Weaving memories in Pangnirtung
Energy Challenge

Forecasts suggest that world energy consumption will increase by 40 percent in the next 25 years. Technological advances will be key to ensuring a continued supply of reliable, affordable energy.

As an oil industry executive, I am often asked how we, as a society, can resolve what is perhaps the central energy-related issue of our time—how to meet the ever-growing demand for reliable and affordable energy while simultaneously addressing environmental concerns.

This is a fundamental question that we face today because energy is central to the lives of all people, providing us with heat, light, motive fuel and electrical power. And there’s no doubt that the demand for energy will increase as the world’s population grows and developing nations improve their standards of living. Forecasts predict that by 2030 population and economic growth will increase the world’s consumption of all forms of energy by about 40 percent from today’s levels. North American energy demand is expected to increase by more than 30 percent during the same period.

Petroleum—that is, oil and natural gas—is expected to remain the dominant source of world energy until at least 2030 and probably beyond. Petroleum fuels offer a unique combination of high energy density, widespread availability, and ease of handling and transportation. This gives them an unbeatable competitive edge in many major energy applications, such as transportation, residential and commercial space heating, and industrial processes. Coal, hydro and nuclear power will continue to play a major role, particularly in electricity generation. And while alternatives such as wind and solar power will become more prevalent, they are not expected to account for more than a very small percentage of world energy supply within the next two or three decades. Even at a growth rate of 20 percent a year, which in itself would require major technological breakthroughs and massive investment, alternatives would meet less than one percent of the world’s expected energy needs by 2030. However, all forms of energy will be needed.

The challenge for petroleum producers will be to meet this growing demand in conventional oil and gas reserves are depleting. Clearly, we will have to find and produce new reserves. Given that we have identified reserves in the most accessible areas of the world, the likelihood that new reserves will be as more and more remote regions. Not only will we have to find ways to access and produce these oil, but we must do so in ways that minimize our impact on the environment.

We face a huge challenge. Meeting it will require enormous ingenuity, all-out effort on many fronts and huge investments of time, capital and resources. The International Energy Agency estimates that the petroleum industry will have to invest $750 billion a year in new development projects to support demand for oil and gas alone is to be met. The investment required in the area of power generation is even greater. Yet investing capital is only part of the answer. The key to ensuring a continuing supply of reliable and affordable energy is technology. We must find new and improved technologies for producing energy, for using it efficiently and for addressing environmental concerns. Innovative minds must be turned to this challenge, which ultimately will touch all our lives.

Much has already been done to enable us to use energy more efficiently. For example, new automobile engines today are considerably more fuel-efficient and produce dramatically lower emissions than their counterparts of 10 years ago. But there’s room for further improvement, and much work is being done in this area (see "Elegantly Simple," beginning on page 24).

On the industrial front, most manufacturing companies have introduced more efficient machinery and equipment. Carefully analyzed and adjusted their processes, if not for other reasons than to reduce their energy bills. Technological advancements have also led to increased energy efficiency in the petroleum industry, which is a major consumer of raw energy. Imperial’s refineries today are 40 percent more energy efficient than they were 10 years ago, and we are committed to further improving energy efficiency. On the home front, more cars, more and will be done to improve energy efficiency. But it is also clear that the projected gap between energy use and energy supply cannot be closed or even narrowed through conservation and efficiency alone. At best, given increasing demand, they can only narrow the widening of the gap.

The most critical task will be to find and bring on new sources of supply, including alternative sources, such as wind. While some technological breakthroughs are essential if alternative energy sources are to be economically viable on a large scale. In that respect, I would caution that government subsidies for alternative-energy projects that are not commercially competitive are not an appropriate use of scarce financial resources. The market is the best allocator of financial resources.

The challenge for the petroleum industry is immense. In Canada, we are fortunate to have abundant oil and gas resources, but we face a particularly challenging one in the threedimensional nature of that resource base, notably the oil sands of Western Canada, its expensive to produce. To compete effectively for the capital needed, we must develop our resources at the lowest possible cost and with the highest possible efficiency.

There is no question that the industry can rise to the task. We’ve been providing Canadians, and the world, with reliable and affordable petroleum energy for more than a century, and in recent years despite declining conventional reserves. In fact, recent forecasts by some sources were predicting that oil and gas supplies would run out before the end of the century, yet there are more known oil and gas reserves in the world today than there were then. The supply of oil will fall to meet increasing demand before the year 2020, most probably between 1985 and 1995, even if energy prices are 50 percent of current levels in real terms;" was a statement made at a Massachusetts Institute of Technology workshop in 1977. While oil prices have not increased in 25 years, the events in geopolitical events, they are estimated to have increased by more than 30 percent during the same period.

Again and again, the oil and gas industry has found ways to overcome obstacles, developing innovative technologies as they have been needed. For example, only in the last 15 years has the industry made any significant headway in reducing the environmental impact of oil sands, which is one of the world’s largest single sources of heavy oil. Since Imperial’s bitumen-recovery operation in Cold Lake, Alta., first went into commercial production, the cost of producing one barrel of oil equivalent has declined by about one-third. With operations such as Cold Lake and Sparwood, port McMurray, Alta., oil sands production now exceeds one million barrels a day and accounts for more than third of Canada’s total crude oil production. This would not have been possible without a sustained effort to devise new technologies and techniques for bitumen recovery from the oil sands such as the "in situ" process developed by Imperial to produce bitumen in Cold Lake. And in step with advances in oil recovery have come significant environmental improvements. For example, the Alberta government has been able to reduce the amount of forest destruction by 90 percent.

In other regions of Canada and around the world, petroleum producers have made extraordinary advances not only in finding and recovering oil and gas in remote, difficult and environmentally sensitive locations, but also in getting more and more oil out of existing fields and reservoirs at lower and lower costs.

New technologies have been devised to challenge the challenge of exploring, probing and tapping vast underground reserves of oil, gas and minerals—reserves that are economically viable at only a fraction of the cost of conventional production. These breakthroughs have been possible because of the tremendous advances made in computing capacity, data processing and analysis, as well as the increasing use of remote sensing and imaging technology.

The key to research and development is the support of innovative research and I’m proud that Imperial has been a leader in this respect. In addition to research carried out at its own Canadian laboratories, the company sponsors a wide range of energy research programs at Canadian universities and other institutions. For example, the company recently announced that it will provide funding of $10 million over five years to the University of Alberta for an Imperial Oil Centre for Oil Sands Innovation, which will be dedicated to finding ways of developing Canada’s vast oil sands in a more efficient, economically viable and environmentally responsible manner.

Imperial also participates with Exxon Mobil Corporation in contributing up to $150 million over 10 years to Stanford University’s Global Climate and Energy Project (GCEP), which is dedicated to finding new, commercially viable technologies that can substantially reduce greenhouse gas emissions.

I believe such partnerships between industry and academia are an important ingredient in meeting the energy challenge of the future. I believe that government and industry must work together to provide the support and encouragement to this challenge. Governments, in particular, should recognize that the private sector will be the primary driver of new energy technologies and that market mechanisms will determine the winners and losers. That means helping to provide a fiscal and regulatory climate that is hospitable to investment and recognizes the risks associated with energy development.

All parties with a stake in our future energy future should work together to ensure that Canada invests in developing both new, commercially viable technologies and the skills needed to deploy and manage them. The challenge is too important and too pressing for any of us to take a narrow view. Focusing on applying new technologies for both energy supply needs and environmental management is, in my view, the best path forward.

Necessity, they say, is the mother of invention. Necessity is upon us, so let us focus on invention.

Tim Hearn is chairman, president and chief executive officer of Imperial Oil.
Woven Art

In a quiet studio on Baffin Island, Inuit tapestry artists are creating works that are gaining international attention.

BY DYAN CROSS

Five women work in the round room that is the tapestry studio at the Uqkuraniq Centre for Arts and Crafts in Pangnirtung, Nunavut. Four of them are seated at looms on the floor, their fingers lifting and placing coloured yarns in tapestries unravelled row by row. Another selects skeins of wool, bunching them into the colours she knows the weavers will need.

Conversation flows from family news to community events to the latest hunt as the collaborative effort that transforms a line drawing into fibre art continues.

The Uqkuraniq Centre looks out over Pangnirtung, which lies at the edge of a fjord off Cumberland Sound with the mountainous terrain of eastern Baffin Island reaching up around it. Days at the centre are punctuated by the routine events of life in the small
During the last three decades, the style of the tapestries has become more and more complex as the weavers developed their techniques and artistic understanding. "The early strong images against a neutral background could be considered akin to posters," writes von Finkenstein. "In the eighties we have more graphic images, with the contours of the narrative scenes being set off against a clearly defined background, similar to prints. Finally, in the nineties, figure and background blend as they would in an oil painting."

The creation of a tapestry begins with a drawing or painting. Once a year, the weavers select drawings or watercolours from the centre's archives to be interpreted in woven form. They generally produce a cartoon of the artwork to serve as a pattern, which is then interpreted using a wool weft and a cotton warp. Each tapestry, therefore, has two artists—the "drawing" artist and the tapestry artist. "Tapestries are generally produced in editions of 10, with individual tapestries in the edition numbered one through 10," says Deborah Hickman, a tapestry artist from Mabou, N.S., who is an artistic advisor to the Penartnaq weavers. "An edition can take years to complete."

Hickman, who travels to Pangnirtung whenever a new collection is being created, explains that one of the greatest challenges the weavers face is reproducing the various colours and shades of the original artwork. "The subtle variations in tapestry colours are achieved by blending different colours of single-ply yarn by hand in the studio," she says.
yarn," she says. This technique, similar to mixing paints, makes it possible to "paint" with wool.

Attention to detail is a hallmark of the Pangnirtung tapestries. The warp ends on the top and bottom, for example, are woven back to finish the edges and a linen sleeve is applied to the back of the tapestry. Information about the tapestry is written directly onto the sleeve in English and Inuktitut—the names of both the drawing artist and the tapestry artist are given.

Geella Keenainak, a senior weaver at the Uqaiqaut Centre, was born at Qiniqau camp on Baffin Island in 1943 and moved to Pangnirtung when she was 22. A skilled seamstress, Keenainak started weaving in 1962. Over the years, she has embarked on ever more ambitious projects and now produces stunning tapestries of northern images and landscapes. Her version of Coming Up for Air is one of the 49 Pangnirtung tapestries featured in the Museum of Civilization’s Nauvikak exhibit. "I really liked the image from the beginning," says Keenainak through an Inuktitut interpreter. Creating a tapestry, she explains, is a collaborative effort, with all the weavers at the centre providing suggestions on colours and technique.

The Great Hall of the Nunavut Legislative Assembly in Iqaluit is home to a mammoth Pangnirtung tapestry. Nearly seven metres long and three metres wide, the spectacular work depicts Inukshuk hunters, caribou and birds flying against a purple-pink sky. The piece is based on Back Then, a water-colour by Joel Maniapik, an artist who was born and raised in Pangnirtung and is now a coordinator of community programs at Iqaluit’s Arctic College. "I enjoy seeing my drawings and paintings woven into tapestries," says Maniapik. "They take on a new and different presence."

The tapestry, which took seven weavers seven months to create, was a gift from the Uqaiqaut Centre to the Legislative Assembly and is one of the largest tapestries ever woven in Canada.

The work has played a significant role in heightening the profile of the Uqaiqaut Centre. "Even with the tapestries, we were making a statement about the community’s health centre. Evinguat has been weaving at the Uqaiqaut Centre since 1985 and believes her work and that of her fellow tapestry artists is not only personally fulfilling but historically significant. "Through the stories and pictures we weave, we help to keep our culture strong," she says. "Through weaving the drawings of Elden, I began to pay more attention to the history of my people. It is important that the younger generation see the old ways of life depicted in the tapestries. I hope that weaving in Pangnirtung never stops." Images courtesy of the Canadian Museum of Civilization and the Uqaiqaut Centre for Arts & Crafts.
Man of Letters

At times during the last four decades, Austin Clarke doubted his ability to be a successful novelist, but he persevered nonetheless. His most recent work, *The Polished Hoe*, won him both the Giller Prize and the Commonwealth Writers’ Prize.

BY WARREN GERARD

The Polished Hoe was greeted with critical superlatives. The Toronto Star described it as "an unqualified masterpiece" and as having "Biblical proportions" and "Homeric grandeur." The Globe and Mail wrote that "there is an utter extravagance and thoroughly compelling tragedy of Shakespearean scope and poetic intensity embedded in the text." The Ottawa Citizen found the novel "a magnificent, breathtaking plunge into the secret depths of human relations."

More rewarding for Clarke were the three prestigious awards he won for *The Polished Hoe*: the $25,000 Giller Prize, the £10,000 Commonwealth Writers' Prize, and the $20,000 Trillium Book Award. Some 60,000 copies of the novel have been sold. Clarke, at 69 years of age, received recognition that was overdue.

There were the mid-mornings when there was little food in the house, and at times Clarke wrote on the backs of pages already written on because he couldn't afford typing paper. His typewriter ribbon was so worn that he would neatly fill in faded letters with a ballpoint pen. Nothing seemed to be going right, and he doubted his ability.

Clarke applied for a number of Canada Council grants and was turned down. "That was a very great shock," he says. "It scared me. My early writing had been highly praised, and I began to wonder if I had been overrated. I had this feeling that my career was over. I don't know how I got the strength and the courage to continue. But of course I do know. I got it from my mother, from her teaching, from what I learned when I was going to school in Barbados."

His mother, Gladys Clarke, was 16 years old when Austin was born on July 26, 1934, following a brief relationship with his father, Kenneth Trotman, a craftsman and amateur painter. Although he was grandly christened Austin Ardinell Chesterfield Clarke, his mother called him Tommy Boy or Tom Boy. (Because he was premature and so small at birth he had been nicknamed Tom Thumb.) She told him from a very young age to set his sights high, that he should be a doctor or a lawyer and not settle for a labourer's life. She brought him up believing in Jesus and God, taught him manners and social graces, and made sure he received a good education, paying for an after-school tutor in English, arithmetic and history.

Clarke read the same authors as well-schooled English boys—Dickens, Shakespeare, Chaucer, Milton, Stevenson, Eliot, Hardy and others. But his favourite—"my best book of all time"—was Tom Brown's, School Days. "As a matter of fact," he said, "my friends and I used to imitate Tom Brown, who was a scruffy—"
There was very little of Barbados in Clarke's classical Church of England schooling. "Now we memorized things about a Grecian urn, learned about a man with 'revolution' in his name, and who killed beasts to sea and picked up seashells," he wrote in his childhood memoir, Growing Up Stupid Under the Union Jack. "We picked wells and 'sea' beef ourselves. The tools in our village consisted of a hoe and a shovel. We made this..." He added that in Barbados, people were educated about their culture.

Clarke went as far as he could in school, attending the elite Harrow College in Bridgetown, where he did well as a student, wrote poetry and excelled as a runner and cricket player. In 1952, at 18, he took a teaching position at a rural secondary school in Barbados and taught English language and literature, Latin and scripture. He had a full social life, went to parties, developed an eye for women and became the secretary to the country's Dominion Nautical Labour Party, which led the struggle against exploitation of blacks on the island.

Clarke's ambition drove him to seek further education abroad. In 1954, he applied to Oxford University and the London School of Economics, and was accepted by both. However, he decided he could afford neither. He learned, however, that in Canada he could study at a good school and while he studied and supplemented the minimal funds he would receive from his school in Barbados. He arrived at the University of Toronto in the fall of 1955 with a supply of rum and less than $20 in his pocket.

Clarke's plan was to take a degree in economics and political science in Toronto, study law in England, and then return to Barbados to establish a law practice and write and do politics in life. Life took another turn, however. At Trinity, the University of Toronto's establishment Anglican college, Clarke took on the role of a stylish English gentleman, a role he still plays well. But, he says, he wasn't as disciplined as he should have been. He read books and magazines that weren't on course reading lists. He enjoyed conversation over lectures, the sports field more than the classroom; he skipped many classes. Clarke still remembers the occasion when visiting American student, Gene Dugas, read the poem "In the city of the history of slavery, displacement and colonialism."

Angeles Times and Thorns, published the following year, was Clarke's second novel. For the most part, the work was well received by critics. It is a product of Clarke's own memories and insights into his roots, and..." he says. In 1964, The Survivor of the Crossing became the first of Clarke's novels to be published. For the most part, the work was well received by critics. It is a product of Clarke's own memories and insights into his roots, and..."

In 1966, The Survivor of the Crossing became the first of Clarke's novels to be published. For the most part, the work was well received by critics. It is a product of Clarke's own memories and insights into his roots, and..."

In 1966, The Survivor of the Crossing became the first of Clarke's novels to be published. For the most part, the work was well received by critics. It is a product of Clarke's own memories and insights into his roots, and..."

Clarke was a prolific writer, with numerous novels and short stories to his credit. However, his most significant works are his poems and essays, which explore themes of identity, culture, and the struggle for independence. His work has been widely acclaimed and has earned him numerous awards and accolades. Clarke has been named a Companion of the Order of Canada and has been awarded the Order of Barbados. He has also received several honorary degrees from universities around the world.

Clarke's poetry and essays are characterized by a deep sense of irony, social commentary, and a keen observation of the human condition. He has been described as a master of the Barbadian vernacular, and his work is often infused with the music and rhythms of the Caribbean.

Clarke's novels have also been praised for their rich characterizations and vivid descriptions of the Caribbean landscape. His work often explores themes of power, class, and the struggle for self-determination. Clarke's writing has been praised for its ability to capture the essence of the Caribbean experience and to illuminate the complexities of life in the region.

In addition to his work as a writer, Clarke has also been an active social commentator. He has been a vocal critic of government policies and has been known to speak out on issues of social justice and human rights. His work has been translated into several languages and has been published in numerous countries around the world.

Clarke's influence has been significant and enduring, and he continues to be a respected figure in the world of literature. His work has helped to shape the development of Caribbean literature and has inspired generations of writers to come.
Earth Care

From helping children learn about the ecosystem to contributing to wetland conservation, Imperial supports a broad range of environmental initiatives.

BY CATHERINE TEANDALE

The teacher motions to a man standing at the back of the classroom. He steps forward, holding a cage covered with a blue towel, and is introduced to the grade 6 students as Mark Nash, a former private investigator who gave up his day job for his true passion, peregrine falcons. Looking at the young faces staring up at him, Nash, a founder of the Canadian Peregrine Falcon Foundation, says in a near whisper, “In order for you to learn this important lesson, I will need complete silence.”

He places the cage gently on a table, puts on thick leather gloves on his left hand, and lifts a piece of raw chicken onto it. He opens the cage, and with a magnificent flap of its wings, a peregrine falcon flies out and sticks its talons into the raw meat.

In the 1970s, peregrine falcons became an endangered species as a result of the extensive use of the pesticide DDT. Once used widely in North America to control insect infestations, DDT made its way into the food chain, with animals at the top of the chain (including birds of prey like the peregrine falcon) having the highest concentrations. The “bioaccumulation” of DDT in peregrine falcons prevented them from producing eggs with strong shells. As a result, few chicks were hatched and the peregrine falcon nearly became extinct. While these majestic birds still aren’t plentiful, says Nash, they are “in recovery” in Canada, where their national status has been upgraded from endangered to threatened.

The children learn how the food chain works and about the interrelationships within the ecosystem and the need to consider the ecosystem when undertaking almost any activity. “This knowledge is fundamental to children’s understanding of the environment,” says Barbara Hejduk, president of the Imperial Oil Foundation, which supports the Canadian Peregrine Foundation’s School Visits Program and a range of other initiatives across the country aimed at increasing the environmental understanding of young Canadians. “We believe that we can contribute a great deal to the well-being of the planet by helping children learn how to act in an environmentally responsible manner, which is why we focus much of our environmental giving on education.”

The Imperial Oil Foundation’s environmental giving ranges from a $250,000 contribution made over five years to the Vancouver Aquarium to support its Discovery project to $1,000 donations made through Imperial’s Volunteer Involvement Program to environmental groups with which employees, retirees or their spouses or common-law partners volunteer. For example, this past summer, a $1,000 grant was made on behalf of one employee to support a program that saw urban youth from Toronto learning about the land from First Nations youth while spending a week living together in the bush near Red Lake, Ont.

Although the environment didn’t become a key public issue until the 1980s, Imperial has been supporting environmentally related initiatives since the 1920s. It was then that the company developed a program to encourage better maintenance of farmland and equipment. In 1996, it began publishing Farm News, which provided information and advice on eliminating farm waste, caring for animals, implementing good land-use practices, maintaining proper drainage, and preventing soil erosion. By the 1990s, Imperial had begun sponsoring programs for rural youth aimed at teaching aspiring farmers about caring for the land and animals.

In the 1980s, the company broadened its support of environmental initiatives, helping to establish the Mark Nash, founder of the Canadian Peregrine Falcon Foundation, uses peregrine falcons to help children learn about the ecosystem and the importance of considering it when undertaking almost any activity.
Canadian Wildlife Federation and to set up the National-Provincial Parks Association of Canada (now the Canadian Parks and Wilderness Society). By the 1970s, Imperial was providing support to numerous environmental groups, among them the Canadian Wildlife Federation, the Canadian Forestry Association, the Peace Trail Association and the Manitoba Wildlife Federation. "It's amazing to go back through the company records and see how many environmental initiatives Imperial has supported over the years and to understand the value of that support from today's perspective," says Jim Levins, Imperial's safety, health and environment director. "More than 30 years ago, the company was supporting the Arctic International Wildlife Range Society, which worked to protect the caribou range in the northern Yukon. Today, we can see a positive impact from that support."

Sandra McEwan applauds Imperial's current focus on supporting initiatives that help young people learn about the environment. "It is more important than ever for corporations to fund the development of environmental education programs," says McEwan, a former science, environmental science and outdoor education teacher who is now a faculty member at the Ontario Institute for Studies in Education of the University of Toronto. Such support, she notes, is critical because less class time is devoted to environmental and earth science education today than it was a decade ago. "You need to be able to take a high school course dedicated to environmental science. Today, that topic is only units within broader science and geography programs. Without a good basic understanding of environmental science, students are less likely to be informed of the issues."

McEwan, a past president and director of the Ontario Society for Environmental Education, says that environmental programs aimed at children not only raise their awareness but help to make young people stewards of the environment. "Environmental education helps children acquire environmental social values," she says. "If the topic speaks to them personally, it can motivate future generations to become involved in protecting the environment."

As Barbara Hjekhans says, "Our future is in the hands of our children."
Plots of Paradise

Across Canada, a community gardening boom is seeing urban dwellers turning empty lots and rooftops into patches of green.

BY NARGIS PFEIFF

MY GARDENING YEAR STARTS IN December. While the pests of my chives and turnips are frozen beneath a blanket of snow, I get an invitation to a pre-Christmas potluck dinner with the folks who share my community garden, a patchwork of 157 square meters of tended niches behind a high school near downtown Montreal. Over lasagnas and Polynesian feather beds, we catch up on what’s happened in our lives since we tended out the last pumpkins and reminisce about the past growing season—a good year for broccoli, a bad one for rhubarb—and what went those white dots all over the

NEW
LIMA BEAN
GROWS ONLY 10 INCHES
Swiss chard! Trading seeds and recipes, we discuss composting and techniques for keeping mosquitoes down. When it's finally time to head home, it's a shock to step outside into midsummer; in my mind it feels as though I've spent the evening in spring.

By February, I'm usually unimagining through my basement, digging out pots and bags of soil. The big window in my living room becomes a greenhouse for tomatoes, Japanese eggplants and pepper plants. There's a jump-start on Quebec's short summers. For the next few weeks, I visit my seedlings more often than necessary; the fruit shoots and smell of earth allow me to dream about my garden while making little rage outside.

By nature, gardeners are passionate about their land, and none more so than those living in cities, where green space is scarce. I grew up in Vancouver with German parents who turned part of our suburban back lawn into a vegetable garden. Moving into an apartment in Montreal in 1985, I missed the fresh herbs, the peacefulness of working the soil and the excitement of watching baby peppers ripen to adulthood.

When I heard of the city's community gardening program, I applied and became one of 14,000 Montrealers—more than 1.5 percent of the adult population—who have their own three-by-six-metre slice of heaven.

I'm lucky. Quebec has more community gardening plots across 22 cities than the remaining provinces combined—more than 10,000 in all. Montreal's community gardening program has 97 gardens and 8,200 individual allotments. The program reaches more people per capita than any other similar gardening project in North America. And it is also the most organized and receives the most government support. And that doesn't include dozens of locally run gardens in boroughs outside the city of Montreal, a growing network of collective gardens. Seniors homes, recreation centres and even hospitals are developing community gardens.

Urban gardening in Canada is becoming involved in the community gardening movement. Looking for a way to revitalize some of the charred lots, he met with the city's renegade tillers. With their help, the first informal community gardens were set up on lots in low-income, highly urbanized areas. Residents were often only a generation away from having lived in the countryside,

"The movement's main obstacle—one that has plagued it since the 1970s—is lack of available land. In the United States in decades past, an exodus from inner cities to the suburbs left downtown lots vacant, enabling New York City, San Francisco and many other centres to create extensive urban gardening programs. In Canada, however, people continued to reside in city centres, so plots were harder to come by, and today urban gardeners struggle to keep hard-won plots from vanishing beneath new buildings. Montreal was the exception. The economic stagnation of the 1980s, and '90s kept property values low, and once the gardens were established, the city protected them from development through zoning. Two-thirds of Montreal community gardens are now zoned in parks, a solution unique in North America.

Montreal's community garden movement began in the early 1970s with groups of "gardening guerrillas" who worked empty lots and fallow land beside railway tracks and along hydroelectric lines. They were mostly Italian and Portuguese immigrants, but also included a group of 200 seniors in the district of Snowdon who worked a rubble-laden lot into a 176-gardening plots (a grassroots endeavor chronicled by a 1979 National Film Board documentary called The Vacant Lot). After a series of fires during a three-day strike by firefighters in 1974, former Montreal mayor Pierre Bourque, who at the time was a city councilor, introduced a plan that encourages city gardeners to donate surplus vegetables to food banks. Since its inception in 1986, more than half a million kilograms of fruit and vegetables have been contributed to the Harvest Food
Community gardens are more than just a place to grow produce; they bring people together in a common cause.

MONTREAL'S PLOTS OF GREEN are the birthplaces of salsas, curries and pestos — a multicultural feast on the vines

Bank through Groz-Box, which has spread to Halifax, Edmonton, London, Ont., and many other cities.

In October, Toronto hosted the 15th annual conference of the American Community Garden Association (ACGA), which brings together community gardening organizations from coast to coast. Toronto is a city where urban gardening is on the rise. The Toronto Community Garden Network has set up 116 garden sites, and city high-rises are sprouting rooftop gardens. Sixty metres above ground level, the Fairmont Royal York’s rooftop herb garden supplies the hotel’s fine dining rooms with the likes of lemon balm, edible pansies and red basil. There are even cultural gardens. In a Caribbean community garden, residents grow the produce of their home islands: black-eyed peas, callaloo (the leaves of the taro plant), and “red peas” (kidney beans) for the staple “peas and rice.”

Community gardening is in its infancy across Atlantic Canada, but interest is spreading. In St. John’s, N.W.T., 200 kilometres north of the Arctic Circle, volunteers have converted a former cinder block into a community garden, as does Irvik, N.W.T., 200 kilometres north of the Arctic Circle. Here, a hockey rink has been converted into a greenhouse, which holds 89 raised beds. Residents can garden above the permafrost and beneath the midnight sun, which shines from mid-May to mid-August. Gardeners say the extra light makes vegetables ripen a week to 10 days faster than in the South. "Ironically, our biggest problem is that the long hours of sunlight can mean that too much heat builds up," says the St. John’s garden coordinator Carri Young. "Some things bolt... they go to seed too quickly.

From the refreshing in the facets of melting snow, I knew I wasn’t the first person to unlock the gate into my allotment garden last spring. Carrying a big bag with the winter harvest of moist black compost harvested from my balcony compost, I headed toward plot number 32. When I spied the first garlic shoots peaking through the soggy soil, my heart soared. Working the garden beside mine was 78-year-old Maria Laurier, who grew up on a farm in Italy. Her plot is a sweet reminder of her youth, and she lays out the garden bench every summer morning before she waters her robust tomatoes, basil, peppers and onions. Maria is our garden’s sage and the grandmother figure we all turn to with our gardening questions. While we are lucky to have Maria, the rest of Montreal is fortunate to have Daniel Reid. One of six bumbling, multicultural landscapers in Montreal, he makes the rounds of gardens from April to October to advise on everything from pruning to planting. A unique concept in North American community gardens, the landscapers also give brief talks on gardening issues like organic methods and genetically engineered seeds. Personally, each garden receives a visit every two weeks. Part of Reid’s job is to make certain garden rules are followed. "You must plant at least five different vegetables," he says, "because the diversity of the garden is what will interest the allotment frequently.”

Reid is also one of the judges in the city’s Best Garden Contest. Every garden chooses a winner from each block of 25 plots. Certificates and prizes for houseplants are presented at an annual ceremony. "We creeper," she says, "for the person who best fosters community spirit and goodwill within the vegetable patch.”

The sense of community and camaraderie that begins to flourish in my garden with the first blossoms in full swing by mid-summer. We admire each other’s produce and arrange to water one another’s gardens while we’re on summer vacation. For many, the human contact the garden provides is just as important as the harvest. My Jamaican-born friend David Bulley has a plot in the Des Seigneurs garden near the Lachine Canal, and every afternoon he can be found unloading his hip-deep raked earth and my community garden's neat rows of plants. Beneath a shady tree in a corner of the garden, "A few of us finish up our gardening with a game," he says. "It’s time we like to pass chatting in a green place.”

Some gardens have barbecues set up for garden parties, others have croquet, art and music, frisbees, horseshoes and checkerboards strung in the clubs on the sidelines. In one garden, a barbeque sometimes sets up shop, clipping hair in the shade of the Chinese long squash trellises.

Especially in early morning and at dusk, stepping through the garden gate is like entering a sanctuary. I feel the stress slip away as I pluck weeds from between dew-drenched flowers or listen to the birds while I pull up beets for the evening’s borscht. Many days, the garden for me is more about nurturing callaloo than carrots.

Lydia Lockert, a spoken-word artist, took up gardening after being injured in a fall. "I bought a bucket and let on it, gardening under a beach umbrella," she says. "I was in terrible pain but felt like a happy three-year-old with a bucket and shovel." The garden helped her heal and continues to be a place that makes her happy. Lockert’s job and passion is to make people smile, so she donates flowers to a senior home and vegetables to the poor.

While 38 percent of Montreal’s community gardens are over 55, increasing numbers of young people are taking up gardening in response to concerns about food additives, "food security" and "food miles." How far their food must travel from farm to table. Since pesticide and insecticide use was banned in Montreal gardens in the 1980s, 75 percent of community gardens are largely organic. "We encourage people to use natural and organic methods," says Daniel Reid, "and composting takes place in more than one-third of our gardens.

Montreal’s plots of green are the birthplaces of salsas, curries and pestos — a multicultural feast on the vines. In the garden abutting mine, Mercedes Nohoe grows vegetables I’ve never seen before, like upo, a round white squash that dangles from her trellis and will wind up in stir-fries like the ones she ate as a child in the Philippines. She shows me unusual string beans that she mixes with pumpkin and coconut milk in a traditional Filipino soup. "They are so hard to find in stores," she says. "So I have this garden to grow my own.”

In at least eight Montreal gardens, the majority of gardeners are people whose first language is neither French nor English. Whitlocke has the city’s Snowdon neighbourhood, 18 nationalities are represented among the gardeners. Since Asian, Portuguese, Italian and Spanish gardeners cultivate climbing and trailing plants that require longer trellises than usually in the garden, many of them have permit this gardeners on the perimeter of the site to use the fences as support for climbing plants.

By late summer, fruits and vegetables fill the plots and the gardeners gather to celebrate the harvest with an outdoor potluck dinner. In the days ahead, many will be busy making jams and salads, storing vegetables and fruit, and preparing produce for the freezer to them through the long winter months.

As winter takes hold of Montreal, the plots remain green, as evident in my freezer. If I’m careful, they’ll last me until spring, nourishing my spirit with memories of the smell of newly turned earth and my community of urban gardeners.”
Elegantly Simple

Since its invention more than a century ago, the internal combustion engine has become ever more efficient.
And there is still much room for improvement.

By Russell Felton

The first thing you notice as you slide behind the wheel of the "car of the future" is that the dashboard display in front of you looks, well, futuristic. Where in a conventional car you would find the instrument panel, here you are faced with a small computer-type screen whose purpose is not immediately obvious. Other surprises: there is no place to insert an ignition key and no recognizable gearshift lever.

The car is the latest "second-generation" model of the Toyota Prius (Latin for "going before"), one of a number of so-called "hybrid" automobiles being marketed in Canada today (others include the compact Honda Insight and the newly introduced Ford Escape). Hybrid vehicles utilize two separate, but linked, motive power sources—a battery-powered electric motor and a gasoline-fueled internal combustion engine. Essentially, the electric motor drives the wheels, while the engine keeps the battery charged. But when there is increased demand, such as during acceleration or when climbing hills, power from the engine can be diverted directly to the drive...
What is the purpose of all this sophisticated wizardry? Quite simply, to save fuel. The Prius I drove boasts a fuel-consumption rate of four litres per 100 kilometres for city driving.

In the new Prius, the small dashboard-mounted computer screen shows the driver which power source is being used and the car’s fuel-consumption rate at any given moment and provides a wealth of other information. Additional features of the vehicle include regenerative braking, which uses energy produced when brakes are applied to help recharge the battery; an electronic sensor that “recognises” the driver and eliminates the need for an ignition key; and a “gearless” transmission system — shifting is only required between forward and reverse.

What is the purpose of all this sophisticated wizardry? Quite simply, to save fuel. The Prius I drove boasts a fuel-consumption rate of four litres per 100 kilometres for city driving and 4.2 litres per 100 kilometres on the highway. And not only is the fuel-consumption rate almost twice as good as in the average new car, but the better fuel economy for city versus highway driving (a result of the engine shutting off completely, rather than idling, when the car stops) is unique. Equally important is the fact that on an overall distance-travelled basis, the Prius releases only about 10 percent of the exhaust emissions of comparable conventional cars.

Impressive as these statistics are, it’s perhaps significant that this “car of the future” still relies on an internal combustion engine as the ultimate source of its energy. As recently as 2001, some automotive experts were predicting the imminent demise of automobiles powered by gasoline- or diesel-fuelled internal combustion engines. These cars would be supplanted, they suggested, by the fuel-cell vehicle, which runs entirely on electricity created on board from hydrogen in stacks of fuel cells. (Advanced membrane technology is used to separate electrons from protons, enabling electricity to be generated with water vapour as the only emission.) At the time, almost every major automobile manufacturer had produced at least one prototype fuel-cell vehicle, and commercial production was thought to be only a year away.

Today, however, many experts believe that it could be several decades before fuel-cell vehicles are common on our roads. In an August 2004 issue of Fortune magazine, Joseph Romm, an author and former U.S. Energy Department official, wrote that hydrogen vehicles would be lucky to get five percent of the market by 2030. And a recent report by the investment firm BMO Nesbitt Burns states that “significant technical and economic barriers are expected to keep fuel-cell vehicles from making significant market penetration until at least 2020.”

Those technical and economic barriers include the high cost of fuel cells themselves, difficulties with cold-starting and warm-up times, and most of all, the problem of supplying the necessary hydrogen and delivering it to consumers at the roadside. Hydrogen is the most plentiful element on earth, but it occurs only in compounds with other elements — notably oxygen (as water) or carbon (as natural gas and other hydrocarbons such as gasoline). In its gaseous state, hydrogen is highly volatile — in fact, explosive. So the technical challenges of building infrastructures to produce, transport, and use hydrogen safely, reliably, and affordably are tremendous and will likely not be resolved quickly.

Automotive and petroleum industry researchers are experimenting with systems to extract hydrogen from gasoline within the vehicle, but again, production on a commercial scale may be a long way off. Many experts believe that fuel cells are much more likely to be used in large-scale vehicles such as buses and for stationary applications such as industrial and residential power generation than in automobiles.

In the meantime, fuel-efficient and low-emitting hybrids have gone into commercial production, and while they have not exactly taken the market by storm, they have at least been favorably received and may be turning a significant corner. Trade reports note that Toyota sold 1,300 second-generation Prius cars in the 10 months following its introduction, more than the total number of the first-generation model sold since its introduction in 2001. As well, Honda has announced hybrid versions of its popular Civic and Accord lines. Ford has introduced its hybrid Escape model, and other automobile manufacturers are believed to have plans to introduce hybrids.

ExxonMobil Corporation, Imperial Oil’s multinational affiliate, projects that hybrids will account for about one-quarter of new vehicle sales in the United States by 2020. It forecasts that, by far, the majority will be “conventional” single-power-source vehicles with gasoline- or diesel-fuelled internal combustion engines. Which is to say, the internal combustion engine, either in hybrid or traditional vehicles, will likely remain the standard power source for automobiles for a good while yet, as it has been since the first “motor car” took to the roads almost 120 years ago.

“Historically speaking, the internal combustion engine must stand as one of the world’s greatest inventions,” says Professor Jim Wallace of the department of mechanical and industrial engineering at the University of Toronto. “By dramatically improving the mobility of both people and goods, it changed civilization and society within a very short period. Today, few of us could imagine what our lives would be like if the automobile didn’t exist.”

Indeed, the car has become central to daily life. More than seven of every 10 North Americans own one, and four of every 10 Europeans. Our cars carry us to work and school, to the supermarket and the doctor, to vacation spots and to family and friends. In some respects, the history of the 20th century could not have unfolded as it did without the automobile and other vehicles powered by the internal combustion engine.

The design of the internal combustion engine — attributed to various individuals, although most commonly to the German inventor Nikolaus Otto — is elegantly simple. In its most common “four-stroke” configuration, combustible gas is introduced through a valve into a cylinder and compressed by a rising piston that is attached to a rotating crankshaft. When the gas is ignited (either by a spark plug in a gasoline engine or spontaneously by pressure in a diesel engine), the resulting explosion drives the piston down the cylinder, which turns the crankshaft. On the return upward stroke, the piston expels the spent gas through an outlet valve. Thus, as it starts down again, the piston draws more gas into the cylinder and the cycle is repeated. The more cylinders that are attached to the crankshaft, the greater the amount of power generated.

On an overall distance-travelled basis, the Prius releases only about 10 percent of the exhaust emissions of comparable conventional cars.
While powering automobiles and other vehicles has been the most widespread application of the internal combustion engine, it has also had many other uses—from boats and airplanes to industrial machinery, pumps, chain saws and lawnmowers. And of course, there have been many refinements over the years. Most notably, engineers found that increasing the compression in the combustion chamber generated more power from smaller engines. Yet the internal combustion engine that Otto’s fellow German Gottlieb Daimler attached to his bicycle frame in 1885 is essentially the same as the engines that power today’s automobiles—from the lowest-priced economy car to the most expensive limousine or “mule car.”

Certainly, the car itself has changed, but under the hood, gas is still compressed and ignited and the pistons still go up and down, rotating the crankshaft to deliver power to the wheels.

For most of the 20th century, Professor Wallace notes, advances in vehicle technology focused more on drive trains and other ancillary systems innovations such as four-wheel hydraulic and disk brakes, independent suspensions, automatic transmissions, limited-slip differentials, radial-ply tires, power-assisted steering and other consumer-friendly features than on the engine itself. "Probably the most dramatic changes to the engine took place in the mid-1980s with the introduction of microprocessors, which allowed continuous fine tuning of fuel and ignition systems," explains Wallace. A response to new automotive emission standards that required the installation of catalytic converters in exhaust systems, microprocessors (essentially small onboard computers) provided greatly improved control over fuel consumption and emissions while maintaining engine power and performance. Among other things, they allowed closely controlled fuel injection systems to replace the traditional carburetor as the standard method of delivering an air-fuel mixture to the cylinder.

As the internal combustion engine and its fuel systems evolved, the fuels themselves were required to keep pace. Higher-compression engines required higher-octane gasoline to prevent "knocking" and maintain performance, which led to the use of octane-increasing additives, such as lead. Then, in response to air-quality concerns, lead additives were phased out. Later, "detergent" additives were introduced to keep advanced fuel injection systems clean and functioning. More recently, sulphur levels in gasoline have been drastically reduced to meet the needs of today's more complex emission-control systems, and more stringent sulphur-content standards will soon be applied to diesel fuel.

The combination of reformulated fuels and improved fueling and exhaust systems has resulted in steady improvements in fuel efficiency—averaging 1.5 percent a year, or more than 30 percent since the early 1980s—and truly dramatic reductions in exhaust emissions of pollutants such as carbon monoxide, sulphates, nitrogen oxides and volatile organic compounds (unburned hydrocarbons) that contribute to smog formation. In fact, a new car today produces less than one percent of the unregulated emissions per kilometre than a comparable new car of the mid-1970s.

David Paterson, vice-president of corporate and environmental affairs for General Motors of Canada, cites some startling data in this respect: "You could drive 37 new Chevys Trail Blazers around the equator and produce fewer emissions than burning a single cord of firewood," Paterson says, adding that using one gallon (3.8 litres) of water-based house paint puts more unregulated substances into the air than driving a Chevys Trail Blazer from Toronto to Vancouver and back again.

It’s interesting to note, however, that the improved fuel economy of engines has not led to lower fuel consumption overall. "The average fuel consumption per kilometre of new vehicles in North America hasn’t improved in 20 years," says Jim Hughes, manager, energy analysis, with Imperial’s corporate planning department. "And the simple reason for this is that consumers have been buying larger, more powerful vehicles. Engineering efficiency gains don’t necessarily translate into reduced energy consumption."

Hughes’s assessment is borne out by the data. Relatively larger and less fuel-efficient sport utility vehicles (SUVs), pickup trucks and minivans now account for about half of all vehicles on the road in Canada. This trend may be changing, however. Automobile industry analysts report that Canadian sales of larger vehicles were significantly lower in the first three-quarters of 2004 than in the previous year, and some manufacturers are planning to introduce smaller, more fuel-efficient SUVs, including hybrid models.

At the same time, the internal combustion engine itself may be poised for further improvements in fuel efficiency. Sherri Stawer, a manager with ExxonMobil’s corporate planning department, points out that although the fuel efficiency of automobile engines has doubled since 1974, there is still a lot of room for improvement. "Engine fueling systems remain a key focus of our company’s research, and some highly promising options are already in development," Stawer says. "By 2020, the internal combustion engines in new vehicles will almost certainly be significantly more fuel- and energy-efficient than the engines in cars being sold today."

One technical improvement that is offered in some European vehicles is direct injection fueling. In the microprocessor-controlled fuel injection systems introduced in the 1980s, a computer-determined mixture of fuel and air is injected into an inlet port (basically, a holding chamber at the top of the cylinder) before being drawn into the combustion chamber for compression and ignition. With direct

Even more promising is a fuelling and combustion technology known as "homogeneous charge compression ignition" or HCCI, which is believed to have the potential to improve the fuel economy of internal combustion engines by as much as 30 percent.
Potential benefits provide a powerful incentive for automakers, petroleum companies and governments to support further research and experimentation into improving the efficiency of the internal combustion engine.

In Closing

Four Wheels and a Crank

I have never been a car person. I can’t identify a passing car by the shape of its fenders or the sweep of its lines. I like the conventional cars fine, but I really don’t care what kind I have as long as it operates safely and reliably, is big enough to accommodate my family and our dog and has a radio that works. So, I am usually found reflecting with some pleasure on the cars of my life after reading Russell Felton’s piece on the internal combustion engine (“Elegantly Simple,” page 24).

When I was five, six and seven, living in London, England, during the late 1950s and early 1960s, my mother had a series of old Morris Minor cars. Most were made just after the Second World War, and one, my brother, Nick, tells me, dated from 1939. All of them seem to have lived. Mostly, my thumbnail sketch of the old Minor was a semi-luxury saloon with comfortable whitewall tires, a generous engine (1100 cc) and a spacious interior. Not until later that it that I realized the extent of the risk he’d taken on our behalf.

Long after this accident, my mother arranged for my brother and me to take a trip from school in our old Minor car to a nearby town. We were thrilled. In principle, Nick and I would have been able to drive a car of our own.

Not long after this incident, my mother arranged for my brother and me to take a trip from school in our old Morris Minor car to a nearby town. We were thrilled. It wasn’t until years later that I realized the extent of the risk he’d taken on our behalf.

During the early years of my childhood, my father had a dark gray Rover. It was a secondhand car, but nonetheless it seemed luxuriously to me, with its soft, fabric-cover-

acquaintances. We were bound. Nick moved into the driver’s seat and began filling with the pedals and levers. The car began to roll down the hill on which we’d parked toward the main street that intersected at the bottom. I began screaming. My brother desperately tried to apply the brake. And then a man stepped in front of the car and, through some irreplaceable exercise of strength and ingenuity, managed to stop it.

It would be just like it was, and my father would usually buy me some sweets and a comic to keep me busy in the car when I wouldn’t go with him into a parent’s home. And it was in that car that we travelled to a small cottage in North Wales for our much-loved summer holidays.

The car of my teenage years, when I was living in Canada, seemed so much more modern than those we’d had in England. My father had a series of hub (British and today’s standard) green Chrysler Newports and my mother a more modest, but rather sporty, old Dodge Dart. They had seat belts and headlights. It was a whole new world.

My father’s cars took us on adventures across Canada, but the Dodge Dart holds place of honour as the seminal car of my youth. It was in the Dodge that I learned to drive, had my first not serious — but humbling — accident, and drove to school dances and the drive-in with my friends on Friday nights. I named the car Guinevere, and she and I were companions for many years.

When I went to university, my mother let me take Guinevere with me. “It would,” she said, “make it easy for me to come home for the holidays.” Guinevere served me well in college and university, but eventually had to be consigned to the scrap yard, the victim of advancing age and an alarming tendency to keep on rolling despite my depressing the brake pedal.

In the years since Guinevere, I’ve had far fewer car-based adventures than those I once had with her, but I’ve been busy. I’ve had two more children. I’ve watched my children grow up and frequently gone out at night to deliver babies or deal with emergencies at home. Consequently, I’ve done a lot of driving in my life, both in my own car and others, and I’ve driven with the pedal and levers.

In conclusion, I do not believe that the car of the future will be as powerful as the car of the past, but I do believe that it will be more efficient, and that the environment will be substantially more enjoyable.