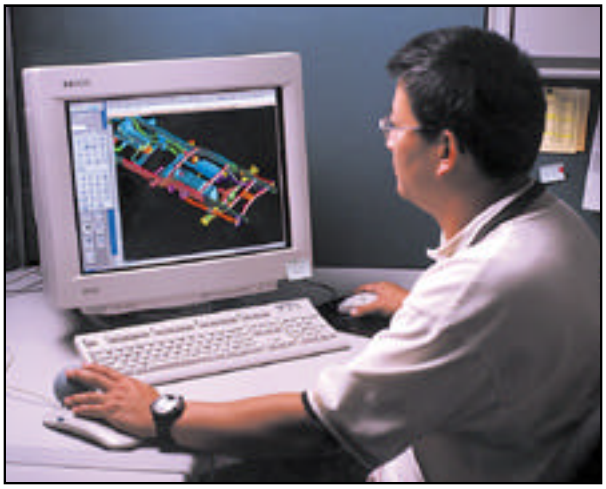
GM research centre brings automotive design jobs to Canada

by Karen Hawthorne

Since the announcement last August of General Motors of Canada's new $20-million Regional Design Centre in Oshawa, more than 1500 applications have flooded the human resources department for 150 engineering jobs.



Made in Canada: Tan Lo, P.Eng., a design services engineer at General Motors of Canada, uses Unigraphics–GM's computer-aided design/computer-aided manufacturing system–to design new body structures for the company's vehicles at the new Regional Engineering Centre under construction in Oshawa.

Slated for completion by summer 2000, the centre has roughly one-third the desk stations complete for the rigorous 26 weeks of training required for each employee. About one-third of the jobs have been filled by recent graduates and experienced engineers in a variety of fields, and the on-site training has begun for these design professionals.

The unique concept used at the centre integrates the job skills traditionally performed by the vehicle designer, engineer and engineering analyst, shortening the design process, says Stew Low, GM's director of public relations. "This is important because of the strong links among these three activities," he says. "When these activities are performed by separate people, it increases the wait time for a job to progress from one area to another."

The engineers will be trained in Unigraphics, GM's computer-aided design/computer-aided manufacturing (CAD/CAM) system.

Although specific projects have yet to be finalized, the centre will focus on vehicle body frames and body subsystems, and add to the work already being done in Oshawa on alternative fuels, specialty vehicles and improving operability in cold weather.

Touted as bringing "total vehicle design and development capability to Canada," the design centre will be linked with similar GM centres around the world in the U.S., Japan, China, Mexico, Brazil and Australia for collaborative research and development. The CAD/CAM system will allow the sharing, modification and exchange of three-dimensional, math-based computer models on a real-time basis.

The investment brings GM Canada's total engineering and product planning team to more than 330 people.

Business opportunity for environmental industries

Industry Canada and the Confederation of National Industry of Brazil are jointly funding an energy efficiency program aimed at reducing carbon dioxide levels and other greenhouse gas emissions for Brazilian industry. The program will focus on building in Brazil medium-sized industries and replicable energy management projects. As the executive agency for the project, the Canadian Environment Industry Association (CEIA) is seeking the participation of Canadian suppliers of energy and environmental equipment and services. For further information, contact Martin Adelaar, general project manager, at (613) 523-0784; fax: (613) 523-0717; email: adelaar@marbek.ca. Information on the project will also be posted on the CEIA's website (www.ceia-acie.ca).

PEO talks software engineering at High Tech Show

by Karen Hawthorne

Amidst booths pushing computer products and the latest in software security at September's High Technology Show at the Toronto International Centre, PEO took centre stage for a presentation on software engineering and the importance of regulating the discipline.

"What we're interested in is protection of the public," PEO President-elect Peter DeVita, P.Eng., told the audience of about 50 engineers and software professionals. "Software is used in so many applications, and that puts the public at risk," he said, stressing the need for regulations, standards and licensure.

In May, PEO Council approved new criteria for assessing the qualifications of software practitioners who wish to become licensed as professional engineers. The criteria define the core knowledge that software practitioners require for P.Eng. licensing, providing a basis for consistently assessing the qualifications of software practitioners (see "PEO takes first steps toward professional regulation in software," *Engineering Dimensions*, September/October 1999, p. 16).

Promoting the "P.Eng." at Toronto's High Technology Show: PEO President-elect Peter DeVita, P.Eng., talks shop.

"PEO has to be a lot more forthright and aware because things are changing at such a rapid rate," DeVita said, pointing to licensure as the first step in closing the regulatory gap between traditional engineering disciplines and the modern high-tech world.

DeVita said that PEO is a little behind the game, in part because of the torrent of technological change. The huge demand for IT professionals has spawned numerous Microsoft and other commercial training centres that offer unaccredited "certified engineering" programs. The first graduates of accredited software engineering programs at Ontario Universities will graduate in 2001.

"We'd have better luck taking on God than Microsoft," said David Parnas, PhD, P.Eng., director of the software engineering program at McMaster University and the second speaker in PEO's presentation. Calling the name "misleading," Parnas said that the "certified engineering" education is equivalent to that of a technician. He also said the training goes out of date quickly and doesn't provide such traditional engineering fundamentals as math and physics, as well as those parts of mathematics and computer science that are relevant to software development.

"Everybody knows there's a huge and growing demand for software out there–and we all know that most of it is lousy," he said to justify the need for licensed professional engineers to assume responsibility for software design. "The Y2K problem is clear evidence."

Ben Wagner, an engineering graduate from the University of Waterloo, stops at PEO's booth at Toronto's High Technology Show for information about licensure from Barbara Dodds, PEO admissions representative.

Software engineers must be more than good programmers, Parnas stressed, adding that systems can be flawed because their design has not been properly documented, structured or tested.

Parnas said that since computer science graduates are trained to focus only on what's inside the computer, "we need software developers who understand how to analyze the world outside the computer." A software engineer understands the interface between system components and can design a system to fit its environment, so that products work effectively, he explained.

Parnas also pointed out that industry and the public are crying out for a means of assessing who is a competent IT professional. "They want to know how they can tell who is competent," he said, which is the intent of licensing by PEO and accreditation by the Canadian Engineering Accreditation Board of software engineering education at universities.

Ottawa engineer to publish book on Antarctic expedition

by Susanne Frame

Joe MacDowall, P.Eng., knows the stress and anxiety of living in the Antarctic, a desolate, yet pristine landscape. For two years, he led a scientific expedition that was the first to make extensive measurements of atmospheric ozone. That was back in 1957. Now these measurements are used to assess global warming.

Today, MacDowall has written a book, *On Floating Ice: Two Years on an Antarctic Ice Shelf South of 75^0 S*, which recounts the story of this expedition mounted by the Royal Society as England's contribution to the International Geophysical Year, July 1957 to December 1958. Scientists from 67 nations participated in a cooperative study of the solar-terrestrial environment.

"It marked a big step forward in Britain's pursuit of scientific excellence for its work in Antarctica," says MacDowall, from his home in Ottawa. The retired Canadian engineer was born and educated in England, where he joined the Meteorological Office to work in research and development.

◀ Joe MacDowall, P.Eng., leader of the Royal Society International Geophysical Year Antarctic Expedition, is shown here using a theodolite (a survey telescope) on the Brunt Ice Shelf by the coast of the Weddell Sea in 1957. Theodolite observations of the sun and stars were used to track the seaward movement of the ice shelf.

MacDowall was one of 20 young men who set up a base camp on an ice shelf in the Weddell Sea, near Halley Bay. The expedition extended over three summers and two winters, as the iceberg inched its way out to sea.

From his diaries and letters to his family, the author takes the reader on the six-week ocean voyage from London to Halley Bay, to the daily life of the expedition at work and play.

Upon his return, MacDowall spent two years writing the expedition reports, and later joined the aerospace industry, working for British Aircraft Corporation. He'll never forget the remarkable journey, or the demand for self-reliance and ingenuity: "It helped me develop a confidence in tackling quite amazing problems."

The book, complete with original photos, will be available this December from The Pentland Press. For further information, log on to www.pentlandpress.co.uk/.

Mystery matter detected by Sudbury observatory

by Karen Hawthorne

Flashes of blue light from the cosmos have been detected some 2 kilometres beneath Sudbury in an abandoned nickel mine.

That's good news for the Sudbury Neutrino Observatory (SNO), up and running since June. The observatory and its team of scientists from around the world are taking data to provide revolutionary insight into the properties of neutrinos–the fundamental particles of matter that may hold the key to understanding the sun's core and the universe. SNO's Canadian partners include the Natural Sciences and Engineering Research Council of Canada, the Northern Ontario Heritage Fund, the engineering firm Agra Monenco and five universities.

The accepted model of the universe dictates that, given the current rate of expansion, the universe should have a certain mass. But astronomers can't find all of it, with the visible cosmos making up only 10 per cent of the calculated mass.

Where do neutrinos fit into the puzzle? Neutrinos carry no charge and very little mass, if any, making them difficult to detect. But if they could be shown to have a tiny mass, their abundance might make up a great deal of the cosmic shortfall.

"This is extremely exciting," says SNO associate director David Sinclair, PhD, a physicist with Carleton University's Centre for Research in Particle Physics. "The neutrino problem has been plaguing physics for the last 60 years."

A feat of engineering research and design, SNO is the first heavy-water neutrino detector. It uses 1000 tonnes of heavy water in a 12-metre-diameter acrylic tank, which is surrounded by hundreds of photomultiplier tubes to detect the feeble light produced when neutrinos collide. The location deep within Inco's Creighton mine shields the detector from cosmic rays and other sources of unwanted "background" signals.

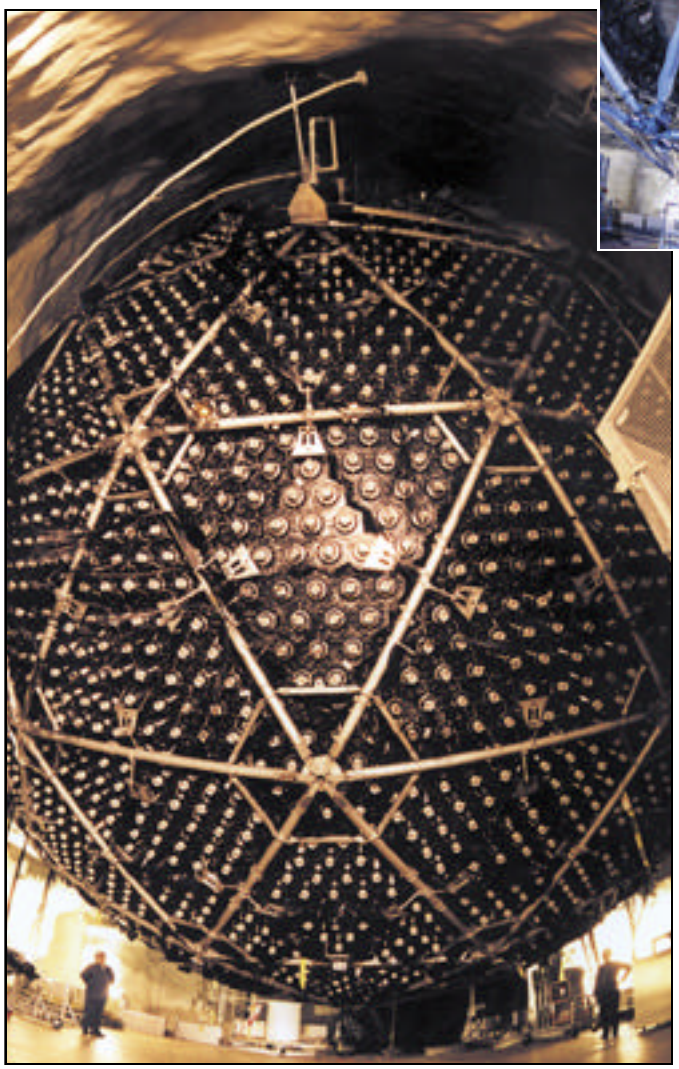
Sinclair says the detector could also shed light on the allied solar neutrino problem, which relates to the sun. The nuclear fusion process in the sun's core produces neutrinos, bathing each square centimetre of the earth's surface with billions of them every second. But, so far, scientists have only been able to detect about a quarter the number they expect to observe.

According to Sinclair, there are two possible explanations: Either the sun is producing fewer neutrinos than scientists believe, or the neutrinos are changing into other forms as they travel from the sun to Earth, thereby defying detection.

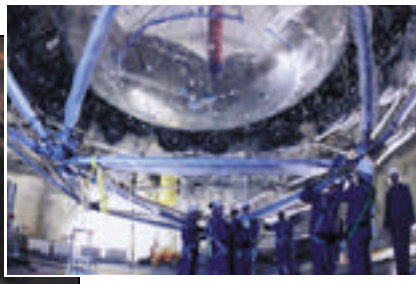
"Evidence from a number of experiments points to the neutrinos changing," says Sinclair. SNO, unlike other detectors, will be able to confirm the switching. With both its neutral current and charge current processes, SNO can discriminate among, and measure, electron neutrinos and non-electron types or "flavours" known as "muon" and "tau." Since the sun produces only electron neutrinos, picking up evidence of the other two, non-electron types will confirm the switching.

"Understanding the actual nature of the universe hinges on making a few critical measurements and good statistics," Sinclair says of the multi-year production data run that's now in progress at the observatory.

Although he wouldn't comment on findings thus far, Sinclair said the first real physics analysis should be ready for an international science conference slated for next June in Sudbury.



A window on the cosmos: The Sudbury Neutrino Observatory's support structure holds hundreds of photomultiplier tubes that detect faint flashes of light as neutrinos collide in heavy water.



Inside the SNO cavity: 2 km beneath the Earth's surface, the acrylic vessel holds heavy water to detect mystery neutrinos.

Jury still out on health effects of electromagnetic fields

by Karen Hawthorne

Using your microwave, hairdryer or personal computer could put you at risk for cancer or depression—but there's no hard, scientific evidence to prove it.

At a recent seminar, Cathryne Glanville, policy advisor on environment, health and safety, Ontario Hydro Services Company, told Mississauga Chapter members little is known about the health effects of electromagnetic fields and how consumers can protect themselves.

Electric and magnetic fields, the invisible lines of force surrounding any wire or device that uses electricity, are something that scientists, government and public utilities are concerned about, but "there are no clear-cut answers," says Cathryne Glanville, policy advisor, environment, health and safety, Ontario Hydro Services Company. She spoke at a seminar in September hosted by PEO's Mississauga Chapter.

Electric fields are produced by voltage when, for example, a lamp is plugged in but turned off. Magnetic fields are produced by electric currents, such as when a lamp is plugged in and turned on. Both are reduced in strength with increasing distance from the source.

Despite numerous studies around the world in the past 20 years, evidence linking exposure to electric and magnetic fields with health problems like breast cancer and child leukemia is weak, and cannot be substantiated by laboratory research, Glanville said. The immeasurable number of factors that influence epidemiology–the study of patterns and possible causes of diseases in human populations–make studies that have linked proximity to power lines with various types of childhood cancer impossible to replicate in a controlled, laboratory environment, she said.

"In lieu of no scientific answers, we want to continue to educate the public and look at ways to reduce exposure," Glanville said. She said that utilities have tried to manage the fields by changing the configuration of power lines, for example. But changing wiring can lead to other problems, such as making the lines more difficult to repair and more dangerous to workers.

"The problem is," she stressed, "nobody knows if it's the length of exposure or the strength of the current that's harmful, like a five-minute exposure to a hairdryer or watching TV for three consecutive hours from three feet away."

To prove her point, Glanville cited the recently published findings of two studies by Canadian research teams, which are completely contradictory. Dr. Lois Green and colleagues at the University of Toronto and Hospital for Sick Children found that a relationship exists between leukemia risk and electromagnetic fields in residential settings for children diagnosed at a young age. But, overall, the findings do not support an association between leukemia and proximity to high-current configuration power lines.

At the same time, however, the team's findings for magnetic field exposures, measured by a personal monitoring device, support an association with the risk of childhood leukemia.

Conversely, a study by Dr. Mary McBride's team at the British Columbia Cancer Agency offered little support for the hypothesis of increased risk of childhood leukemia, either from magnetic or electric fields, or from residential power line configurations.

There have been over 100 studies of occupational exposure with no conclusive evidence, Glanville says, adding that over 88 scientific panels have been convened by governments and health organizations since 1977. Most studies have identified areas for additional research, and some have noted uncertainties about the possibility of health effects, she said. But none have concluded that exposure to power-frequency electromagnetic fields causes cancer or any other disease.

Although many consumers ask electricity providers or consultants to measure the electromagnetic fields in their homes or on their property, that information won't determine whether your environment is safe, says Glanville, because no scientific evidence proves that stronger fields pose a health danger.

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