atmosphere is highly charged, yet there is also a real feeling of camaraderie. Since everyone is part of the learning process, information circulates freely; the entrepreneurs discuss every minor event between them, and then always consult with their mentors.

The Concept of Mentoring

Inno-Centre is not a para-public body with an unlimited budget. Just like the businesses it nurtures, this non-profit organization must find its own sources of financing. Until now, the City of Montréal, the *Ministère de l'Industrie et du commerce du Québec*, *Employment and Immigration Canada*, and the former *Department of Regional Economic Expansion* (now *Industry, Science and Technology Canada*) have enabled it to pursue its projects.

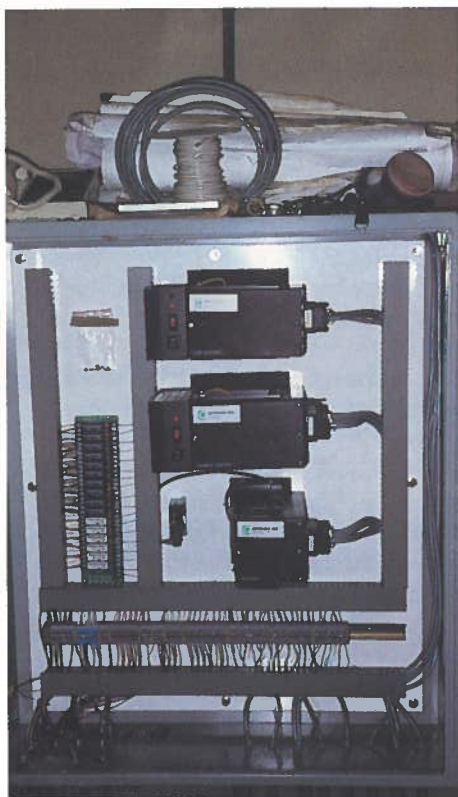
Consulting firms are not generally renowned for being philanthropic, but they provide the essential expertise behind Inno-Centre. For instance, the law firm Bernard, Cimoné, Pourpart, Despatis, Cormier, Proulx, the accounting firm Samson, Bélair, and the patent agents Swabey, Mitchell, Houle, Marcoux & Associates help new undertakings in the start-up phase. They offer a certain number of consulting hours, and provide financial aid as well.

Various educational and research institutions are also making a contribution. The École des Hautes Études Commerciales holds special courses and seminars for Inno-Centre firms. Specialized expertise and laboratories are provided by the Centre de développement technologique de l'École polytechnique, the Centre d'innovation industrielle de Montréal, the Centre de recherche industrielle du Québec (CRIQ), the Industrial Materials Research Institute — which is part of the National Research Council (NRC), and the Institut de recherche en électricité du Québec.

Autolog's André Nadeau stresses the importance of this scientific support. "The Industrial Materials Research Institute has really helped us to perfect our product. We used their labs to do some testing, and their technologists analyzed the results. And the Centre de recherche industrielle du Québec has given us access to its data bank to do research on components and manufacturing processes; they've really been a big help."

The mentors, or the companies' management committee, may change over the two-year start-up period, depending on the type of input needed at each stage of the development process.

Autolog, which is commencing the manufacturing phase, needs production-related advice at this point in time. As it is actively preparing to expand into western Canada, where 70 percent of the country's sawmills are located, it must negotiate agreements with parties who will represent its interests in the West. Inno-Centre is there to provide the appropriate orientation.



Business Mentoring: A Growing Trend

Inno-Centre is part of a growing trend toward business mentoring. In 1987, the Corporation de développement économique de Boucherville launched the Centre in collaboration with the city's mayor, Jean-Guy Parent. Initially, the goal was to foster development on a provincial scale, not just regionally. In fact, after a few months of operation, Inno-Centre attracted the attention of the mayor of Montréal, and at his request, it is setting up operations there. It was a nice coup for the City of Montréal.

"We'll never really leave Boucherville," insists Serge Bragdon. "Many of our firms will remain there, and we'll continue to follow up on their progress. Montréal represents a new phase for us, and we're ready to meet the challenge."

Inno-Centre's board of directors is composed of individuals from business circles as well as government and research bodies. Unlike the companies' management committees, which play a consultative role, the board makes numerous decisions, especially regarding the recommendations of the selection committee. "We're demanding and very discerning when choosing new member firms," maintains Bragdon. "Many factors are taken into consideration, but one of the most important aspects is the personality of the entrepreneurs."



In just a few weeks, Inno-Centre will be setting up its offices in Montréal, in more spacious quarters. Already, a dozen or more applications for membership have been received from fledgling firms. If the board approves the decisions of the selection committee, the new member companies will be able to sign a contract for a period of one, two or three years. With the mentors' assistance, Inno-Centre will justly be called "the school for business excellence."

For further information, please contact:

Inno-Centre Québec
Claude Martel, Executive Director
1243, Gay-Lussac
Boucherville, Québec
J4B 7K1
Tel: (514) 641-4590

Control console for equipment that prepositions 2-cant logs (logs which have been cut on two parallel sides) for further milling. Developed by Autolog, an Inno-Centre Québec member.

Inner view of Autolog's control system for sorting and classifying lumber or logs.

Luge Tracks in a High-tech Age

Ice and snow sliding is a delightful sport which can be done standing, kneeling, or lying down, on a toboggan or a simple sheet of cardboard. Many children in cold countries use a toboggan even before they learn how to walk. For the first time in their lives they experience the thrill of speed, streaking down a hill pressed firmly against a brother or sister, only to land at the bottom in a burst of laughter or a profusion of tears.

In Canada, sliding sports have undergone a technological revolution in the past few years.

For the past year and a half, a Quebec company, Glacem Inc., has been producing and marketing something which happens to be one of Quebec's most abundant natural substances: ice. Glacem manufactures inside and outside ice sporting surfaces (specifically, luge tracks) for the pleasure of serious sportspeople and amateurs alike. Its customers are mainly municipal authorities wishing to offer their constituents sports activities to fill the long winter months.

"You can't rely entirely on nature for winter sports. You have to give nature a helping hand," explains André Paquay, technical advisor at Glacem, who was a civil engineer before he started the company. "For example, artificial snow has revolutionized winter sports. These days, we're enjoying a longer ski season, and an increasing number of people are practicing this sport.

"Glacem has introduced a technological concept which will allow the public to do luge sports during four months of the year, without interruption," he says.

A Simple and Efficient Concept

The concept developed by Glacem consists of a heat exchanger in the form of a carpet made of EVA plastic, which comes in strips of 1.22 metres wide. The carpet is composed of small, six millimetre tubes running parallel to each other and containing methanol, which circulates in the carpet and is cooled by a freon compressor system.

Thus, in the case of luge tracks, the methanol maintains the ice at an ambient temperature of 8°C. When the temperature goes above freezing, the compressor has to work harder.

There are several advantages to this concept, according to Mr. Paquay. It forms ice much more quickly than nature, and the gas in the exchanger does not have to be replaced. The heat exchanger carpet is portable, and can be adapted to all types of indoor and outdoor facilities.

In May, the luge track can be easily rolled up to make room for other activities; in the fall, the carpet can be installed in just a few hours, without the assistance of specialists. And all the equipment is guaranteed. For municipalities on a tight budget, those aspects are extremely important.

"This year, the City of Repentigny installed two 33-metre-long treated-wood luge tracks over the stands of the baseball field. In the spring, it'll be really simple to take down the wooden structures supporting the tracks," said Glacem's technical advisor.

The recreation director of the Repentigny recreation centre, René Gauthier, is very pleased with this new sports facility. He cannot get over the public's reaction. "People of all ages have tried the facility, and they keep coming back. The tracks are getting more and more popular all the time. I thought kids would be the only ones to use them, but the adults are using them just as much!"

The Repentigny recreation department has used the stands in the baseball field to create a slope, thus enabling the municipality to save on the cost of treated wood required to build the structure. The stadium lights are used to illuminate the track, which starts to get dark in mid-afternoon.

"We're the first municipality in Quebec to acquire this type of structure, but I'm sure we won't be the last," adds Mr. Gauthier.

Technology for the Benefit of Luge Enthusiasts

The secret of a good luge track is proper calculation. The slope of the Repentigny track is 27° 35 min., over a length of 33 metres. In fact, the luger slides beyond the luge track itself. The total length of the slide ends up being 160 metres, at a maximum speed of 40 km/h.

In comparison, the track used for Olympic luge events has a slope of only 10°, but the slide extends to a total length of 2500 metres. Competitive lugers can reach a speed of 130 km/h. It is the length of the track which determines the speed.

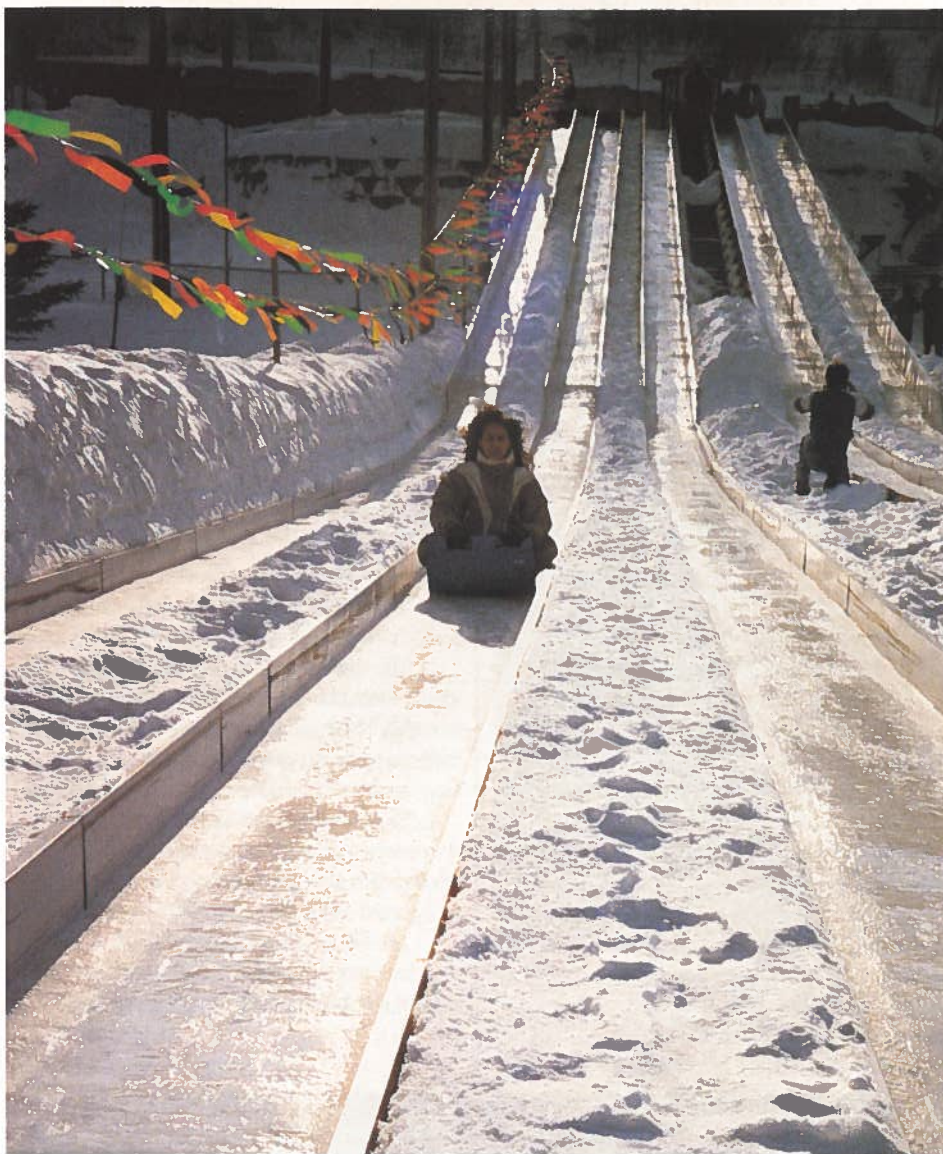
Nevertheless, accidents are rarely due to the luger's speed. The real danger is a poorly designed track. No one has ever been injured at the Repentigny facility, and more than 1000 people use the track each day.

Glacem can design and build tracks of all sizes and dimensions, but safety is always the prime concern.

The cost of the project is not determined solely by the slope of the track. Also influencing the price are the track's exposure to sunlight, the characteristics of the ground, the length of the tracks, the desired speeds, and the number of months of operation. Another determining factor is the number of tracks to be built — the more tracks you build, the lower the cost of each track.

Glacem-equipped luge track at dusk.





A major advantage of these facilities is that they are less expensive than Olympic-type structures and, once they are built, the maintenance costs are minimal.

The International Market

Not only have luge tracks changed with the times, but the toboggans and luges themselves have also changed, and there are many different types on the market today. Some people simply use rectangular sheets of coloured plastic which are thin and slippery, while others use wooden luges on runners, steered by two guide ropes. Competitive lugers ride their vehicles lying flat on their stomachs.

Glacem has developed a new type of luge which resembles the sheets of coloured plastic, but has a foam pad to act as a shock-absorber.

"Remember, when you're zipping down the track at 35 or 40 km/h, you're really thankful for that foam pad!" says entrepreneur André Paquay with a smile.

André Paquay markets two types of luges to developers of luge centres, and in Glacem's 18 months of operation, the firm has installed seven tracks at two Quebec centres. The first is in Repentigny, while the second — a much larger one — is in the Laurentians.

Marketing the Glacem concept is a full-time occupation. The company is not only courting the Canadian market, but is also looking to potential American buyers. Developers in Atlanta, Georgia, were shown the concept, and were enormously impressed by its numerous applications. Others in Colorado and Minnesota are seriously thinking of purchasing one of these sports facilities.

Of course, certain markets do not offer much promise. For example, it would not make sense to approach the Mexican market, since the cost of operating a centre there would be very high.

"Obviously, the operating costs for a track depend partly on the ambient temperature. In the northeastern United States, winter temperatures hover around the freezing point. Not so in Mexico. The compressors would have to work too hard. But this technology is easily exportable to places with milder climates than Montréal or Toronto," assures Mr. Paquay.

Sunlit luge track complete with equipment developed by Glacem Inc. to maintain ice surface.

A Magic Carpet

Nevertheless, Glacem's market is not limited to northern countries. New applications for the heat exchanger carpet are broadening the company's horizons. For instance, why not combine ice sports with water sports? Glacem's luge tracks can be converted easily into water slides in the summer. This seems to be a highly interesting prospect. Unlike the centre at Repentigny, an all-season facility would be a permanent structure made of fibreglas — all you would have to do in summer is roll up the carpet to make room for a water slide. Municipalities with high population densities seeking recreational facilities could find this concept very attractive.

According to Mr. Paquay, some municipalities have even said they are ready in the near future to purchase the "Rolls-Royce" of tracks — an all-season centre featuring eight tracks of varying levels of difficulty. Amateurs could admire the pros flying at speeds of 30 to 40 km/h, almost like the Olympic events.

André Paquay keeps finding new applications for the heat exchanger carpet, which can meet a wide range of refrigeration and heating needs. It can be used on the floor of greenhouses, or outside, to protect plants from excessive temperature variations, he notes.

The heat exchanger concept can also be useful to golf courses, whose greens must be protected against wide fluctuations in temperature. If the roots are kept warm, the grass will stay greener. But even more important, Environmat (as this application of the heat exchanger is called) gives protection against sudden temperature variations in the subsoil, in the fall and spring.

So André Paquay is busy marketing all these different types of heat exchanger carpets, designed to meet a recreational need. He is very confident that things will go well. After all, people will always enjoy sliding. . . and nothing is easier to export than fun.

For further information, please contact:

Glacem Inc.

André Paquay

1145, Parnasse

Brossard, Québec

J4W 2C5

Tel: (514) 465-3247

Telex: 05-25134 PAQ

Canada Awards

Innovation and Invention — Factors in Success

Innovation and invention are major factors that have ensured success to such Canadian companies as **Alcan International Limited** and **Virtual Prototypes Inc.**, both of Montréal.

The two companies were Gold Award winners in their categories in the 1988 annual Canada Awards for Business Excellence — Alcan in *Invention* and Virtual Prototypes in *Innovation*.

The 1988 ceremony saw gold, silver and bronze awards won by Canadian companies in eight categories — Small Business, Productivity, Marketing, Entrepreneurship, Labour/Management Co-operation, Innovation, Invention and Industrial Design.

Alcan International Limited

Alcan International won the Invention category Gold Award with its development of a safe, compact and highly efficient source of standby power which could make noisy emergency generators and huge battery banks obsolete.

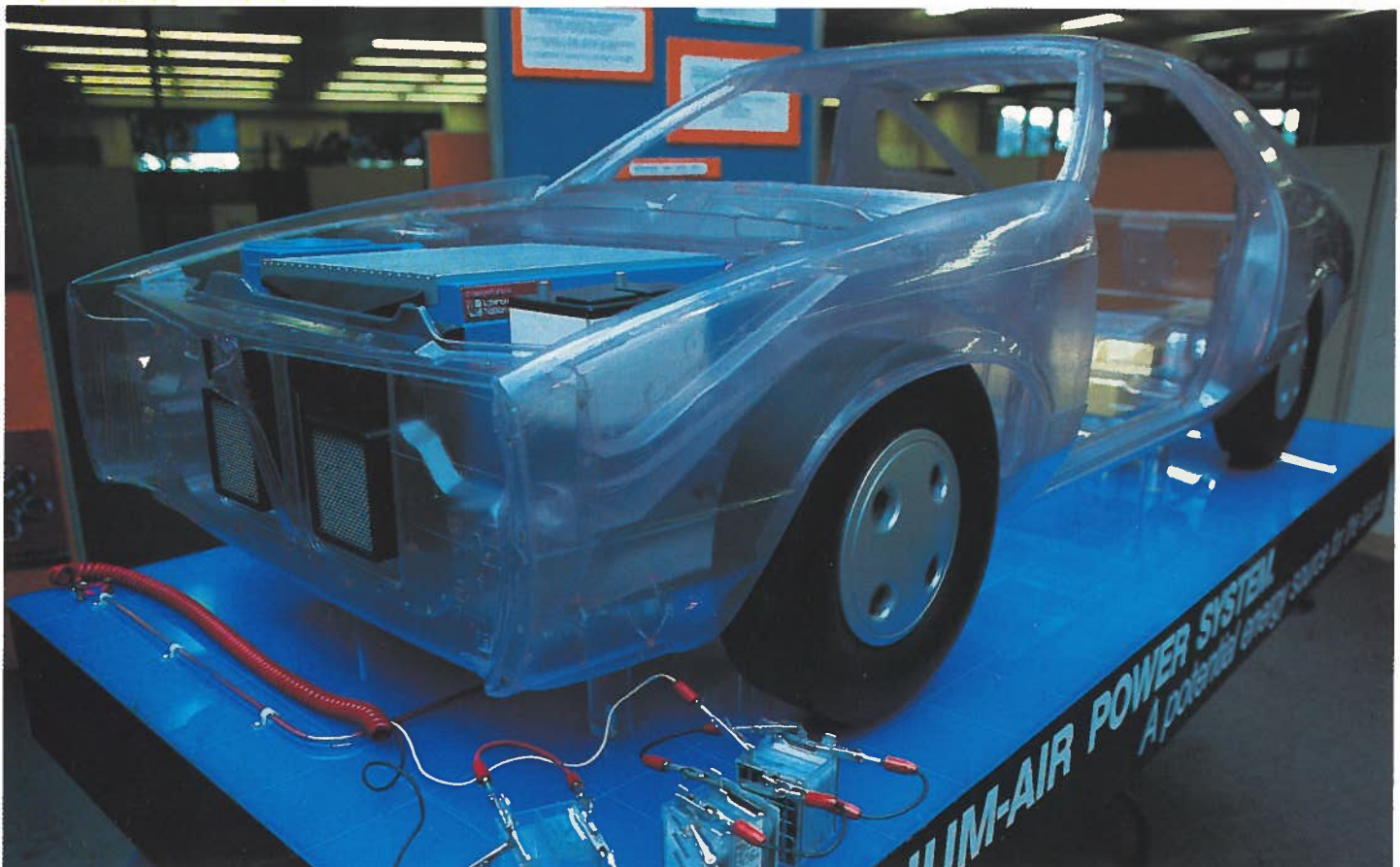
The company's invention is the first-ever refuelable aluminum battery, considered the most efficient fuel cell available. It is said to outstrip the performance of high-technology polymer electrolyte and high-temperature molten salt systems by a further 100 percent. It is also a potential energy source for on-highway vehicles and could replace the inner combustion engine.

The aluminum battery is a primary energy source, more like a fuel cell than a conventional secondary battery. It was based on caustic electrolyte, designed by Dr. Brian O'Callaghan of Alcan's Kingston Research Laboratories and patented in 1987.

The company's aim was to create a fuel, using aluminum, that would produce non-polluting vehicles with an energy source which is recyclable, easily stored and non-combustible.

The fuel cell is currently being tested at telecommunications systems in the field and indications are that it is meeting predicted energy levels.

Alcan International Limited's award-winning power source used to power a car.



Virtual Prototypes Inc.

In its award-winning effort, Virtual Prototypes recognized that there was a gap in the design of software for complex computer control and display systems such as used in aircraft cockpits, car dashboards and monitoring workstations.

In some industries, such as aerospace, writing and debugging complicated software could easily delay a crucial project and, to overcome this, the company developed its *Virtual Prototyping System*, or VAPS.

VAPS replaces special-purpose computer hardware, used in control and display systems, with touch-sensitive computer graphics. Instead of spending countless hours programming software to make a prototype work, a process of drawings and selections from a menu is used by VAPS to generate the desired software automatically.

VAPS helps evaluate systems quickly without building them and without having to rely on programming experts. It also has the unique ability to develop prototypes into operational systems, eliminating redundancy associated with the development of software. In addition, VAPS helps reduce the risk of errors and costly delays caused by changes in specifications.

Virtual Prototypes' clients for its VAPS include Boeing, General Dynamics, Aerospatiale and the Canadian Department of National Defence. Transport Canada is finding VAPS useful in work on a design for a new air traffic control system.

For further information on the two award-winning companies, contact:

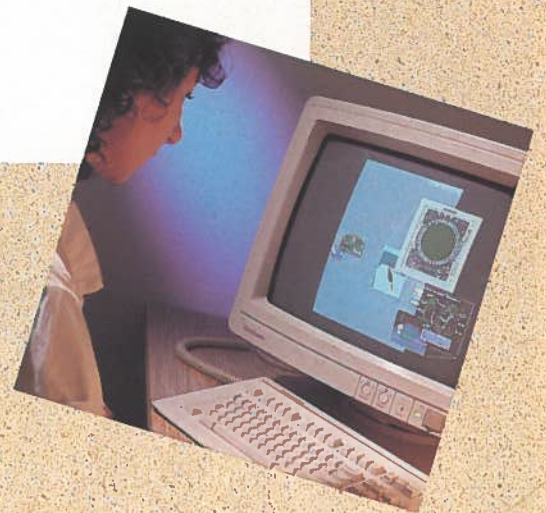
Alcan International Limited
1188 Sherbrooke Street West
Montréal, Quebec
H3A 3G2
Tel: (613) 541-2202
(Kingston Research Location)

Virtual Prototypes Inc.
5252 de Maisonneuve West, #318
Montréal, Quebec
H4A 3S5
Tel: (514) 483-4712



An award-winning software developed by Virtual Prototypes Inc. is shown as used in an aircraft cockpit display.

Virtual Prototypes' software used in a complex computer control system.



The Canadian Plastics Institute (CPI)

Plastics — Canada's Fastest Growing Industry

The Canadian plastics industry has come a long way since 1885 when a Toronto entrepreneur filed for the first patent. More than a century later, the industry is looking for new ways to use this adaptable material. Right now, plastics are used to produce everything from flexible artificial arteries to graffiti-proof wall coatings.

The plastics industry is the fastest growing in Canada, more than doubling the real gross domestic product in the last 20 years. The industry employs about 100 000 people and produces \$12 billion worth of products each year.

The Canadian Plastics Institute (CPI) is assisting the Canadian industry to go even further. It is helping it to discover and exploit the innovative technology.

The mandate of the six-year-old institute is to make the Canadian industry more competitive in the tough world of global trade. With the added pressure of free trade looming, the industry may need to be spurred to action — with support from CPI.

CPI was created in 1983 through the efforts of the Society of the Plastics Industry of Canada (SPI) with help from the then Department of Regional Industrial Expansion (now Industry, Science and Technology Canada — ISTC). ISTC continues its support through sustaining funding under its Technology Outreach Program (TOP). Substantial financial support

is also provided by the National Research Council of Canada (NRC) on an ongoing basis through its Industrial Research Assistance Program (IRAP). NRC funds two of its industrial technology advisors (ITAs) based in the CPI offices who are in contact with 150 ITAs across the country.

SPI took a look at the industry's direction and decided that the status quo was no longer an option. SPI concluded research and development could only benefit the industry if the technology made it to the marketplace instead of languishing in the laboratory.

SPI became concerned that new discoveries were rapidly being translated into products in the international market, leaving Canada behind. CPI was established to help Canadians take fully developed technology and introduce it to the North American market. Along the way, it would also encourage a whole new generation of researchers to put Canada on the map.

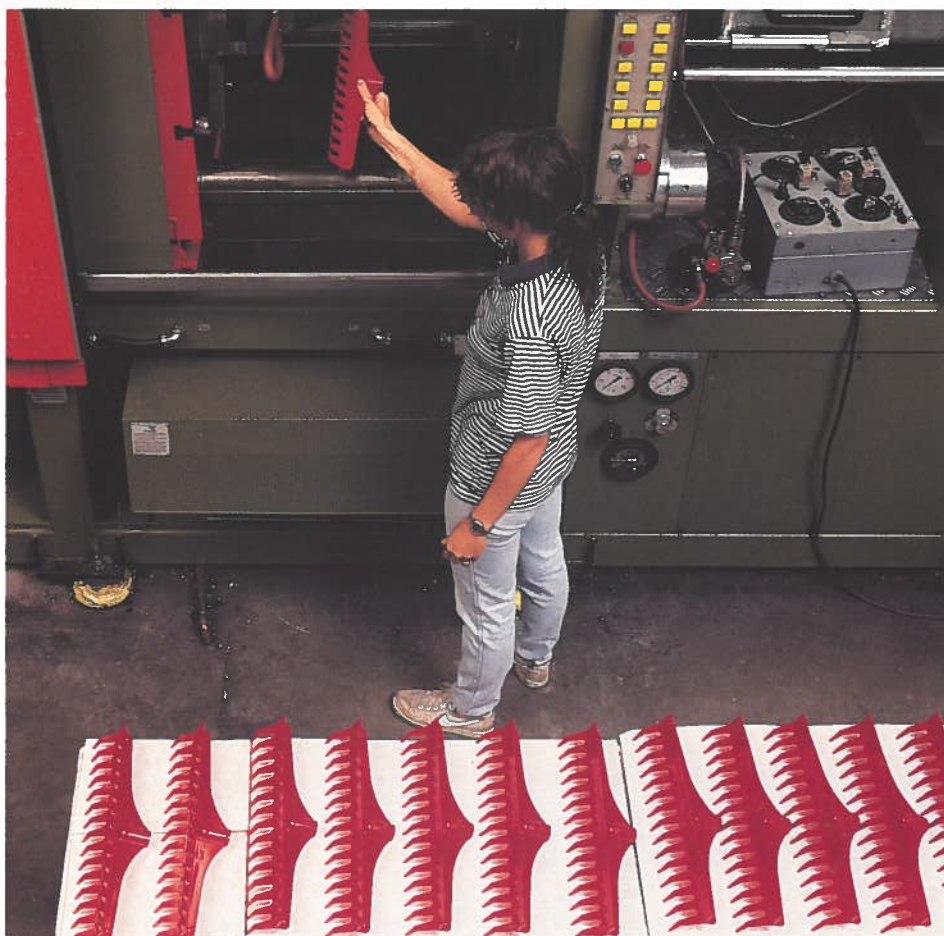
It sounds like a huge undertaking, but Dr. Andrew Bobkowicz, CPI president, is optimistic. He should know. Dr. Bobkowicz and his staff of six plastics industry professionals comb the world to find technologies ripe for adoption in Canada — then return to Canada to nudge companies to make the most of these technologies, and make themselves more competitive in the marketplace.

Canadians have always been plastics pioneers. The first plastics patent in Canada was granted to William Carl Zeidler of Toronto for "the polishing of cellulose nitrate", or cellulose, which was used to make early movies. In 1931, McGill University initiated some of the earliest basic research on polystyrene. Also in 1931, French Ivory Products, a Toronto company, installed the first injection moulding machine in North America.

Plastics have come a long way since the first plastic products appeared on the market. Many early products cracked and broke after exposure to frost, or faded after a day in the sun. Plastics ended up with a rather tarnished image and resin producers stepped in to regulate the end uses and improve the image.

Since then, better processes have made better plastics. Today's plastics can take the toughest tests. They are harder, more durable, chip-resistant and built to withstand even acid rain.

Plastics products manufacturing showing the mould and the finished products.



Most recent plastics breakthroughs can be attributed to a better understanding of chemistry. Knowledge of molecular architecture is increasing and research is accelerating into how these building blocks of matter can be rearranged to change their nature.

CPI has a four-pronged approach to promoting the plastics industry:

- acquire new technology;
- inform the industry about its availability;
- encourage the industry to use the technology; and
- facilitate more and better research and development.

Learning about new products and processes keeps Dr. Bobkowitz and his team busy. Contacting or visiting up to 300 companies each year, the team carefully monitors reports of promising developments. Team members log thousands of kilometres in travel, read dozens of technical journals and use databases from around the world to ferret out new developments.

When Dr. Bobkowitz and his staff travel — mostly in Europe and Japan — they look for technology that is:

- ahead of current North American practice;
- ready, or almost ready, for commercial use; and
- available for licensing or joint-venture arrangements to Canadian firms for commercial exploitation.

Importing technology is nothing new, says Dr. Bobkowitz, pointing out that 98 percent of all the technology used in Canada originated somewhere else. Finding applications for already-developed technologies is much easier than starting from scratch.

And much faster, too, he adds, referring to the example of a high-strength plastic rope developed in Japan. The technology was ready and waiting; all it needed was a niche in Canada. The opportunity existed in Canada's lumber industry as a replacement for metal cables.

Getting the word out is the second priority for CPI. Every two months, the institute publishes a newsletter outlining new products and processes. Detailed monographs — state-of-the-art reports that concentrate on a specific topic — are published each year.

Seminars and presentations are another way to spread the news. Some of these seminars offer information never before available in North America. This happened last year when a Japanese researcher was invited to a seminar to discuss a super-plastic that can outperform steel.

This year, seminars will concentrate on recycling, computer-integrated manufacturing, as well as on co-operative industry-research ventures that have worked in Europe. For members who miss seminars, CPI summarizes the proceedings and prepares publicity features on innovations for the media.



Plastics-clad airport terminal in Frobisher Bay, Northwest Territories.

Putting the wheels in the motion to encourage the industry to use the technology is the next step. Team members keep in touch with companies trying to adopt technology and offer technical assistance in choosing the best materials and processes, and in improving new products.

About 3000 companies produce plastics, plastic products and machinery in Canada, says Dr. Bobkowitz, of which some 80 percent have fewer than 50 employees. These are the companies that will benefit the most from CPI's activities. Smaller processors are usually eager to use the institute's services because they don't have the resources or the budgets to keep up with worldwide trends.

The last component of CPI's approach is fostering Canadian research. This strategy will pay big dividends in the long run, according to Dr. Bobkowitz. Promoting plastics research in Canada will result in more skilled professionals coming out of universities, better pure and applied research for use, and a bigger network of expert consultants — a commodity Canada needs desperately, he adds.

Even though Canadian universities carry out excellent research (Dr. Bobkowitz cites McGill University, McMaster University, Queen's University, the University of Toronto and Montréal's École Polytechnique as examples), CPI believes a great deal more can be done. The institute tries to bring universities and the industry together to match their goals more closely. As part of its educational thrust, CPI subscribes to the Ontario Centres of Excellence program, encourages the establishment of a university chair in plastics research and represents the views of industry.

As well, CPI has participated in conferences, including last year's National Conference on Technology and Innovation, at which the federal government announced Higher Performance Polymeric Systems under the National Networks of Centres of Excellence program. The initiative is designed to link all major plastics research centres through a network. The CPI was represented both as a delegate and as one of the few industrial exhibitors.



CPI has developed a co-operative research consortium to show Canadians research opportunities and summarize plastics research in Canada. It keeps the government informed by offering technical education to groups such as senior civil servants, and by providing advice to such groups as the House of Commons Standing Committee on Research, Science and Technology.

CPI also helps drum up funds for creators of new technologies. The institute continues to navigate the channels of government funding, including the research assistance program of the National Research Council, and works with 150 industrial technology advisors across the country, including two resident advisors.

The institute's market emphasis for 1989 is the construction industry. And small wonder. This industry is largest untapped market for plastics. Builders snap up about 22 percent of the plastics produced by the Canadian industry.

Still, on a tonnage basis, that accounts for only two percent of the weight of all construction materials. If the industry could boost this to three percent, the plastics market would increase 50 percent. Wood, stone, iron, concrete and glass have all had their day. Now it's plastics' turn, says Dr. Bobkowicz.

When plastics were first introduced to construction more than 40 years ago, builders saw them as cheap replacements for traditional building materials. They discovered that they were lightweight, easy to process, adaptable to exciting new designs and, best of all, resisted corrosion.

Builders are now using plastics in many ways. Homeowners can buy plastic shingles that look like cedar but last longer, and flexible vinyl seals that keep patio stones from buckling. Other products range from practical and commonplace plastic pipes to the truly innovative.

One example of innovation at its finest is a demonstration home in Orillia, Ontario. Outside, the house is a geodesic dome. But the interior can be redesigned every day, with imagination and the help of plastics.

The interior walls of the house are double panes of clear glass that give the home an open feeling. By blowing polystyrene beads between the panes, they become opaque. The beads block out light and provide insulation, and can be used in the walls in several combinations for different light levels and degrees of insulation.

Plastics may even be used for projects that have never been attempted before. For centuries, a bridge linking Europe to Africa across the Strait of Gibraltar has been a dream. But such a bridge was an engineering impossibility using traditional building materials, which simply could not support the weight of such a long structure.

But, according to Swiss researchers, carbon-reinforced plastics bonded to the bottom of the bridge span could reduce the weight on the concrete beams by 50 percent. The plastic composite would absorb tension while the concrete does what it does best — absorb compression.

Plastics are already being put to good use by designers right here in Canada. In the Arctic, plastics are good alternatives to highly expensive wood. They offer excellent insulation, are fire resistant and can be moulded into appealing shapes.

Plastics have been used in several building projects including an observatory, the Frobisher Bay airport (designed by Montréal architect Guy Gerin-Lajoie) and several Inuit schools. When one of the schools caught fire, plastics again proved their worth. The wooden part of the school was scorched but the plastic portion was untouched.

Plastics let designers do things that are impossible with traditional materials. But dramatic new approaches need designers who are willing to turn their patterns of thought upside down, says Dr. Bobkowicz. CPI wants Canadian companies to break out of the traditional way of thinking.

A Japanese firm, for example, developed a way to use plastic mesh to make concrete plates — a technology CPI would like to see Canadians adapt. The mesh eliminated the need for clumsy wooden forms in building concrete walls. The result is a corrosion-resistant wall with a sophisticated look that can be formed into any shape and thickness.

The Japanese are studying ways to use the mesh to build curtain walls for nuclear reactors. Other mesh walls are used as seawalls in Tokyo harbour.

Some Canadian firms have already grabbed opportunities in plastics and turned them into success stories. Mirotech, a Toronto firm, has adapted a mould-making process. Nickel vapour is deposited on the original model and peeled away when the process is over. The form is then backed with metal and ready for use. This process is much faster than the time-consuming, traditional method and is just as accurate. It can be used to mould anything from automotive parts to packaging products.

Getting plastics accepted into every niche won't be easy, Dr. Bobkowicz admits, especially since it must compete with materials and practices that have been used for centuries.

The solution, he says, is to demonstrate that plastics offer higher quality at a lower cost without sacrificing safety. In fact, he adds, plastics make some products safer. Plastics are new structural materials in construction and need to establish a track record. For this, experiments must be developed to collect data over long periods of time.

Plastics are always changing, adapting, improving and are continuing to replace other materials. Plastics' ability to change makes it easy to find new applications, says Dr. Bobkowicz enthusiastically.

"The one thing that remains is the ability of plastics to continually surprise us."

For more information, please contact:

Canadian Plastic Institute
1262 Don Mills Road
Don Mills, Toronto, Ontario
M3B 2W7
Tel: (416) 441-3222

Leader in Radiation Monitoring

The very air we breath is becoming increasingly hazardous as the human race dumps more and more of its waste into it. Pollutants of all kinds float unseen and are inhaled. One source of pollution are the radioactive decay products of radon, a naturally occurring radioactive gas, part of the decay chain of uranium which occurs throughout the earth's crust.

R.A.D. Service and Instruments Ltd. device for monitoring radon gas decay products.

A Canadian company, R.A.D. Service and Instruments Ltd. of Scarborough, Ontario, is a leader in the field of radiation monitoring. The company has developed a method of monitoring the levels of harmful radon decay products, called "radon daughters", in buildings and homes using its Model M-1 Time-Averaged, Working Level Surveymeter.

"Radon Daughters"

"Radon daughters" are short-lived products which attached themselves to aerosols in the air and, if inhaled, are partly deposited on the human respiratory tract. In many countries, "radon daughters" constitute a major part of the natural radiation dose to human beings.

Since the fluctuations of "radon daughters" are subject to variations in radon levels and to aerosol conditions, the estimation of risk to humans is measured by their time-averaged value on a working level basis.

R.A.D.'s M-1 offers a risk estimation using this accurate and reliable measurement. It is considered the simplest system currently available for the precise determination of time-averaged working level of "radon daughters", ideal for indoor monitoring.

M-1 Surveymeter

The M-1 consists of a pump and a detecting head with a polycarbonate plastic compound used in a solid-state track registration system as detector. There are no electronic parts and the only moving part is the pump.

The solid-state track registration has proved a highly reliable means of recording alpha particles from the "radon daughter" products. Night-to-day variations are automatically averaged and the M-1 provides an accurate average working level value for any sampling period from three days to several weeks.

Available in either 110V (60 cycles) or 220V (50 cycles) versions, the M-1 is easy to use. It plugs into a standard AC outlet and, after running for a number of days, the detector can be processed and the results available in a few days.

R.A.D. Service and Instruments Ltd.

R.A.D. has been successfully developing and manufacturing radiation protection instruments and providing professional services for the past 10 years. It is involved in three main areas — instrument design and production; monitoring devices; and professional services.

The company has designed and produced a broad range of monitoring devices for both indoor and outdoor use. It is listed as the only North American firm in its field that manufactures its own instruments, performs mail service and conducts its own laboratory processing.

For further information, contact:
R.A.D. Service and Instruments Ltd.
 50 Silver Star Boulevard, Unit 208
 Scarborough, Ontario
 M1V 3L3
 Tel: (416) 298-9200
 FAX: (416) 298-9220
 Telex: 065-26274



Technology Transfers

Offered

Canada

- Transmission System
- Abdominal Rope
- Ultrasonic Image Camera Using Arrays of Acoustic Waveguides
- Production of Immunogens by Antigen Conjugation to Liposomes
- Lithographic X-Ray Source
- Recovery and Purification of Silica
- Method for On-Line Thickness Monitoring of a Transparent Film
- Method and Apparatus for Evaluating the Degree of Cure in Polymeric Composites
- Manufacturing an Anaerobic, Biocatalytic Sandwich Reactor
- Device for Detecting Pinholes in a Moving Sheet
- Computer Program for Contour Plotting
- Bacterial Control of Bertha Armyworm Larvae (*Memestra configurata*)
- Automatic Aseptic Sampling Apparatus
- Collinear Acousto-Optic Interaction in Cladded Fibres

Austria

- Electronic Control Systems
- Silos for Bulk Goods

Germany, Federal Republic of

- Process for Purification of Drinking Water

Great Britain

- Vehicle Loading System

The Netherlands

- Plastic Pipe Systems

Switzerland

- Wheelchair Accessories

United States

- Rigid-Rod Molecular Composites
- A New Series of High-Performance Epoxy Resins
- Advanced Phase-Change Thermal Energy Storage Materials for Heating and Cooling Applications
- Fluorocarbon Cleaning Process for Cleaning Strengthened Nickel Superalloys
- Solar-Powered Oven
- Water Proofing for Concrete
- Speech and Voice Recognition System
- Baking Machine
- Wind Turbine
- Folding Binoculars
- Safe Insecticide
- Educational Doll
- Non-Toxic Stain Remover
- Anti-Smoking Video
- Economical Disinfectant
- Ultraviolet Water Purifier
- Automatic Water Purifier
- Truck Unloading Platform
- Diagnostic System

Offered

Canada

Transmission System

Through a licensing or joint-venture arrangement, a Canadian inventor is offering to manufacturers of bicycles or of light motor-driven devices or machinery his invention — a light automatic transmission system for belt or chain-driven transmissions. Interested parties should be capable of developing and testing a prototype.

Write to: John D. Pootmans, 27 Kilbarry Crescent, Ottawa, Ontario K1K 0G9; Tel: (613) 233-8716 or 749-6682.

Abdominal Rope

A Canadian inventor is offering the manufacturing and marketing rights, under a licensing, joint-venture arrangement or outright sale of his patent rights, for an abdominal rope. It is claimed that the use of this rope will strengthen and tone the abdomen, arms, shoulders, hands and back muscles.

Write to: SOLON, O'IOANNIS GIANNAKOS VIV PD, Prince Continent's, Export Canada of the Royal Group, P.O. Box 7367, Station E, Calgary, Alberta T3C 3M2; Tel: (403) 249-2000

The following are offers of technology transfer available from the Canadian Patents and Development Limited.

Ultrasonic Image Camera Using Arrays of Acoustic Waveguides 8112

A technique for making an ultrasonic image camera using a bundle of acoustic waveguides where delay lines are provided by means of different waveguide lengths. The technique is said to be far simpler and more powerful than other known techniques used for ultrasonic imaging systems. Applications include medical diagnostic instrumentation.

Production of Immunogens by Antigen Conjugation to Liposomes 8188

This is a technique for the preparation of antigen-liposomes bonded composites with a minimum protein-to-lipid ratio. These immunogens provide an enhanced immune response desirable for the production of antibodies.

Lithographic X-Ray Source 8297

This pulsed plasma X-ray source is designed to be used in commercial sub-micron lithography to make densely packed, large-scale integrated circuits. It offers high conversion efficiency of electrical energy into 1 keV X-ray emission from a source of sub-millimetre size, with the X-ray emission being substantially constant from pulse to pulse and capable of being fired at high repetition rates (10 to 100 Hz).

Recovery and Purification of Silica 8352

A three-step process is described for the recovery of costly isotopes of silicon from dilute aqueous solution. The resulting high-purity silica residue may be used in plastic-moulded semiconductor devices or for the production of high-purity silicon for silicon chips. This process can successfully replace other time-consuming, multi-step procedures.

Method for On-Line Thickness Monitoring of a Transparent Film 8559

This is a new infrared absorption technique for measuring the thickness of polymeric films which are either free-standing or coated on a substrate. It consists of projecting a polychromatic light on the film to provide a signal from which it is possible to eliminate errors caused by surface effects or by scattering due to pigments or impurities in the film. This improved technique is also more convenient to use than other similar, existing techniques.

Method and Apparatus for Evaluating the Degree of Cure in Polymeric Composites 8610

This is a non-destructive technique for monitoring the degree of cure in carbon-fibre-reinforced plastics and other thermoset polymers, prior to, during and after processing, to maximize mechanical performance. The technique is more versatile than spectroscopic techniques which are not suitable for light-absorbing composites. It is also simpler and faster than thermoanalytical techniques.

Manufacturing an Anaerobic, Biocatalytic Sandwich Reactor 8688

A manufacturing process is described for building an anaerobic, biocatalytic sandwich reactor for treating liquids. The sandwich reactor has an ultrafiltration membrane on one side and a reverse osmosis membrane on the other and will operate continuously. It has been used to produce ethanol from glucose.

Device for Detecting Pinholes in a Moving Sheet 8748

This device is designed for detecting flaws in a moving sheet of material. Unlike existing techniques, the technique used is compatible with typical industrial requirements for speed and accuracy over extended fields of view. Surface flaws or pinholes a few tens of microns in diameter can be detected.

Computer Program for Contour Plotting 8892

Using either cartesian or polar co-ordinates, this program machine plots smooth contour lines from data sets containing at least 12 and up to 2000 points. It also calculates average height and volume under 3-D surfaces. At present, it is the only known machine plotting program operable on a personal computer (HP 9836). It is coded in BASIC 2.

Bacterial Control of Bertha Armyworm Larvae (Memestra Configurata) 8919

Selected strains of *Bacillus Thuringiensis*, highly toxic to the larvae of the Bertha Armyworm, have been cultured for use as insecticides to control infestations in canola and other cruciferous crops. The bacteria are more environmentally acceptable than currently used toxic chemicals.

Automatic Aseptic Sampling Apparatus 8993

This apparatus allows the retrieval of uniform sterile liquid samples from bioreactors or other containers, through a three-way valve system. The manually operated or automatically controlled system prevents contamination and allows the sample to be returned to the bioractor. It is useful in sampling operations of sterile streams (e.g., food and beverage or pharmaceutical industries).

Collinear Acousto-Optic Interaction in Cladded Fibres 9027

This is related to a new acousto-optic device in which ultrasonic waves are used to modulate optical waves. The device, in which acoustic waves propagate along the same longitudinal axis of the fibre, is efficient, simple, miniature and economical. It is also compatible with standard optical fibre systems.

For further information on the above items, write to: Canadian Patents and Development Limited, 275 Slater Street, Ottawa, Ontario K1A 0R3; Tel: (613) 990-6100; FAX: (613) 990-8528.

Please quote the appropriate case number.

Austria

Electronic Control Systems

An Austrian company is offering to Canadian companies the know-how, training and equipment for the development and production of electronic control systems and combinations of multi-train control systems for model railways.

Write to: P. W. Ziegler, ZIMO Elektronik, Schönbrunnerstrasse 188, A-1120 Vienna, Austria.

Silos for Bulk Goods

An Austrian company is offering to a medium-size metal working company, through a licensing or joint-venture arrangement, the technology for construction of silos, from three to 100 tonnes, for bulk goods, such as flour, sugar, starch, salt, etc.

Write to: The Austrian Trade Commissioner in Toronto, 2 Bloor Street East, Suite 3330, Toronto, Ontario M4W 1A8; Tel: (416) 967-3348; Telex: 06-23196 Autrad Tor; FAX: (416) 967-4101.

Germany, Federal Republic of

Process for Purification of Drinking Water

A German company is offering to Canadian companies turnkey plants and the technology and technical training for a purifying process to produce drinking water without adding chemicals. The process is said to be applicable to the brewery, food processing and pharmaceutical industries and to public buildings and camps.

Write to: Klaus Kempf, UNIDO Investment Promotion Service, P.O. Box 10 20 65, D-5000 Cologne 1, Federal Republic of Germany; Telex: 17221349.

Great Britain

Vehicle Loading System

A British company is offering to Canadian firms, through a licensing arrangement, the manufacturing and marketing rights to its KAYBE Penetrator Vehicle Loading System. By using a telescopic continuous belt, this loader can load or unload a vehicle with continuous adjustment of penetration depth.

Write to: H. Matthew Pollard and Associates Ltd., Brownacres, 145 Sapcote Road, Burbage, Leics, United Kingdom, LE10.2AT; Tel: 0455-611733; Telex: 333388 LINK G.

The Netherlands

Plastic Pipe Systems

A company in the Netherlands is offering to Canadian plastics processors, under licensing and technical assistance agreements, the know-how for manufacturing plastic pipe systems.

Write to: W. H. Ros, Business Unit Manager, Wavin Overseas bv, Rollepaal 19, NL-7700 AD Dedemsvaart, The Netherlands; Telex: 30732 wavov nl; FAX: 05230-24600.

Switzerland

Wheelchair Accessories

A Swiss company is offering, through a licensing arrangement, the manufacturing and marketing rights for its wheelchair umbrella. The umbrella is claimed to be adjustable in all directions and will also protect the wheelchair attendant. It comes with a storage bag and can be mounted or dismantled by the wheelchair user. As an additional accessory, a spotlight can be mounted on the umbrella arm.

Write to: Krummenacher, Krummenacher Gerätebau, Chilestrasse 12, CH-8906 Bonstetten ZH, Switzerland; Tel: (01) 700 25 88.

United States

The following inventions are available for licensing from the University of Dayton Research Institute, Dayton, Ohio.

Rigid-Rod Molecular Composites

The Institute has established a new approach to polymeric materials through the use of intrinsically rigid-rod polymers to form "molecular composites". These materials are molecular-level analogs of conventional state-of-the-art composites of chopped fibreglass. They are dispersed in a thermoplastic or thermoset matrix of the type used in the automotive industry. The Institute replaced chopped fibreglass by intrinsically rigid-rod molecules, thus avoiding interfacial problems encountered in conventional fibre/matrix composites. Protected by U.S. Patent.

A New Series of High-Performance Epoxy Resins

The Institute has synthesized a series of new epoxy resins claimed to have properties superior to those of commercially available materials. Evaluations of cured and post-cured neat castings of these new resins have shown that the Institute's materials are less brittle than state-of-the-art epoxies, and their thermal properties are equal to or better than those of existing epoxy materials. It is also claimed that the moisture sensitivity of these new epoxy resins is much lower than that of the commercially available resins. U.S. Patent pending.

Advanced Phase-Change Thermal Energy Storage Materials for Heating and Cooling Applications

The Institute has defined a series of commercially available, low-cost crystalline alkyl hydrocarbons that melt and freeze congruently in the temperature range of 15°C to -80°C, have a high heat-of-fusion, and are chemically inert and non-toxic. Three U.S. patents have been issued. Patents are pending in Canada, Japan and several European countries.

Fluorocarbon Cleaning Process for Cleaning Strengthened Nickel Superalloys

Developed by the Institute, this process uses the controlled decomposition of a fluorocarbon resin (Teflon) to produce an extremely reactive atmosphere capable of converting normally stable oxides, such as TiO₂ and Al₂O₃, to volatile fluorides. Conventional metallurgical process equipment is employed and the effluent products are non-toxic and non-polluting. Protected by patents in the United States, Canada, EPO and other countries.

For further information on the above inventions, write to: the University of Dayton Research Institute, 300 College Park, Dayton, Ohio, OH 45469; Tel: (513) 229-2113.

The following are joint-venture and licensing opportunities from American companies.

Solar-Powered Oven

Burns-Milwaukee, Inc. seeks joint-venture partners to produce its solar-powered oven that cooks and bakes.

Water Proofing for Concrete

ConSeal International Corporation seeks licensees to produce its easy-to-apply water proofing for concrete.

Speech and Voice Recognition System

Covox Inc. is looking for licensees for its system that adds speech and voice recognition to IBM and IBM-compatible personal computers.

Baking Machine

E. Christensen Co., Inc. offers a joint-venture or licensing arrangement for its fast and efficient baking machine.

Requested

Wind Turbine

Earth Labs Inc. seeks joint-venture partners for its efficient, high-output wind turbine.

Folding Binoculars

Innovational Products Co. is seeking licensees for its inexpensive folding binoculars.

Safe Insecticide

Insecta International Inc. is offering its safe insecticide with long-term effect for a joint-venture arrangement.

Educational Doll

A doll that is claimed to dispel the fear of darkness is offered to licensees by J. & R. Enterprises, Inc.

Non-Toxic Stain Remover

Lustre-Glo seeks licensees for its non-toxic stain remover.

Anti-Smoking Video

A video program that helps stop smoking is available for licence from MMI Video Inc.

Economical Disinfectant

A licensee is sought by Omnitec Medical Corporation for its economical disinfectant.

Ultraviolet Water Purifier

A water purifier using ultraviolet light is offered for licensing arrangement by Pura Inc.

Automatic Water Purifier

Pure Water, Inc. seeks a licensee for its automatic water purifier.

Truck Unloading Platform

A platform that is used to unload trucks easily and efficiently is offered to a licensee by Straight Engineering Co.

Diagnostic System

Transimatics seeks a licensee for its diagnostic system that is said to be fast and complete.

For more information on the above products, please contact the Consulate General of the United States of America, 1000-615 Macleod Trail S.E., Calgary, Alberta T2G 4T8; Tel: (403) 265-2116

Requested

Canada

- Food Ingredient Products

Bangladesh

- Inks and Lacquers

Belgium

- Street Fixtures

Brazil

- Saws and Cutting Machines
- Analytical Instrumentation or Sensors

France

- Boiler Components
- Automated Mechanical Handling Products and Systems

Great Britain

- Hospital Supplies and Laboratory Equipment

Greece

- Aluminum Sheets and PVC Packaging

Japan

- Miscellaneous Products and Technology

Peru

- Phyto-Pharmaceutical Products

United States

- Health Care Products

Canada

Food Ingredient Products

A Canadian company wishes to acquire, through licensing or other arrangements, the manufacturing and marketing rights of new food ingredient products.
Write to: Bruce Gitelman, Vice-President, UFL Foods Inc., 6320 Northwest Drive, Mississauga, Ontario L4V 1J7; Tel: (416) 671-0808; Telex: 037-3902; FAX: (416) 671-0809.

Bangladesh

Inks and Lacquers

A Bangladesh manufacturer of wooden pencils and black and coloured lead, seeks technical know-how to manufacture offset printing inks and lacquers.
Write to: A. Martin, Managing Director, Bengal Pencils Limited, House No. 2, Road No. 3, Sector-1, Uttara Model Town, Dhaka, Bangladesh; Telex: 642472 RPD-BJ.

Brazil

Saws and Cutting Machines

A Brazilian manufacturer of band saws and cutting machines seeks joint-venture or licensing arrangements for the local manufacture and export of machine tools.

Write to: João Candido dos Santos, Director, Franho-Maquinas e Equipamentos S.A., C.P. 30, Rua Marco Aurelio 485, 13280 Vinhedo, São Paulo, S.P., Brazil.

Analytical Instrumentation or Sensors

A Brazilian company is seeking, through a licensing arrangement or joint venture, technology related to analytical instrumentation or sensors for use in laboratories or industrial areas.

Write to: Francisco Forés Medina, Director, Digimed Industria Eletronica Ltda, Rua Ampere, 460-Socorro, São Paulo 04762, Brazil; Tel: 522-9844; Telex: (011) 80138.

European Community

The following are requests for transfer of technology from country members of the European Community (E.C.).

Belgium

Street Fixtures BRE/0155/46/EN

A Belgian company, specialising in the supply of street fixtures to public administrations, wishes to extend its line of products with readily marketable related items.

France

Boiler Components BRE/0141/31/EN

A French manufacturer of boiler equipment and agri-food machinery, wishes to expand its product line in the field of boiler components.

Great Britain

Hospital Supplies and Laboratory Equipment BRE/0075/92/EN

A British company wishes to acquire, through a joint-venture or other marketing arrangement, hospital medical supplies and laboratory equipment.

Greece

Aluminum Sheets and PVC Packaging BRE/0145/49/EN

A Greek company, specializing in packaging, is seeking a joint-venture or other type of arrangement with a manufacturer of sheets of aluminum in rolls and of PVC for domestic use and packaging of foods

For more information on the above technology transfer requests from E.C. countries, write to: Task Force SME, Business Cooperation Centre, Commission of the European Communities, rue d'Arlon 80, B-1040 Bruxelles, Belgium; Tel: 02/236 1676; FAX: 236.12.41; Telex: 61.655 BURA P B.

Please quote the appropriate reference number.

France

Automated Mechanical Handling Products and Systems

A development agency, representing companies in France, is interested in acquiring, through licensing, joint-venture or strategic partner arrangements, new products and systems related to automated mechanical materials handling ranging from bulk handling to robotized industrial mechanical handling.

Write to: John W. Morehead, President, Technology Search International, Inc., 500 East Higgins Road, Elk Grove Village, Illinois, IL 60007, U.S.A.; Tel: (312) 593-2111; Telex: 754296 TECH UD.

Japan

Miscellaneous Products and Technology

A group of Japanese firms are seeking, through licensing, joint-venture distribution agreements or other arrangements, new products and/or technologies in — medical equipment and devices; computer image software; measuring instruments; composite and advanced materials; medical and dental materials; die-casting technologies; water treatment technologies; process engineering technology; optical materials technology; gold mine development projects.

Write to: John W. Morehead, President, Technology Search International, Inc., 500 East Higgins Road, Elk Grove Village, Illinois, IL 60007, U.S.A.; Tel: (312) 593-2111; Telex: 754296 TECH UD.

Peru

Phyto-Pharmaceutical Products

A Peruvian company wishes to acquire technical know-how for the manufacture of such phyto-pharmaceutical products as tablets, capsules, unguents and ointments, conforming to the standards set by the World Health Organization.

Write to: Dr. L. Pena M., ITEFAR, Av. Higuiereta 439, Lima 33, Peru.

United States

Health Care Products

An American manufacturer of woven and non-woven health care products is seeking new and innovative technologies and products in these areas, specially in the low-cost barrier technologies or materials.

Write to: John W. Morehead, President, Technology Search International, Inc., 500 East Higgins Road, Elk Grove Village, Illinois, IL 60007, U.S.A.; Tel: (312) 593-2111; Telex: 754296 TECH UD.

Special Events

Summary

Canada

- WORLD ENERGY CONFERENCE
Montréal — September 1989
- EXPOCAM '89
Montréal — October 1989
- GROCERY SHOWCASE CANADA '89
Toronto — October 1989
- WMS '89
Toronto — October 1989

China, People's Republic of

- AUTOMOTIVE CHINA 89
Shanghai — July 1989

France

- INTERNATIONAL LEATHER WEEK
Paris — September 1989
- INTERNATIONAL ELECTRONIC
COMPONENTS EXHIBITION
Paris-Nord — November 1989

Germany, Federal Republic of

- INTERBRAU '89
Munich — August-September 1989
- INTERNATIONAL GARDEN TRADE FAIR
Cologne-Deutz — September 1989
- REHA
Düsseldorf — September 1989
- 9th EUROPEAN PHOTOVOLTAIC
SOLAR ENERGY CONFERENCE AND EXHIBITION
Freiburg — September 1989
- INTERKAMA
Düsseldorf — October 1989
- S+B COLOGNE
Cologne-Deutz — November 1989

Great Britain

- OFFSHORE EUROPE
Aberdeen, Scotland — September 1989
- INTERPLAS
Birmingham, England — September 1989

Greece

- AUTO/MOTO
Thessaloniki — October 1989
- INFOSYSTEM
Thessaloniki — November 1989
- HOTELIA
Thessaloniki — November 1989
- EXPLORIA
Thessaloniki — November 1989

India

- CLOTHING AND FOOTWEAR TECHNOLOGY
FOR INDIA
New Delhi — October 1989
- OFFICE AND BANK TECHNOLOGY FOR INDIA
New Delhi — October 1989

Korea, Republic of

- KOREENERGY 89
Seoul — September 1989

United States

- Licensing Executives Society
U.S.A./Canada Annual Meeting
Maui, Hawaii — October 1989

Canada

WORLD ENERGY CONFERENCE 14th Congress, Energy for Tomorrow

Montréal

September 17 to 22, 1989

Write to: Canadian National Committee,
World Energy Conference, Suite 305,
130 Albert Street, Ottawa,
Ontario K1P 5G4; Tel: (613) 993-4624.

EXPOCAM '89 Showcase for Suppliers to the Trucking Industry

Place Bonaventure

Montréal

October 20 to 22, 1989

Write to: Jack McLean, Show Manager,
Southex Exhibitions, 1450 Don Mills Road,
Don Mills, Ontario M3B 2X7; Tel: (416) 445-6641;
Telex: 06-966612.

GROCERY SHOWCASE CANADA '89 Food and Equipment Display

Toronto Convention Centre

Toronto

October 22 to 24, 1989

Write to: Donna Leigh, Show Manager,
Grocery Showcase, 101 Duncan Mill Road,
Suite 405, Don Mills, Ontario M3B 1Z3;
Tel: (416) 449-3020.

WMS '89 Woodworking Machinery and Supplies Show

Exhibition Place

Toronto

October 27 to 29, 1989

Write to: Lisa Coulson, Cahners Exposition Group,
Box 3833, 999 Summer Street, Stamford,
Connecticut, CT 06905, U.S.A.; Tel: (203) 964-0000.

China, People's Republic of

AUTOMOTIVE CHINA 89 5th International Exhibition for the Vehicle Industry

Shanghai, People's Republic of China

July 5 to 10, 1989

Write to: E+E EDIT EXPO INTERNATIONAL,
12, rue Vauvenargues, 75018 Paris-France;
Telex: 283 284 F EDXPO.

France

INTERNATIONAL LEATHER WEEK

Porte de Versailles

Paris

September 16 to 19, 1989

Write to: Promosalons, Salons Spécialisés Français,
C.P. 1302, Place Bonaventure, Montréal
(Québec) H5A 1H1; Tel: (514) 861-7841;
Telex: 05-25534 PROGEXCO MTL.

INTERNATIONAL ELECTRONIC COMPONENTS EXHIBITION

Villepinte
Paris-Nord
November 13 to 17, 1989

Write to: Promosalons, Salons Spécialisés
Français, C.P. 1302, Place Bonaventure, Montréal
(Québec) H5A 1H1; Tel: (514) 861-7841;
Telex: 05-25534 PROGEXCO MTL.

Germany, Federal Republic of

INTERBRAU '89

Exhibition of Products and Techniques for the Brewery and Beverage Industries

Munich Exhibition Centre
Munich, Federal Republic of Germany
August 25 to September 1, 1989

Write to: Unilink, 5 Donald Crescent,
Agincourt, Ontario M1S 1N5; Tel: (416) 291-6359;
Telex: 06-968027; FAX: (416) 291-0025.

INTERNATIONAL GARDEN TRADE FAIR

Cologne Trade Fair Centre
Cologne-Deutz, Federal Republic of Germany
September 10 to 12, 1989

Write to: Edel Wichmann, Cologne International
Trade Shows, 480 University Avenue, Suite 1410,
Toronto, Ontario M5G 1V2; Tel: (416) 598-3343;
Telex: 06-23581; FAX: (416) 598-1840.

REHA

International Congress and Exhibition on Aids for the Disabled

Fairgrounds
Düsseldorf, Federal Republic of Germany
September 23 to 27, 1989

Write to: P. R. Charette Inc., 5890 Monkland Avenue,
Suite 206, Montréal, Quebec H4A 1G2;
Tel: (514) 489-8671.

9th EUROPEAN PHOTOVOLTAIC SOLAR ENERGY CONFERENCE AND EXHIBITION

Freiburg, Federal Republic of Germany
September 25 to 29, 1989

Write to: Prof. G. Wrixon or Dr. S. McCarthy, NMRC,
University College, Lee Maltings, Prospect Row,
Cork, Ireland.

INTERKAMA

Exhibition for Instrumentation and Automation

Fairgrounds
Düsseldorf, Federal Republic of Germany
October 9 to 14, 1989

Write to: P. R. Charette Inc., 5890 Monkland Avenue,
Suite 206, Montréal, Quebec H4A 1G2;
Tel: (514) 489-8671.

S+B COLOGNE

International Exhibition and Congress for Sports, Swimming Pool and Leisure Facilities

Cologne Trade Fair Centre
Cologne-Deutz, Federal Republic of Germany
November 8 to 11, 1989

Write to: Edel Wichmann, Cologne
International Trade Shows, 480 University Avenue,
Suite 1410, Toronto, Ontario M5G 1V2;
Tel: (416) 598-3343; Telex: 06-23581;
FAX: (416) 598-1840.

Great Britain

OFFSHORE EUROPE

Products and Equipment for the Offshore Oil and Gas Industry

Exhibition and Conference Centre
Aberdeen, Scotland
September 5 to 8, 1989

Write to: Spearhead Exhibitions Ltd., Rowe House,
55/59 Fife Road, Kingston-Upon-Thames, Surrey
KT1 1TA, England; Telex: 928042.

INTERPLAS

International Plastics and Rubber Exhibition

National Exhibition Centre
Birmingham, England
September 1989

Write to: Industrial and Trade Fairs Ltd.,
Radcliffe House, Blenheim Court, Solihull,
West Midland B91 2BG, England.

Greece

AUTO/MOTO

2nd International Exhibition for Motorcar, Motorcycle and Accessories

HELEXPO Halls
Thessaloniki, Greece
October 7 to 15, 1989

INFOSYSTEM

3rd International Exhibition of Information Systems

HELEXPO Halls
Thessaloniki, Greece
November 1 to 5, 1989

HOTELIA

2nd International Exhibition of Equipment and Catering for Hotels, Restaurants, Pastry Shops, Bakeries, Hospitals, Shops

HELEXPO Halls
Thessaloniki, Greece
November 16 to 20, 1989

EXPLORIA

5th International Exhibition for Boats, Caravans, Camping and Sports

HELEXPO Halls
Thessaloniki, Greece
November 18 to 26, 1989

For the above exhibitions in Greece, write to:
HELEXPO, 154, Egnatia Str., GR 546 36
Thessaloniki, Greece, Telex: 0412291;
or to: Greek Commercial Section, Place Bonaventure,
P.O. Box 303, Montréal, Quebec H5A 1B4.

India

CLOTHING AND FOOTWEAR TECHNOLOGY FOR INDIA

International Textile, Garment Making and Shoe Manufacturing Exhibition

Pragati Maidan
New Delhi, India
October 3 to 7, 1989

OFFICE AND BANK TECHNOLOGY FOR INDIA

International Office and Bank Technology, Computer and Communications Equipment Exhibition

Pragati Maidan
New Delhi
October 3 to 7, 1989

For the above exhibitions in India, write to:
Spearhead Exhibitions Ltd., Rowe House,
55/59 Fife Road, Kingston-Upon-Thames,
Surrey KT1 1TA, England; Telex: 928042.

Korea, Republic of

KORENERGY 89

International Exhibition on Energy Sources Management, Energy Saving Technology and Equipment

Seoul, Republic of Korea
September 18 to 21, 1989

Write to: SHK International Services Ltd., 22/F,
151 Gloucester Road, Hong Kong.

United States

Licensing Executives Society U.S.A./Canada Annual Meeting

Hyatt Regency Maui
Maui, Hawaii
October 15 to 19, 1989

Write to: J. Stuart Ott, 1444 W. 10th Street,
Cleveland, Ohio, OH 44113, U.S.A.;
Tel: (216) 241-3940.

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Parsons Building
90 O'Leary Avenue
P.O. Box 8950
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Atlantic Canada Opportunities Agency

Toll-free 1-800-563-5767

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Confederation Court Mall
Suite 400
134 Kent Street
P.O. Box 1115
CHARLOTTETOWN
Prince Edward Island
CIA 7M8
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P.O. Box 940, Station M
HALIFAX, Nova Scotia
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Atlantic Canada Opportunities Agency

Toll-free: 1-800-565-1228

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P.O. Box 1210
MONCTON, New Brunswick
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Fredericton

Tel: (506) 452-3124

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Tel: (506) 473-5556

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Toll-free 1-800-561-4030

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800 Victoria Place
P.O. Box 247
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Tel: (418) 968-3426

Sherbrooke

Tel: (819) 565-4713

Trois-Rivières

Tel: (819) 374-5544

Val-d'Or

Tel: (819) 825-5260

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Dominion Public Building
4th Floor
1 Front Street West
TORONTO, Ontario
M5J 1A4
Tel: (416) 973-5000

Local Offices

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Tel: (519) 645-5820

Ottawa

Tel: (613) 993-4963

Sault Ste. Marie

Tel: (705) 942-1327

Sudbury

Tel: (705) 675-0711

Thunder Bay

Tel: (807) 623-4436

MANITOBA

330 Portage Avenue
Room 608
P.O. Box 981
WINNIPEG, Manitoba
R3C 2V2
Tel: (204) 983-4090

Local Office

Thompson

Tel: (204) 778-4486

SASKATCHEWAN

105 - 21st Street East
6th Floor
SASKATOON, Saskatchewan
S7K 0B3
Tel: (306) 975-4400

Local Office

Regina

Tel: (306) 780-6108

ALBERTA

Cornerpoint Building
Suite 505
10179 - 105th Street
EDMONTON, Alberta
T5J 3S3
Tel: (403) 495-4782

Local Office

Calgary

Tel: (403) 292-4575

BRITISH COLUMBIA

900 - 650 West Georgia Street
P.O. Box 11610
VANCOUVER, British Columbia
V6B 5H8
Tel: (604) 666-0434

Local Office

Prince George

Tel: (604) 561-5158


YUKON

108 Lambert Street
Suite 301
WHITEHORSE, Yukon
Y1A 1Z2
Tel: (403) 668-4655

NORTHWEST TERRITORIES

Precambrian Building
P.O. Bag 6100
YELLOWKNIFE, Northwest Territories
X1A 1C0
Tel: (403) 920-8568

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