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When Imperial wants a new oil product for its customers or a new refinery process, it turns to white-coated researchers at Sarnia for the answer—by Michael Jacob

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They're always ready, these strong-looking and tanned river pilots, to navigate sea-going liners and tankers along the Montreal-Quebec section of the mighty St. Lawrence—
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Not the idea, it's only slightly younger than the wheel. But the modern market place has a giant parking lot and its patrons come by automobile—by Don Davidson

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It's a joy to many and a boon to others but millions of dollars are spent each year in Canada to get rid of it—
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Most of Imperial's engineering and development divisions have had no vacuums in the last 10 years—they handled all planning details for the company's vast refinery expansion program—by Gordon Wright

Photo Credits: Walter Curzin (P.8-15); Dave Portiga (P.23); CPR (P.25); Wallye Berry (P.27); Staff 2-7, 21, 23-26, 28-32.

Eric Aldwinckle, our front cover artist, is a free-lance design illustrator in Toronto. He has designed murals, magazine covers, book illustrations and jackets, theatre programs including those of the Stratford Festival, and the Macleay medal for architecture. His hobbies are the other arts; he writes a bit, plays the piano, composes light and ads.

Thoreau MacDonald of Thornhill, Ont., who painted the inside covers, credits himself with "no formal studies, societies or degrees." However, he studied under his father, J. E. H. MacDon-ald of the Group of Seven, and has exhibited in New York and Paris. His work illustrates more than 30 books. His specialties: farming and forestry subjects.

A Healthy Trend

Last summer, the Canadian Manufacturers Association took a financial survey and one of the interesting facts it turned up was that the 1,043 companies studied had 567,394 shareholders against 465,169 employees. In other words, there were over 100,000 more owners than workers in these industries which have sales of nearly eight billion dollars annually.

Still more interesting was the fact that while this army of shareholders includes "a tiny handful of wealthy men, by and large, its bulk consists of the general public and the workers in the industries themselves."

As the CMA observes, this is a "healthy trend." It is a trend that has been under way at Imperial for more than 36 years—almost half the company's corporate life. At the end of last June there were 43,000 Imperial Oil shareholders. Registered as one shareholder were the trustees of the Employees' Thrift Plan who hold stock on behalf of 8,500 Imperial employee participants. Many employees also hold stock, registered in their own names, which they acquired through earlier employee savings plans or by direct purchase on the market.

Like Imperial's other 33,000 Canadian shareholders, these "capitalists" live in every province and are a broad cross-section of Canadian life. Some are welders, boilermakers or stenographers; others are drillers, engineers, executives or chemists; all are part owners of the plants and equipment which provide them with instruments for earning their livelihood.

Over the years a considerable share of ownership in many large companies has passed into the hands of their employees. Today practically all large corporations have stakes of thousands of shareholders; and the so-called "little man" represents an important segment of corporate ownership, both directly and through the holdings of insurance companies and other trustee organizations which invest the savings of millions of people.
Better oils, weed killers and fertilizers, waxes for fruits and vegetables and, of course, gasolines — these and many other projects for tomorrow's life are tackled daily by researchers in Imperial's quiet, campus-like labs at Sarnia

Search Unlimited

by MICHAEL JACOT

In a large red-brick, ivy-clad building, whose flower beds and neat lawns are sheltered by Canada's largest refinery, a young man who has sown his wild oats is daily working on the problem of how to rid himself of their harvest.

In a room nearby, another man is patiently teaching a batch of microscopic, one-celled aquatic creatures to eat and thrive on carbolic acid.

Down the corridor from him, a colleague spends his time watching a giant machine exert thousands of pounds of pressure in an attempt to crush a chunk of asphalt.

All three are members of Imperial's 122-man research department at Sarnia, Ont., an organization presently carrying out the most comprehensive petroleum research in Canada. The work of all three men has the same end in view — a new or improved product or process.

The first man is seeking a new spray to kill off the wild oats that often ruin prairie crops; the second is breeding bugs to dispose of the phenols which accrue in refinery waste fluids during the processing of crude oil, and the third is engaged in developing new and better asphalts for Canadian roads.

These examples of the widely-varied and apparently unrelated projects under way at Imperial's research centre in Sarnia point up a big new development that is taking place in Canadian industry: a development that is changing our lives faster than many people realize. Other departments play their role in this change. Research is a tool that many Imperial men and women use to help the company find better ways to do its job.

Researchers have become shock troops of industry. Not too many years ago an industrial development might have followed because someone had invented — not necessarily by design — a new process or product. Today, management decides that a specific product or process is needed and gives the problem to the research people, saying in effect: "Invent this!"

Industrial research has created new products, devised time-saving ways of producing and improving established products, and developed many new chemicals and processes. In the petrochemical industry alone, for example, it has opened up a whole new standard of living. Research has changed our homes, stores, clothes and furniture. It has brought about better health, better education, better food, and is continuing to help Canadians lead a fuller and better life.

The research man is no longer regarded as a strange, long-haired genius with little respect for management, isolated to a little-used part of the plant. He is now an integrated part of industry and management, and his advice is sought on marketing, plant planning, production and economics.

Often, the researcher's efforts have an impact far beyond the industry for which he is primarily working.

For example, in 1951, General Motors' engineers at London, Ont., were worried about excessive wear, bearing corrosion and carbon deposits that were showing up on their diesel locomotives after only 40,000 to 80,000-mile runs. Complete overhauls had to be made after the engines had run 140,000 miles. If the condition were not corrected, it could cost thousands of dollars in repairs and maintenance and probably retard the use of railway diesels in Canada.

Imperial's Sarnia research group heard of the problem and was sure it could help because Dr. O. S. Pokorny, a world authority on lubricating oils, had anticipated just such a problem two years before. By processes which even today are still a closely-guarded company secret, he had developed an oil which a few months previously had received the blessing of American diesel locomotive users.

Dr. George Gurd, manager of the research department, sent Pokorny to London where he persuaded GM engineers to try his oil in their labs. They did so and decided it warranted a field test. After a three-year tryout they said it was the best diesel lubricating oil on the North American continent. Pokorny's new oil cut engine wear enormously, prevented corrosion and reduced maintenance to a fraction of what it was. Not only did the oil eliminate 90 percent of all engine deposits, but locomotive engineers found they could run a diesel engine for up to 330,000 miles without an overhaul, more than twice as far as the previous overhaul point.

But the story hasn't ended yet, says Dr. Cam Caesar, assistant manager of the department. Pokorny, or "Porky", as he is more familiarly known, is now working on an improvement to his new oil.

Sowing wild oats is an important aspect of East End's job.
Research has been an important part of Imperial's operations almost since the company was born 76 years ago. One of the company's first moves was to hire Herman Frisch, a German-born chemist, who devised a method of removing sulfur from oil products made from Ontario crude and worked on a process called fractional distillation. Since then, and especially over the past 30 years, hundreds of petroleum developments—both products and processes—have originated or been modified at Sarnia. Many of them have been world firsts, such as the development of phenol-treating for lubricating oils, which Dr. R. K. Stratford produced to make the first specially-refined automobile oils. Dr. Stratford joined Imperial in 1954 as a research chemist, became the research department's first manager and is now scientific advisor to the company.

The variety of research problems being tackled in the Sarnia labs today touches on almost every aspect of our daily lives. Some of the problems are age-old; some are, the researchers admit, probably insoluble; others are fresher than the traditional morning dew.

How, for instance, can we make an oil that will not freeze in Canada's 60 below zero northern winters, and yet not thin out in summer heat? How, using the same amount of crude oil, can we get more gasoline from Ontario and Quebec refineries, and more heating oil from some prairie refineries? A wax curton manufacturer wants a special wax, how can we make it? How can we best test the new grease that has been developed in the labs?

Always in the forefront of the minds of the petroleum researchers is the problem of fuels. How will we fuel the cars of the future? Jet engines, rockets, turbines for locomotives and ships, even space travel—what demands will they make on petroleum fuels?

Perhaps the department's biggest job over the past three decades has been in gasoline research. Dr. Harold White, who is in charge of fuel research, says, "The gasolines of 30 years ago would be practically useless in a modern engine. Their knocking would almost deafen the driver, he wouldn't be able to pick up speed and in a short time he would completely ruin his engine."

Because of the development of new refining processes, scientific methods of blending and the discovery of new gasoline components—most of them developed in some way by the research department—gasolines are tailored today to fit the engines in which they will be used. Today's gasolines are at least 50 percent more efficient than the gasolines of the late twenties: two gallons of today's product will do the work of three gallons of the gasoline made three decades ago. But perhaps the researchers' greatest achievement is not the product improvement, but that they have been able to bring about this improvement and produce a gasoline which—exclusive of taxes—is cheaper than the old product.

The gasoline research chemists work closely with the automobile manufacturers, testing every characteristic of their fuels. Among other things they check its octane rating (the gasoline's ability to stop knocking), though, says Dr. White, "Octane rating is not the only part of gasoline research that we feel is important. Our studies have proved that although it is essential, a balanced fuel giving quick starts, acceleration, economical burning for maximum miles per gallon and clean burning is also necessary."

Before the war the average gasoline octane of premium gasoline was 82. Today it is about 96, though experimental gasolines at Sarnia have gone considerably higher. But the high octane gasolines created a problem of their own. Until recently, the octane scale only went to 100. "For years," says Dr. White, "researchers tried to work out a new scale. We needed one that would not limit the octane rating in any way. Just last July one was recommended, and accepted by the oil industry, that permits octane ratings to be measured up to 120."

Development of new gasolines turns up some unexpected facts. For instance, the discovery that an auto engine's octane requirement varies with the climate in which it is being used. Dryness, dampness, altitude and other climatic conditions all affect the performance of a car engine. "With the co-operation of the meteorological office, we can write the specifications for gasoline to be used in any part of Canada," says Dr. White. "For example, when the altitude is low, we always recommend a higher octane for proper performance."

"A properly balanced gasoline is only half a modern auto engine's requirements," says Dr. Gurd, the department manager. "The real improvement in an engine's performance is realized when it uses such a gasoline in conjunction with a good lubricating oil."

The first successful large-scale production of a modern motor oil in the world was made by Imperial in 1926, when it introduced Marvelube, a lubricant specially refined for autos. Until then auto lubricants had been a thick green oil containing harmful deposits. The carbon left by these oils caused engine wear, particularly on the cylinders. The average life of an auto engine was only 30,000 miles.

That was until Dr. Stratford set to work and came up with a revolutionary idea. He developed a process in which phenol—carboxic acid—could be used to remove the harmful deposits. The Stratford process left the oils a rich amber color; they were purer and far better lubricants.

"The strange part of the story," says Dr. Gurd, "is that we had the devil's own job selling it. The motorists were suspicious of the light color and maintained that it looked too thin to lubricate."

One retailer called on an Imperial executive to register his protest in person. Picking up a bottle containing a murky substance that would barely flow, the Imperial man handed it over to the retailer and said, "Here's what we took out of your oil. You can have it back if you like."
operating under extreme pressure at high temperatures or ones which will remain soft at 65 degrees below zero for aircraft control lubrication.

Manufacturers of electric motors once had a grease problem. Their high-speed machines needed frequent lubrication or bearings burned out and had to be replaced. The Sarnia search group developed a new grease to meet this need and to
day, these machines can be made with sealed bearings in which the grease will last as long as 10 years.

What Sproule's group has done with greases it has also done with waxes. "Until about 20 years ago," says Sproule, "we used mostly South American crude in Sarnia and it didn't contain much wax. Then we switched to a waxy crude to get better motor oils. With all that wax on our hands, we decided we'd better find a better way." Experimenting with his name by Dr. Straford and Sproule led to the recrystallization pro-
cess which separates the wax into many different types and im-
proves their quality. Two of the waxes has never been produced anywhere before. Extremely pliable, the new waxes behaved better in hundreds of uses—coating vegetables, milk cartons, and cheese, for wrapping potatoes and paper for lining beer cans and barrels. The new wax processes and their potentialities prompted Imperial to build a new $4.5 million wax plant at Sarnia which will be in operation this fall and will produce 35 million pounds of wax a year—half the Canadian demand. It will include the hydrogenation process to improve the odor and color.

One of the big uses for the new waxes will be in coating vege-
tables such as turnips. This enters the province of Earl Emond, who is responsible for agricultural research and is the only man at Sarnia who researches vegetables. Of the problem of using lubricating oils, greases and waxes, says, "Today, we know a great deal about them. Grease is basically a mixture of soap and oil. We have conducted dozens of experiments to find out its basic properties, even measuring soap particles as small as 1/25,000 of an inch long. We are now able to design greases for any service where it's necessary to lubricate steel bearings with no thanks," was the quick reply, "I'll take the new oil." It was a slow process but eventually the new oil caught on. Some of the biggest advances in lubrication in recent years have come in the field of industrial machinery, particularly machines in paper and textile mills. These mills often need special lubricants for bearings on machines which run at great speeds and high temperatures in processes which use steam. The steam helps form rust. In pulp mills, for instance, as the pulp is dried it goes over drums filled with steam which spin at rates up to 23 miles an hour and consequently seize easily.

One B.C. still not so long ago was planning an opening ceremo-
y to be attended by many distinguished guests. But as opening day drew near the machines just wouldn't work; out of 60 bearings all but three were seized. Dr. Pokorny was called in. He composed what he calls his "miracle whip" and sent it out post haste in barrels. The machines started and have been running ever since. In gratitude the mill manager sent him the mill's first sheet of paper with his name on it. Today Pokorny's mill lubricant is in use as far away as Tasmania.

Last November, in its new Edmonton lubricating oils plant,
Imperial inaugurated a unique tubular oils process which had been developed by the research department over a period of years. This infant of the research group is called hydrogenating, a process which involves the use of hydrogen to purify the oils and re-
move certain harmful elements and odors. Still the only com-
mercial unit of its kind in Canada, it is expected to have far-
reaching effects on live oil manufacture in the future.

As every motorist knows, wherever you find a lubricating oil, you nearly always find grease too. Until a few years ago, grease had petroleum chemists baffled. Lorne Sproule, the Sarnia researcher responsible for the advancement of lubricating oils, greases and waxes, says, "Today, we know a great deal about them. Grease is basically a mixture of soap and oil. We have conducted dozens of experiments to find out its basic properties, even measuring soap particles as small as 1/25,000 of an inch long. We are now able to design greases for any service where it's necessary to lubricate steel bearings..."
Come fog, rain, hail or shine, men of the United Montreal Pilots
guide giant luxury liners, freighters and tankers along the tricky
St. Lawrence. It's no mean feat juggling a 700-foot ship down a
channel 500 feet wide

by MICHAEL SHELDON

MONTREAL'S
MODERN VOYAGEURS

Mme. Nicole de la Chevrotière lives in a sparkling white frame house at Lothiérière, above the
south shore of the St. Lawrence between Three Rivers and Levis. Quite often when she's working
about the house or is at table with her father and two-year-old daughter she'll hear a ship's siren—one long pull and two short. Then she'll run out into the garden and wave to her husband,
Andre—provided neither snow nor mist will prevent his seeing her. But if the siren carries a different
message, she'll know that one of the other seven St. Lawrence river pilots who live in Lothiérière is
greeting his family.

Few of the men who pilot ships up and down the river between Quebec and Montreal live far
from its banks. Some have their homes in and around the cities but the majority prefer these small
communities between the water and the farmland like Lothiérière or Deschambault.
And in every pilot’s house, every retired pilot’s house too, there is a powerful pair of binoculars or a telescope handy beside the window. Even off duty the pilots are drawn to each ship that passes, knowing as they do her history—whether liner, tanker or tramp—and that of her owners. They can tell from her lines which shipyard she comes from; and, of course, they usually know who is piloting her.

Nor has the shoreline stroller much difficulty picking these men as St. Lawrence pilots. They are strong-looking, with tanned faces and keen eyes, usually not very tall.

Piloting is not a family business but it tends to run in families. Nicole de la Chevrotière’s father, Edmond De Villers, became a full pilot just after World War I and retired two years ago. One of his last jobs was to bring the royal yacht Britannia up the river to Montreal and back to Quebec during the Duke of Edinburgh’s visit to Canada in 1934. Behind this service lay a long apprenticeship, which began as a deck hand on a collier and took him into most of the major foreign ports.

Closer to the river bank, uncle Napoleon De Villers has his home. He became a pilot in 1915 and was president of the United Montreal Pilots, professional association of the men who serve on this section of the river, when he retired this spring, at the age of 70. (His normal age for retirement is 65, but a pilot can continue another five years provided he takes a health examination each year.) A second pilot uncle, Arthur, also lives in Lottonière, while a third, Samuel, has moved to Montreal. Then there are several pilots and apprentice-pilots in Nicole’s own generation.

Ships and shipping are in the blood of the De Villers. Nicole’s grandfather was not a pilot; he piloted the St. Lawrence in a small sailing boat in the days when the river, not roads, linked the riverside communities. His old wharf, now site of the foot of Napoleon’s garden. But for Grandpère De Villers, daily watching the great ships pass, to be a pilot was the most desirable of careers, and he so inspired his sons.

To pilot along the Montreal-Quebec stretch of the St. Lawrence channel is a man needs technical training, many years’ experience of ships and how they behave. But above all he needs a storehouse of local knowledge—the ability to interpret and anticipate the behavior of the water at all times, in all conditions. His responsibility covers a winding waterway 146 miles long, more than 100 miles of which are a dredged channel only 500 feet wide and 35 feet deep.

A St. Lawrence pilot’s regular port of call include Three Rivers, Sorel and Contrecoeur, where the Ungava iron ore is reloaded on smaller ships for its journey to the Great Lakes. The demand for his services is presently so great that he may well find himself taking ships up and down the river for a fort-night at a stretch before he can return home—especially if he works on the iron-ore boats.

The Montreal-Quebec channel is just one stretch of the St. Lawrence served by pilots. The pilots who take the ships into the Gulf belong to another association, which has its headquarters in Quebec City. And there are pilots available to take vessels up the river from Montreal.

Between Montreal and Quebec pilots are normally on call from early April to December; the weather and the achievement of the keepers decides the actual dates. Last year the UMP pilots made 11,756 separate trips, piloting ships with almost 20 million total registered tonnage. Each pilot spent an average of 261 days on the job, and this figure has been increasing steadily with the growth of St. Lawrence shipping. However, a pilot is not paid for the time he spends on the job but according to the draught and tonnage of the ships for which he is responsible. So the smaller, slower vessels, say the lakers which take up to 25 hours for the Quebec-Montreal trip, are less profitable than the 30,000-ton liners and ore ships which take 12 hours. But this does not work out unfairly for the individual pilot. All earnings are pooled and distributed through the association. A pilot is relieved at Three Rivers whenever his ship takes more than seven hours to reach this halfway point from either Montreal or Quebec.

There are presently 107 pilots in the Montreal association, 64 in that of Quebec; practically all are of French-Canadian parentage. Any Canadian citizen can become a pilot, but he has to register at 16 with the Department of Transport as an apprentice. According to regulations now being worked out by the Department and the pilots, each boy must spend two years at the Marine School run by the provincial government in Rimouski, and then do service as a merchant seaman. He must win his ticket either as second mate (home trade) or master of inland waters. Then he has to learn his special job as an apprentice-pilot—unpaid. Nowadays, so great is the need for pilots, he will likely appear before the board that judges his
The final examination is tough and searching. It includes a test of seamanship, written and oral, judged by a representative of the Pilots’ Authority of the Department of Transport, and an oral examination in local knowledge conducted by a panel of five senior pilots. A doctor examines each applicant to see that he measures up to rigorous standards of fitness. Every pilot must continue to pass regular examinations in hearing and eyesight throughout his working life. What is the local knowledge which is the foundation of a St. Lawrence pilot’s living? The channel is lined with buoys and other markers, and there are lights defining the shore line. But even so, the river is not a mud anyone can travel, especially when maneuvering an ocean-going liner or tanker. The channel twists, there are promontories to skirt and buoys to follow. Landmarks must be recognized on sight, the current must be understood and its effect foretold; an effect that varies with the fullness of the river. Below Three Rivers the ship starts to hit the tide and its influence too must be judged. A pilot really has to know the character of every mile of water from dock to dock. At places the ship “nudges the bank” and is drawn towards it; this attraction must be corrected at once.

There is the weather to watch so that he can be prepared for sudden, dangerous fog and for early morning mists. They are not merely in the fall when the water is warmer than the air above it. Only in the worst conditions will a pilot let down his anchor. That’s a risky, even an impossible act with the larger vessels—700 feet long in a 500-foot channel—especially sailing downstream when they will swing round with the current. Trickest perhaps are the first 15 days of the shipping season, for then there is still plenty of ice in the river and the 500-foot channel is not yet clearly marked. There’s really no other river quite like the St. Lawrence with its long, circumscribed channel. And because of this, St. Lawrence pilots are internationally recognized as among the world’s best.

So long as a pilot is on board he feels his ship is his personal responsibility, even though, officially, he is there to advise the captain. His is no job for a nervous man lacking self-confidence, a man who cannot make decisions and stick by them. But to a degree the pilot’s personal involvement is now being eased by mechanical aids. Today ships carry their own radar which picks out objects, both fixed and floating, in the channel ahead, and is of particular help when the fog comes down. The advanced gyro-compasses are another valuable aid, and ship-to-shore radio telephones, carried by launchers, liners and the ore boats, provide the latest news of both weather and traffic.

But a snowstorm is still a snowstorm and a forest fire can still blanket the channel with sweeping, blinding smoke, though fires are far less frequent than in the old days when, as Napoleon De Villers recalls, “it could take eight days to pilot a collier from Quebec to Montreal past mile after mile of burning forest.”

International regulations require that there should always be an officer in the wheelhouse who knows enough English to carry out the pilot’s instructions. For most foreign crews English is their first or second language, but at times their knowledge is very rudimentary. However, most pilots know the technical terms they need in all the commonly-used languages—German, Spanish and Dutch—as well, naturally, as their native French. Sign language helps a lot, too. Orange Hamelin, present president of the Montreal pilots, likes to have a blackboard behind him when he’s dealing with an unfamiliar or difficult tongue. Common terms are written on it in both English and the language of the ship, and he can point to the action required. He still remembers one occasion when he tried to give orders in Greek, was misunderstood and had to take over the wheel very hastily in order to avert serious trouble. The pilot is on call throughout the shipping season, either to take a ship through the channel or assist her in harbor. The latter is tedious work which quite often comes to break a pilot’s rest after a long day or night on the river. Shipping agents pass their orders to the Department of Transport representative, who calls out the pilots according to his roster. However, certain large ships apply at the beginning of each season to have the pilots they need put on special service. Edmond De Villers, for instance, used to pilot the Imperial Oil tankers that brought the crude from South America to the refinery at Montreal East. In former days, when trips took longer and there was less shipping to be handled, a man would likely spend all season working for the one firm. But today he takes on other ships too. Last year Napoleon De Villers, senior pilot for the Furness Withy Line, made 100 trips, over half of which were on boats of other companies.

Being always on call means spending a lot of time away from home, especially if your home happens to be in a riverside community like Lachine. There is plenty of night work too, for ships steam along the channel at any hour, while port regulations limit loading and unloading to the daylight. In each city where pilotes wait there are one or two hotels where they keep regular rooms, like the Plaza in Montreal, an old hotel with a modern face which fronts Jacques Cartier square just above the waterfront. The staff knows the pilots well—some have been staying there for 30 years—and wake them up instantly whenever a call comes—and wake up the right man. But should a pilot risk driving home for a day after a long stretch of work, he must be prepared for an urgent telephone summons to be ready one hour. There is the weather to watch so that he can be prepared for sudden, dangerous fog and for early morning mists. They are not merely in the fall when the water is warmer than the air above it. Only in the worst conditions will a pilot let down his anchor. That’s a risky, even an impossible act with the larger vessels—700 feet long in a 500-foot channel—especially sailing downstream when they will swing round with the current. Trickest perhaps are the first 15 days of the shipping season, for then there is still plenty of ice in the river and the 500-foot channel is not yet clearly marked. There’s really no other river quite like the St. Lawrence with its long, circumscribed channel. And because of this, St. Lawrence pilots are internationally recognized as among the world’s best.

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A lighthouse yells "Hauger" but also adds to the river's beauty.
they carried their tools with them, so that they could ply their other trade while waiting. That may be one reason why Napoleon De Villers in retirement has become a dedicated cabinet-maker.

It was in 1839 that a separate branch of Trinity House was set up in Montreal, a sign of the growing importance of the younger port. In 1873 the Montreal Harbor Commission took over the control of piloting, a transfer directly related to the Act of Confederation. It was succeeded early this century by the Federal Government.

The United Montreal Pilots was founded as an association in 1918. Each fortnight it allocates among its members the fees which the government receives from the shippers and pays to it. All pilots, old and new, get an equal share; in 1954 they earned about $10,000 each. If a pilot is sick he is entitled to half the average earnings of his colleagues. Those on special duty receive an additional payment from the company for which they had been working. Together with representatives of the Departments of Transport and Finance, the association administers a pension plan, and it represents the pilots both individually and collectively in their dealings with outside bodies. For example, the recent regulations governing apprenticeship are, in large measure, the work of the United Montreal Pilots, who feel the need in these technical days for more technical education.

Looking to the added work the Seaway will bring—some forecasters predict that three times the tonnage will pass along the channel—the pilots are urging that the maximum number of apprentices be increased from 35 to 50. Also they would like to see the channel widened—up to 800 feet. A channel which gave comfortable sailing for ships of 10,000 to 15,000 tons can prove a pretty tight fit for a 30,000-ton ore boat like the Seven Islands or the Ruth Lake, or the 35,000-ton tanker that is being built for Imperial Oil.

Wherever you look in Canada these days conditions of work are changing rapidly. Napoleon De Villers was the last pilot on the active list to bring a sailing ship from Quebec to Montreal. His son, Paul, an apprentice pilot, has spent five hours a day during the past two winters in intense study of charts of the river, the operation of radar and the construction of modern ships.

Yet, when you get down to the essentials, what will make him an efficient, reliable pilot has not changed. For he will still depend on his local knowledge; knowledge he has absorbed from being brought up beside the river, and from the years spent working beside an experienced man in the wheelhouse. It is this knowledge which will enable him to read the signs of the water as easily as his charts or the blips on the radar screens, and to be sure enough of himself to act immediately upon them.

To quote Mark Twain, as the St. Lawrence pilots are fond of doing, there is a calling that requires above all two qualities—courage and judgment. Neither of these has yet been mechanized.

Small ships or luxury liners—all depend on these pilots who know and love the river
WHAT'S NEW ABOUT

shopping centres?

The Greeks, it is said, always had a word for it. Well, they had shopping centres, too.

So did the Egyptians and Romans. What they didn't have were automobiles which make the modern market place the wonder of suburbia

Not long ago a man drove his mother-in-law to Shopper’s World, an ultra-modern shopping centre in Framingham, Mass., to browse among its glittering stores. When she emerged some time later, arms laden with packages, she discovered that the scamp had driven off and left her.

At length the lady took her problem to an official of the shopping centre. “What can I do?” she asked plaintively. He summoned an automobile and chauffeur, lying in the room for just such emergencies.

“We do you five, madam?” the official inquired. She told him and was promptly driven home—all the 200 odd miles to Barre, Vt.

The incident is related at shopping centres all over Canada and the United States as a sort of moral of the trade, for it is precisely in this fashion—by going out of their way to please the customer—that shopping centres are revolutionizing North American buying habits.

The most striking example of this departure is the very location of these 20th century bazaars. Across Canada, in the past five years, stores have closed up shop downtown or branched out to join in the great trek to suburbia. Their new stand is the shopping centre, a meticulously planned and integrated group of establishments—usually dominated by a mass department store or supermarket—catering to the suburban householder with everything from mince steak to mink coats. “Merchants are now going to the people instead of waiting for the people to come to them,” says Carl Peppercorn, executive vice-president of Fairweather’s, an old Toronto firm that now does business in eight shopping centres. “And we like it that way.”

And so do the people. In the past year Canadians spent close to $250 million—about four percent of the national retail sales—in 50-odd shopping centres from Vancouver, which boasts the first in Canada, to Dartmouth, N.S., which has one of the newest. And this, evidently, is just a start. Stores more are rising in subdivided turnip fields on the fringes of our major cities. The biggest single build is Principal Investments Ltd., of Toronto, which operates 10 shopping “plazas” in Ontario. By 1960 its officials expect to have a nation-wide chain of 40 or more, with their collective cash registers ringing up sales of about $400 million annually. By then, too, if the present trend continues, about 100 shopping centres across the land will be growing in the neighborhood of one billion dollars.

One of the surest signs of the new trend is the fact that the two giants of Canadian merchandising, Eaton’s and Simpson’s, are joining it. Eaton’s plans to open its first suburban store in a $12 million centre that Principal Investments is building outside Oshawa, Ont., and Simpson’s is already at work in the Greater Hamilton Shopping Centre, an $8 million creation of financier E. P. Taylor.

Though the idea of shopping centres is only slightly younger than the wheel—the ancient Greeks and Romans having built some dandies—their phenomenal growth in recent times can be traced to one of the wheel’s most modern applications—the automobile.

In Canada’s postwar expansion, the auto’s mobility enabled hundreds of thousands of people to find more breathing room—to hold down jobs in overcrowded cities and yet take out ranch-style mortgages in the burgeoning suburbs. But the blessings were not unmixed. For if Trillium township lacked such urban defects as smog and “No Parking” signs, it also lacked one of
Ever increasing thousands do so. Between 1941 and 1951 the population of Canadian urban areas increased 27 percent. Of these new residents, 68 percent moved into the suburbs. In the same period, automobile registrations increased by 63 percent. More people were escaping to dormitory suburbs by night; more cars were clogging downtown streets by day. In many major cities, shopping became an ordeal of milling crowds, dented fenders and frazzled nerves.

The first merchants to catch the commercial possibilities of this situation were the big grocery chains. They put up giant supermarkets in the roomier suburbs and provided, along with the crunchy-munchy cereals and quick-frozen TV dinners, the acres of parking space that downtown couldn’t hope to match.

These suburban grocerias were an instant success, drawing shoppers even from the cities that bred them. A key reason is given by Scott Feggans, director of advertising and public relations for Dominion Stores. "When people are setting out in the family car to spend $15, $20 or $30 on food," he says, "they will go an extra distance to shop in a one-stop store."

As one-stop suburb supermarket prospects realized, real estate developers realized that one-stop districts could do no less. The direct result was the shopping center, a strip or cluster of stores offering a wide range of merchandise and services just a few steps from their common parking lot.

Among the first shopping center promoters in Canada, and the biggest in the business today, were the Bennett brothers of Toronto—Archie, Jacob and David—whose Principal Investments Ltd. owns more than $150 million worth of stores. In shopping centers the Bennetts see not only a revolution in marketing methods, but, verify, a social movement of large order. "When their potentialities are realized," says Archie, the philosopher of the triumvirate, "our shopping centres will become community centres in the fullest sense of the term, providing full-range shopping facilities co-extensive with the vast reaches of our civilization, suffused with the glow and beauty of the social spirit and cultural essence of our nation."

To this noble end, parking lots in Bennett "plazas" are used for Sunday drive-in church services, square dances, band concerts and a host of other community activities. "For all," says Bennett, "shopping centres are really Main streets—20th century style."

The chief difference between a shopping centre and the main street of yore, Antiquely, N.B., is that the former springs up at once, meticulously planned down to the last nail and neon sign. Earlier this year, for example, Principal Investments opened its $65 million Dixie Plaza, on the southwestern outskirts of Toronto. The centre, which was a year abuilding, began to take shape on paper three years before, when PI rook an 80-acre tract on an old farm. When it opens in October outside Toronto, the Bennetts thought it was a likely shopping centre site and set out to make certain.

The original settlers were sent into nearby housing subdivisions to make a survey of potential customers as thorough in its research as any conducted by Gallup or Kinsey. Householders were asked about their incomes, how much they spent on food or drugs in a month, what day of the week they liked to shop, if they owned their own TV sets or cars, what kind of music they preferred and how long it would take them to pay off the mortgage. Their standard of living was compared with provincial and national averages. "When we get through with one of these surveys," says P.I. official, "we know roughly how many boxes of corn flakes a housewife will buy in October and we can lay pretty good odds on the brand."

Further, a P.I. population check established that 140,000 people lived within 10 minutes' driving time of the proposed plaza, 450,000 within 20 minutes. Another study counted 75,000 cars a day on major highways near the site. It was, in short, smack in the middle of a ready market.

Only then did the Bennetts buy the farm and begin to plan its development. Since Dixie Plaza was to be a motor age shopping district, at least 75 percent of whose customers would come by car, they set aside parking space for 2,500 autos, about 4 times the area given over to stores.

And since the plaza's big attraction, apart from free parking, was to be one-stop shopping, PI planners began selecting a wide variety of merchants for its 35 stores, as yet unbuilt. They had one necessity first: it must not be sterile. They had to be choosy for the simple reason that because store rentals are based, largely, upon sales volume, P.I.'s hopes in this $65 million deal are dependent upon the consumer loyalty of their tenants. P.I. finally settled on two banks, three shoe stores, a book shop, a restaurant, a barber shop and ladies' hairdresser, and stores selling men's, women's and children's clothing, hardware, grocery, farm produce, gifts and stationery, home furnishings, pastries, lighting fixtures, flowers, drugs and a bowling alley. There was also a bowling alley and a dry-cleaning shop.

To variety was added competition: shoppers could choose between two candy stores, and between two "five-and-ten" stores. Some large shopping centres even have two supermarkets and the competition has increased rather than cut the volume of sales—even between two shopping centres. P.I.'s $4 million Golden Mile Plaza, on the northeastern edge of Toronto, faces a 40-store centre owned by Monarch Mortgage and Investments Ltd. Business at both markets is exceeding predicted totals.

In building Dixie Plaza, the Bennetts were guided not only by such cardinal principles as the law of supply and demand, but also by a personal conviction that the average housewife's sensitivity to her shopping surroundings has a direct bearing on how much money she spends. "Shopping," says Archie Bennett, "is an exercise in the expiation of living, which carries with it a sense of participation in the progress of civilized economy." He says P.I. capitalizes on such feelings because at its centres "the conditions surrounding the rate of shopping are conducive to this mood of pleasant self-expression."

At Dixie Plaza, this philosophy was expressed in landscaped and covered promenades, pastel colors, outdoor music, food-lit parking lots and the firm insistence that clerks "smile!" Finally, having learned by surveys and experience just when most householders prefer to do their shopping, the Bennetts decided to keep their centre open until nine o'clock on Thursday and Friday nights.

Like most shopping centres, Dixie Plaza opened its electric-eye doors in an atmosphere reminiscent of Phineas T. Barnum. There were bands and merry-go-rounds, beautiful models to
hand out balloons, fireworks and searchlights at night. Women received roses and free nylons; children were given comic books, chocolate eggs and photos of themselves with the Easter Bunny, who arrived at the shopping centre in a helicopter. A special eight-page section of the Toronto Globe and Mail drew thousands of people to the “Gala Event.”

Such premieres cost about $25,000 (paid jointly by owners and merchants) but they pay off. After the opening of Toronto’s Lawrence Plaza in 1951—a three-day carnival of clowns, square dances and contests for new cars and TV sets—three of those stores had to close. They had nothing left to sell.

In the most densely populated parts of Canada, small community shopping “strips” are giving way today to much larger centres that are designed to serve several cities or towns. Just outside Oshawa, Ont., for instance, PB is building the split-level Oshawa Regional Shopping Centre, which expects to draw customers from an area extending 34 miles west to To- ronto, 12 miles east to Bowmanville and nearby 70 miles north to Fenelon Falls. Bigger yet will be the $18 million Greater Hamilton Shopping Centre, with its 71 acres, 60 stores, glassed-in air-conditioned malls, its theatre, medical centre, 5,000-car parking lot and maps to guide shoppers around.

Significantly, both of these vast suburban centres are built around department stores— Eaton’s in Oshawa, Simpson’s in Hamilton—whose names, until recently, have been identified with downtown. Many downtown retail houses have either branched out into the suburbs or, rather than face the competition, have closed their downtown stores and joined it. Others, though, have been remaining at their old stands and fighting back. Three years ago a new shopping centre opened not far from Montreal’s St. Hubert Street. Worried about its effect on their business, 350 merchants along four blocks of the street banded together and advertised themselves as—lol—“The Largest Shopping Centre in Canada.”

By collective action they talked city hall into providing better off-street parking facilities and permission to keep their stores open until 11 o’clock on Friday nights. The nearby shopping centre prospered nicely, but so did St. Hubert Street. Within a year it had gained 10 new stores.

In Toronto, downtown merchants have been swinging away at the suburban centres with everything from bigger bargain sales to singing commercials—“If you go to shop downtown—wwwwww.” Even the plush salons of that city’s Bloor street, the self-styled Mink Mile of Canada, have been beckoning buyers with treasure hunts, free fashion shows and Christmas parties for shoppers’ children.

Equally important, they’ve been providing more off-street parking. Dr. E. G. Faludi, one of Canada’s leading town planners, predicts that downtown districts will ultimately have to become vertical shopping centres, with adjacent or underground parking facilities. “If downtown is going to compete with the suburbs,” he says, “it must find a place for the shopper’s car.”

In larger cities, this is no simple task. Where co-operative action or pressure at city hall fails, a little ingenuity often helps. In Wilmington, Del., downtown merchants don’t worry about their lack of parking room—they simply provide free taxi service back and forth between the suburbs and their stores. Cramped for space on three sides, one desperate merchant in Toledo, O., built a huge raft—a floating parking lot extending 90 feet out into the Maumee river.

With the trek to the suburbs continuing apace, some authorities see a change of character ahead for downtown. Kenneth C. Welch, one of America’s top shopping centre experts, thinks that Main street, before long, will be a line of office buildings and that most stores will move out to the fringes, where most of the people will live and do their shopping.

Welch’s opinion, however, is widely disputed. “In an expanding and increasing urban country where the quantity of consumer wants is rising,” says Morgan Reid, assistant vice-president of Simpson-Sears, “there is plenty of room for both the downtown store and its outlying neighbor.”

The outlying neighbors agree. Angus McCluskey, president of the Greater Hamilton Shopping Centre Ltd., feels that downtown’s office workers, if no one else, will keep its stores in business for many years to come. And he isn’t certain that the spectacular development of shopping centres is such a revolutionary one after all.

“We’ve always had the corner store,” says McCluskey, “All we’ve got now is the corner store with a parking lot.”

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**SNOW the two-faced giant**

by FERGUS CRONIN

**EVERY DAY of the year it’s snowing in Canada—somewhere.** For instance, while eastern Canada was sweltering under extreme temperatures last July, nine inches of snow was falling on the government weather station at Alert, Baffin Island.

More snow falls on Canada than on any other country, with the possible exception of Russia. And last winter was one of the worst for snowfall in Canadian history. Record falls occurred from one end of the country to the other.

The glaciers, great masses of compressed snow, carved and moulded Canada’s geography during the ice ages, and snow has always been a major factor in our lives. It has influenced the design of our houses, our living habits, our clothes, the way we travel, and what we eat.

It is a boon to logging, to the fur trade, the mining industry and to logging. It aids the farmer; it is a blessing to hydro authorities; and is the source of a multi-million dollar income in the winter sports industry. And it opens roads to otherwise inaccessible parts and acts as a natural refrigerant. It beautifies dab
cities and is a joy to painters, poets, Santa Claus, and little boys in red mittens.

But snow has another face, not nearly as pleasant. It is one of the most bitter, constant and all-powerful enemies of Canadian life. Every year it all but disrupts parts of the nation's economy. Some years it has succeeded.

Millions of dollars are spent every year trying to get rid of it—Montreal alone spends up to $4 million. It ties up railways, provincial highways, city roads and causes devastation and flooding. Mile-long stretches of rail track and highway have been swept away in the Rockies by snow slides. And when snow melts and freezes again on farm lands, it becomes a crop killer.

It is the main cause of our increasing winter accident rate, and a perennial shortener of motorists' already short tempers.

Milkmans, breadmen and mailmen abhor the sight of it.

But like it or not, snow is big business in Canada. Stretching from southwestern Ontario, in the same latitude as California, to beyond the north magnetic pole, the country has to grapple with what is believed to be the greatest tonnage of snow in the world. The 10 biggest Canadian cities have more than 6,000 miles of streets, enough to stretch one-quarter of the way round the world. The railways have over 39,500 miles of track. Add the 10,000 miles of provincial and municipal highways. On many of these roads and tracks snow is falling at the same time and, to keep the country mobile, has to be removed.

Snow has become so important to our economy that chain stores consult weather experts before announcing sales. Snow in downtown city areas keeps women out of the stores; but it helps the telephone sale of some products. One Montreal bakery firm which plans its deliveries on the weather forecast, sends large shipments of bread to downtown stores when it's snowing. They know that husbands will be asked by stay-indoor wives to pick up bread on the way home.

One reason snow affects us so greatly is that most of it falls on some of the most heavily populated areas in the country. The air in the Arctic is too dry for much precipitation. Most of our snowfall is below the 60th parallel, the northern boundary of the provinces.

The snow covering has a few holes in it. Though. Some parts of southern B.C. rarely see snow. With the exception of the Rockies, eastern Canada annually averages more snow than the west. But last winter just about everybody had too much snow. It fell in a record-breaking blanket. Nearly every centre had above normal fall and many had all-time records. Victoria, for instance, had 34 inches when it usually gets 10. Vancouver had 36 inches—11 above normal. Winnipeg had an all-time record of 99 inches; Regina was in the same position with 74 inches. The Maritime provinces were the worst hit. Halifax had 143 inches. Its previous heaviest snowfall was 64 inches. Sydney, N.S., had more than 90 inches above normal. The only places which had reasonable relief were Ottawa and Montreal, both of which had less than usual.

Snowfall was fairly heavy in the Rockies. The range is one of the most snowed-upon in the world; its average is 130 inches a year. According to Morley Thomas, assistant climatologist at the Department of Transport, the heaviest fall in Canada was at Kildala Pass, near Kitimat, where 714 inches fell during the 10 months ending June, 1955. Stacked as one fall it would envelope a five-story building. Canada's highest average fall is at Premier, B.C., on the Alaskan border, where the 30-year average is 433 inches.

Among Canadian cities, St. John's, Nfld., holds the record for a single year with 326 inches in the winter of 1881-82. Quebec City and Montreal are close runners-up. More snow falls in eastern Canada mainly because of its humid climate. Eastern snowflakes are larger, contain more moisture, and

weight more. In the west, with its drier air, snow is harder, more pellet-like and lighter. Because temperatures stay below freezing for longer periods, and because it contains less water, western snow stays on the ground longer, and so breeds the illusion that the west has more snow.

There are many types of snow. All of them are developed from four basic kinds: "needle" snow, which has crystals like long fingers; hexagonal snow, in which the crystals are like six-sided plates; dendrite, which is snow in "lumps"; and hexagonal-column snow, shaped something like dumbbells.

No two snowflakes out of the billions upon billions which have fallen have ever been found to be exactly the same. Some, like those which fell in Berlin in the winter of 1915, have been four inches across. Others have resembled flying saucers or oval dishes. In central Massachusetts in 1931, snowflakes 2½ inches long fell to the ground forming a thin covering of ice. "Snowball" snowfall has also occurred. The balls are usually foot of average freshly fallen snow in Canada weighs about six pounds, but crushed snow may weigh as much as 20 pounds per cubic foot. Even this may seem light to those who have to shovel sidewalks.

The problem of keeping pace with snow is one of the biggest that faces city authorities. "Once you've let a few inches settle, and more's on the way, you've got the world's worst problem," says Toronto Street Commissioner H. D. Bradley.

Montreal, with 800 miles of streets and 120 inches of snow a year, has the worst snow problem of any city in the world. It tackled its 1955-56 snow clearance with a record budget of $4 million and 577 pieces of snow-removal equipment including 47 blowers, snow-equipped trucks, salt, clinders, sand spreaders, graders and tractors. The average annual fuel consumption of Montreal's roads department includes 900,000 gallons of gasoline, 4,500 gallons of lube oil, and 45,000 gallons of diesel fuel. Three-quarters of this is used in the winter.

Montreal's streets don't stay snow-clerged for long. "We'd be murdered if we waited," says Jean Victor Arpin, assistant director of the roads department. But still as many as 300 accidents, most of them minor, have been counted on a single stormy day. In business streets the snow is blown into trucks which dump it in the St. Lawrence or in parks. A blower can fill a three-ton truck in 14 seconds. In residential streets the snow is hauled on snowplows.

In spite of all efforts, storms bring complaints. On Dec. 30, 1954, Mayor Drapeau and thousands of other citizens were late for work, and an official complaint was made that the streets were not cleared by 8 a.m. Road department officials almost cried with frustration. The storm had begun at 3:25 a.m. at a rate of about 2 1/2 inches an hour. By 8 a.m. there were 10 inches on the streets. By the time the storm ended, 16 inches had fallen. It took 3,000 men three days—and cost the city $1
millions—to dig it out. One night last year, 70,000 tons of snow were removed.

Although Montreal has the worst snow headache, other cities may have almost as much. In Olympic Park, which during the week is a large staff, buildings and garages packed with equipment. Quebec City spends about $1.3 million every year to clear its streets. Toronto's budget is $750,000 for snow removal and stockpile. Each year 600 men or more, nine snowthrowers, 78 heavy-duty trucks, 44 mechanical spreaders, and 12 tractor plows are put to work removing snow. Last winter more than 10,000 tons of chemicals were put on its streets.

Winning spends over half a million dollars a year: uses 250 men, two throwers, six graders, 14 tractor plows, and 40 dump trucks. In 1958, he was responsible for 15,000 tons of salt and 30,000 tons of sand in a winter and spent at least $100,000. Even Vancouver spent $107,000 last winter. Most of the snowthrowers used in Canada are made by Siscard Inc. of Montreal, the largest company in its kind in the world. The blower, which sucks up snow and blows it into trucks or over open ground, was invented by Arthur Siscard, an orphaned Quebec farm boy, who got tired of the snowy roads from the farm to his Montreal market. He spent all his capital inventing a machine which would do the work of 10 men. It failed. He persisted and eventually made another snow thrower. After years of trial, the city council of Outremont, a Montreal suburb, bought his machine in 1917. That was in 1927. The machine worked well up to a year or two ago when it was replaced by a newer model and returned to Siscard as a museum piece. Siscard's second thrower still works faithfully each winter near St. Thérèse, Que.

Siscard's machines are now found in cities across Canada, and all over the world wherever fast, efficient snow clearance is necessary. One of them can deke as much as 216 tons of snow an hour. They sell for $2,500 to $4,000, with a specially made thrower for as much as $30,000. A junior size, costing $15,000, is now standard equipment in most cities. Blowers can throw snow 150 feet. Probably one of their biggest users is Goose Bay airport, Labrador. Here, 10 big blowers, working in rotation, can wipe out the worst snowfall in a few hours.

Although airport managers, civic officials and highway maintenance crews express in unblushing terms their sentiments about snow, the people who get really loquacious about it are railway officials. Snow removal cost the Canadian National Railway about $1 million last year, and the Canadian Pacific, with less track, spends about $4 million a year. Canadian Pacific equipment includes six rotary plows, 19 wedge-type plow shoes, 10 rotary brooms. Canadian National's arsenal consists of eight rotary, 36 wedge plows, and 171 wing plows. The big rotary weighs as much as 100 tons.

Snow banks 20 to 30 feet high are half a mile long and are a day's work for the men who keep our railways open. When a slide plug a narrow cut through the Rockies, and switches freeze fast, every member works two or three shifts and eats sitting in their clothes. No sooner is one section of the line than another drifts over. Quitting time is when the line is free, and the snow thrown far back so that the express won't suck it all on again. Permanently-staffed cabins are maintained through the Rockies, and in a storm their cooks get little sleep as weary men come for meals at all hours. Few snows fool the railways. When they do, they are phenomena.

In 1950 the Fraser Canyon, the worst spot in Canada for rail stoppages, was blocked for two weeks. Another year an east-west express was snow-covered for 10 days in the canyon. Last year, one of the worst storms of the century blew through Alberta and into Saskatchewan with drifts nearly a mile long, and 25 feet high. The line between Prince Albert and North Battleford in Saskatchewan was blocked for 44 hours. It took four engines, three snowplows and 100 men to clear it.

Such stoppages don't occur only in the west. In March last year, a trail of people east of Montreal was held up by snow for 20 hours and the same storm isolated the village of St. Hilaire de Dorsor for 19 days. "One snowbank has become packed by its own weight it's like trying to push your way out of solid ice," says a CPR lineman. "We try to get to the drifts as quickly as possible. If they get too packed, we're liable to bend the blades of our snowplows."

Lightly-plied drifts are as big a danger as the charged ones. A man walking into one often disappears completely. That's what happened to Joe Hauser of the government weather bureau at Kittitas, and his companion, when they returned recently from a trip to "outside". The pilot of their helicopter couldn't land the machine sink out of sight in a drift. He dropped Joe and his friend from 10 feet. They disappeared, buried in snow, but managed to crawl out only to find their cabin too had practically disappeared. They had to dig their way into it.

However, not everyone has such unpleasant experiences with snow. Farmers often welcome it. Like rain, snow is an important source of moisture for crops. It picks up nitrogen compounds floating in the air and deposits them on the ground. Rain and snow together deposit as much as seven pounds of nitrates per acre in a year. Snow accounts for 17 percent of this, and pound for pound it is more useful, because it sinks in slowly and spreads more. A blanket of snow protects winter grains. A five-inch covering can raise the ground temperature six degrees, which encourages more biological activity in the soil and better growth.

Snow turns the truckless Canadian north into a network of winter highways. Supplies for outposts travel by truck across frozen lakes and along snow roads where in summer it would be impossible to move. Even towns are moved on snow. Akavik, capital of the western Arctic, is sinking into the mud at the mouth of the Mackenzie River. The government is moving it to a new site, by putting buildings on sledges and dragging them across the town by tractor. Four years ago, Sherbert Gordon Mines closed down a mine in northern Manitoba, and moved the 66 miners' houses across the snow and ice to the site of a new mine at Lynn Lake, 150 miles away.

The industry which probably gains the most direct cash benefit from snow is the tourist trade. Such places as Mont Tremblant in Quebec, Grouse Mountain in B.C., and Jasper and Banff in the Rockies, specialize in winter sports which attract thousands of enthusiasts every year. Hotels are booked months ahead and special trains are put on for the convenience of winter vacationers. A recent hotel convention at Quebec City was told that the province was the snowland "par excellence" of North America. Meanwhile, a heated debate was taking place among the city fathers on who should pay for the removal from the streets of this snow "par excellence."

Actually engineers and civic officials are thinking ahead to the day when snow removal will mean melting it as it falls. Toronto's 24-storey Bank of Nova Scotia building is one of many in the country with snow on its sidewalks—heated pipes under the concrete melt it. Imperial's new office building in uptown Toronto will use a similar system. It has been slow to catch on because of initial costs, though experts feel that in a few years the system pays for itself in labor savings. It started in 1925 at Rochester, N.Y.

The United Nations building in New York has a heated concrete ramp leading to the garage below the main entrance. Pittsburgh's South Side Hospital has a heated ambulance drive way. The new Hotel Dieu in Montreal has a steam-heated parking lot and some Montreal private homes are using the same system for driveways.

Road and asphalt engineers are experimenting with radioactive materials in asphalt. A test was made in Germany but not enough heat was produced. A similar test was carried out in 1954 on a special stretch of highway in New Brunswick with better results.

Fifty years from now, great stretches of highway and railway links through mountain passes may be free from snow all winter. Natural gas, if there is a cheap and abundant supply, may be used to melt the snow. "At the moment, though," says one highway official, "it's a real pipe dream." Canadian roads are already using gas to heat main switches in vital areas.

One fact is clear in the minds of all snow removal officials. The problem today isn't as bad as it would have been 50 years ago with the same amount of traffic. The Canadian climate appears to be warming up. Over the past 70 years temperatures have risen an average of three degrees. Northern ice fields have receded as much as 50 miles, and the yearly snowfall in Montreal has dropped 10 inches since 1930.

According to long-range weather forecasters the change is part of a cycle which may have been as much as a 1,000 years long. Most of them agree we are now at the end of this cycle and our weather will soon get much colder. In fact Professor Kenneth Hare, director of the McGill University weather observatory, believes a new ice age is on the way. But there is little cause for alarm. It probably won't happen for another 250,000 years. 3
Imperial receives
one of five
"Presidents' awards" presented
to business organizations
by the Canadian Association for Adult Education

For a "distinguished contribution to the cultural life of the country" Imperial Oil received in June one of five Presidents' Awards given by the Canadian Association of Adult Education on the occasion of its 21st anniversary.

Similar awards were given to Canadian Westinghouse Co. Ltd., Metropolitan Life Insurance Co., The Royal Bank of Canada and the Wheat Pools of Alberta, Saskatchewan and Manitoba.

The Presidents' Awards were established by the association "to mark public education projects of outstanding merit in such fields as public affairs, health and safety, citizenship and the arts." Nominations for the awards were made by members of the association and a special panel of nominations. Judges were Mrs. L. B. Smart, president of the Imperial Order Daughters of the Empire; M. W. McCutcheon, president of the Canadian Welfare Council; J. G. Cram, president of the Canadian Chamber of Commerce; Frank Patten, president of the Canadian Citizenship Council; James A. Cowan, president of the Canadian Film Institute; and Wilfred Egleston, president of the Canada Foundation.

The judges decided: "In its program of public education Imperial Oil has helped Canadians gain a better understanding of their country and heritage. In its imaginative use of films, radio and television, its encouragement of the arts, sciences and humanities and its development of Canadian talent, it has made a distinguished contribution to the cultural life of the country."

The Westinghouse company received its award for sponsoring a conference on Canada's future. Metropolitan Life was recognized for the health education program it has conducted for many years, the Royal Bank for its Monthly Letter, and the Wheat Pools of the prairie provinces were given an award for rural education programs they have conducted over the years, embracing entire communities.

Among the projects for which Imperial was honored are:
- The Imperial Oil Review—now in its 90th year of publication—published bi-monthly in English and French;
- Its program of films—three oil-information and three cultural were submitted;
- Five fellowships for graduate study (worth up to $2,000 each for three years) open to all Canadians to be used at the university of their choice anywhere in the world;
- The company's activities in the field of art: It recently purchased some 1,600 drawings of the late C. W. Jeffreys as a collection which will be made available to the general public and, in the form of special portfolio, to schools. Imperial also commissions Canadian artists, primarily through the Review, to encourage them in their work;
- The provision of special displays on the oil industry for public events and exhibitions such as the one now at the Macdonald Hotel in Edmonton;
- The production of booklets and pamphlets ranging from illustrated booklets for schools to statistical reference pieces for educators and industrialists;
- The distribution of bursaries amounting to $5,000 annually to aid teachers going to exchange positions in Canada and the United Kingdom, or attending the Kellogg Foundation course in school administration;
- The subsidizing of Canals' Flying Heritage, a history of Canadian aviation by Frank H. Ellis.

The Canadian Association for Adult Education was organized in June, 1935, to co-ordinate the activities of some 30 organizations in Canada working in the field of adult education. It is supported by contributions from member organizations, individual donors, government departments and grants from foundations.

In association with the Canadian Federation of Agriculture, it is responsible for the National Farm Radio Forum which has been broadcasting for 16 years. Its discussion topics range from the rural schoolteacher to civil defence and are listened to by 1,000 organized groups across the country. The program also attracts thousands of other listeners, even in urban areas.

Another national institution in the field of discussion is Citizens' Forum, which is sponsored by the CAAE and the CBC on radio and television.

A comprehensive film award program was originated by the CAAE and is now in its eighth year. The awards are presented in conjunction with the Canadian Film Institute and the Canadian Foundation. Three of Imperial's films—The Loon's Necklace, Newfoundland Scare and The Seasons—have been named "Film of the Year" under this program.

Many leaflets, pamphlets and books on adult education problems—more than one million bulletins each year—are issued from the CAAE office in uptown Toronto. The association also publishes a pocket-size magazine, Food for Thought, six times a year. It deals with problems of Canadian and international citizenship.

Awards were presented at Kingston, Ont. C. E. Carver (left) accepts Imperial's award from CAAE President W. R. Carroll.
There's no refinery project too large, too detailed or too complicated for the men of Imperial's engineering and development division. In the past 10 years they have designed and supervised the building of units costing $215 million from the three other sections of the division, who give rough estimates of processes, costs and size.

When the plans are finally approved, the process design group develops and engineers the processes needed. This work involves selection of the types of processes to be used and the number of pumps, pipes and towers, the arrangement of units, and deciding upon any unusual equipment required.

Next, the mechanical group prepares specifications showing what the units must be made from and the temperatures and pressures which the vessels will have to withstand. The mechan-
The spacious, well-lit reception hall in the new building is designed for efficiency and comfort.

Unusual wood panelling sets of interior in two-story building.

Operational engineers also produce plot and site plans for the project. Then the construction section, from completed specifications obtains bids on the project. It lets contracts, supervises work in the field and, on smaller projects, even buys the materials for the contractor.

A measure of the amount of work involved for the 170 members (120 graduate engineers) of the group is evident when you consider that a single set of specifications for a new refinery can contain over 2,000 pages.

On the engineers, too, falls the responsibility for providing a close estimate of the cost—a project can range from a few thousand dollars to many millions—and the process designs for virtually every piece of equipment that will go into the new plant. Only the most minor of these can be purchased from manufacturers’ stock. The rest must perform specialized, and often unique, jobs and must be specifically designed.

These design projects include huge fractionating towers (in which oil is broken down into some of its component fractions). Furnaces, pumps and heat-exchange equipment. The process units, some of which are 10 storeys high, have to stand extreme pressures up to 2,000 pounds per square inch and scorching heat of 1,200°F temperatures.

Direction of the complex assignment of designing a refinery comes from the division’s manager, Paul Wackenstein, a civil engineer from the University of Manitoba, who has spent more than a quarter of a century in Imperial’s engineering division and refineries. He is aided by two assistant managers, Andrew “Andy” Russell, a mechanical engineer who trained in England, and J. C. “Jim” Maguire, a chemical engineer who graduated from McGill. Russell handles the mechanical and construction operations and Maguire looks after the process engineering and operations analysis.

A typical engineering and development operation was the building of Imperial’s $13 million lubricating oil plant at Edmonton. When in 1953 the decision was made to build a plant the engineers went into action. Before the smallest engineering details could be handled, it was necessary to decide where in the west the plant would be built, what area it would serve, where it would get its crude, its size and capacity and, in general, what processes it would use.

This preliminary planning took six months. The next half-year was spent in detailed planning. When the general nature of the plant had been agreed upon, an estimate of the cost was worked out. The estimators can bring in a rough estimate on a multi-million dollar project within days. A detailed estimate, of course, takes weeks or even months.

With an approved estimate for the lube plant the engineers went into a huddle with the research department for a last check on the specific units required in the plant. One of them—a hydrocracker, in which hydrogen is used to purify the lube oils—was a new type of unit which the engineers had to design. In all, the new plant contained 20 major processing units, 67 cooling and heating units, four big furnaces, 81 pumps and 150 control instruments.

A cylindrical-shaped conference room, seating 100, is one of the most futuristic in Canada.

Computing machines help give the engineers final answers to complex refinery-building problems.
Detailed plans and specifications were split among about 75 people divided into 12 groups. When the designs and specifications were complete there were literally thousands of pages of drawings and instructions.

Three score engineers working independently at the design of the new plant could have led to duplication of work and even to utter chaos. In the interests of efficiency—and, in fact, sanity—a job co-ordinator was appointed. His was the administrative task of co-ordinating the work so that the project could be completed without waste effort as quickly as possible. Through him too, management at any time could learn of the progress being made.

After more than a year's work the engineers produced a set of process designs and specifications, complete in every detail, for the plant best able to do the job it was intended to do. To a foundation of refinery technique, they had added the lessons learned from past operations and the latest innovations of technological research.

It was then up to an outside construction firm to translate their ideas and plans into the colored towers and buildings that presently stand just outside Edmonton.

Even when the contract for the building of a plant has been let, the work of the engineers is by no means finished. To meet changing market demands, designs are often altered during construction; new process methods are often developed and new units added. To ensure that the plant is built to specifications and that any changes are made without wrecking the schedule a member of the engineering division is assigned to each job as resident engineer, who goes to the site of the job with his staff.

When a plant is built, engineers are assigned to help start up the units, and other engineers keep a watch on the equipment to look for possible improvements. Throughout the year, yet another group spends its time inspecting all the company's process units for safety and general wear.

An important part of the work of the engineers at Suncor is keeping abreast of advances in the industry through meetings, papers and technical journals.

The engineers say their work is "just one problem after another." Co-ordinating emergencies with the large building program of the past 10 years has been anything but an sinecure.

Recently, though, the problem was made easier. Since the end of the war, the engineers had been housed in a crowded converted wartime dormitory. The cramped space made efficient operations a major task.

In October, 1955, the engineers moved into a new building which in many ways is as unusual as some of the units they design for the company's refineries. Architecturally, the two-storey building with its large glass areas separated by a strip of enamelled panels resembles a huge sandwich 240 feet long and 65 feet wide. Bunting from the front of it is a cylindrical auditorium with a seating capacity of 100. The rectangle and circle design of the building and auditorium—which was placed outside the main building to allow easy access for other refinery departments—allowed for efficient, economical construction.

The long expanse of glass and colored porcelain gives the $1 million building a futuristic effect. basement walls of the building are recessed so that steel pillars supporting the upper storeys are visible. This gives the structure a light airy look.

From the neat offices and large, airy drafting rooms of the new building will come the designs for the refineries of tomorrow—refineries to meet the rising demand of Canadians for more and more oil products.

Behind these doors, 170 people work as a team, to build and expand refineries across Canada.