

THE CANADIAN SHIELD

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CANADA, closest neighbour to the richest, is itself the second largest country in the world. The total surface area of the earth is nearly two hundred million square miles. But less than 30% of this is land. And of the land, less than 20% is soil, fit for agriculture. Of the rest, the barren lands, a large part is in Canada. This country is more than three and a half million square miles in extent, but only 2.6% of the area of Canada is arable land.

Crude size of a country like Canada is practically meaningless, unimaginable. Compensating for the difficulty of measuring three and a half million square miles with the mind, you seize a figure like 2.6% arable that makes Canada a commonplace country after all. When vaulting spirits like the Lindberghs force the space on the map back into your consciousness again, by taking off from New York harbour and flying by way of Ottawa to Alkavik in the Arctic Circle, you seek to escape the mental problem by pooh-pooing Mercator. His projection maps shamefully exaggerate. Canada is not really as big as it looks. But turn to a globe. There is Hudson Bay, fourteen times as big as Lake Superior. There, indisputably surrounded by far greater areas of land, is Great Bear Lake, larger than the accepted immensity of Lake Ontario. But people, their homes and means of livelihood, are what interest you on a map, you say. In these terms Canada is a string of beads, Montreal, Toronto, Winnipeg, Calgary, Vancouver—a child's arrangement, mostly string. However, this map of yours is out-of-date: spot the mining camps on it, Chibougamau, Noranda, Kirkland Lake, Little Long Lac, Pickle Crow, Flin Flon, Athabasca, Yellowknife, Great Bear. Remembering elementary-school geography classes, you can still retort the blank names Arctic and sub-Arctic, and slam closed your atlas. But then three Russians claiming to be from Moscow land in your Los Angeles backyard. What have they flown over, and being sinister Russians do they know about something up there in the Canadian North that may be important?

The Canadians themselves happen to know more than anybody else about their North, and they now know several things beginning to look very important. Of that vast non-

arable area above the cultivated and known-habited margin on the U. S. border, a big portion is a continuous rock formation belonging all to one geological family. Old estimates give a minimum of 50% of Canada's gross area to this formation, 1,800,000 square miles, and more recent estimates raise the proportion near two-thirds. The rock formation curves in a colossal U around Hudson Bay, from the Atlantic in Labrador, from Hudson Strait and Ungava Bay, down and west and up again past that Great Bear Lake and its only smaller neighbours Athabasca and Great Slave, right up to Amundsen and Coronation Gulfs. The formation, called first Laurentian, known in the Laurentian Highlands above Montreal, called now the Canadian Shield, is Pre-Cambrian rock throughout.

Besides being hard rock, this ground of more than half of Canada's immensity is cold—moon ground, more like the surface of our satellite than our warm fertile Mother Earth. It has been just about as inaccessible as the Moon. Bitter cold, frozen from seven to nine months of the year. Lacerating cold of gales of wind, from which the moon, having no atmosphere, is free. Naked and shelterless in the great stretches above the tree-line, and raggedly clothed by its stunted pine and spruce much farther south. But rock, from which comes gold. Are there rich ores awaiting exploitation in the moon?

The Canadian Shield has a face it shows to the sun—seen ornamented with bathing girls in the Canadian travel ads. Within 55 miles of Montreal this starts, a playground offering camp-life, a vivid imitation of return to nature by its isolated freedom from settled farms or other evidence of civilization. Cottage homes for summer idleness perch on the uncongenial stone. Lakes yield fishing sport, and in the autumn ducks and moose are shot. Within safe distance of cities, hardier sportsmen dare the Laurentian winter, exercising native snowshoes and latterly finding fair country for skiing. The Shield is limitedly productive through these activities, creating a considerable tourist revenue.

In no mood of play the most part of the Canadian North registers winter temperatures from zero Fahrenheit (32 below freezing) to minus 70 degrees. Great Bear Lake is not near the northern limit of the Pre-Cambrian rock formation, but half of the lake is within the Arctic Circle. This lake has been found unbroken ice within a week of the fourth of July. Throughout the area, rivers and lakes of whatever size freeze over, and heavy accumulating snowfalls bog down any ordinary land-

surface movement. If roads could be built, they would be blocked to wheels by snow, and any artificial surface would be heaved out of them by frost. This is open country, but nevertheless as impenetrable as a jungle.

The most famous of all Canadian paintings is Tom Thomson's *Jack Pine*, a portrait of a Northern "character". The jack pine was one of Thomson's few friends. The artist roamed the North in his creative years, and died by drowning in Canoe Lake with only the jack pine in attendance. Grey pine, Hudson Bay pine, Labrador pine, scrub or jack pine, this tree is starved, stunted and wind-warped. It looks like an ugly, deformed old man, as mean as the existence he lives. The bark is gray and scaly. The tree seems to have more dead needles than green ones, and they are as sparse as an old man's beard. The stiff, frequent branch-joints make a knotty wood. The knots that dry hard from the rotting dead tree make a superlative camp-fire, but there is no lumber in this pine.

The Coxe's army of the northern forests includes species that have commercial value as a source of wood-pulp, although when it reaches Great Bear Lake a white spruce takes thirteen years to become a sapling four feet high, one inch in diameter. Economic scarcity, of suitable pulp wood, and the price of paper and rayon have driven men farther into the North than sport has drawn them, but still they are at the fringe where there is near water to freight the logs to mill. The barren lands, the rocky wastes where trees grow not at all or only like Thomson's pine and the Great Bear spruce, are just a timber-cruiser's nightmare of what fire and his own unreforesting haste might leave of present commercial growths.

The Canadian North is no place for anyone with a bad conscience. Lonely, silent, the country can drive a man crazy. The word *loony* derives from here, from a fantastic fishy bird that laughs crazily—the loon. And in the winter, the wild sleigh-dogs howl. The loon is a water bird, marked like black-and-white tile, with inedible flesh stringy and fish-stinking, that laughs, dives and swims underwater a mile across a lake, reappears on the other side and again gives that loony laugh. The occasional ducks and geese are good company by contrast. Other natives are the caribou and the musk-ox and the fox that turns white in winter. Furs, thick and lustrous in cold climates, light, very valuable, gave the North its first inclusive economic value and interested that historic company, the Gentlemen Adventurers to Hudson Bay, in creating an organ-

ization extending to the limits of the Canadian Shield. Indians with furs in canoes were met by trading posts at traffic junctions on rivers and lakes, whether draining towards Hudson Bay or towards the Arctic Ocean, if the posts could be served by steamboat even once a year. Modern adventurers into the empty North wherever they go are likely to hear of an H.B.C. man not far away as it seems up there, a solitary Scotchman usually, who has been "in" for years.

Topographically, the Canadian Shield is saved from a desert monotony only by the innumerable lakes. Highest in Labrador and on the St. Lawrence Gulf North Shore, it is a region of low hills, smoothly rounded to a bird's eye, but very rough, with their tumbled frost-split rock to the foot. The small sharp shallow valleys are all water-filled, a filigree of lakes and rivers covering the whole expanse of territory, silver and blue unclouded by sediment in this carved rock basin. The forests of the southerly areas do not break the filigree. For the indigenous birch-bark and the modern canvas-covered canoe, shouldered by one man across the portage from one lake or channel to the next, the North is a system of waterways, during the brief period from "break-up" to "freeze-up". The Indians reached the fur-traders by canoe, and this primitive transportation carried all the explorers, the surveyors and the fire-rangers protecting the timber-limits and the first mining prospectors too.

Geologically, this great Canadian Shield of rock belongs to the same Pre-Cambrian family as the rock bearing Minnesota's iron, Montana's copper, Idaho's lead, and South Africa's fabulous golden Reef. Pre-Cambrian, the most ancient of any rock exposed on the surface of the earth, is original lava flow. It is distinguishable from the subsequent sedimentary Palaeozoic rock by the scarcity of fossils—and by the presence of metal ores. But the metal ores in the average composition of Pre-Cambrian rock in Canada have to be concentrated 100 times for copper to make extraction economical, 70 times for nickel, 1,400 times for gold. Mines exist, and the theory to account for them is the formation of veins having these concentrations of some of the rock elements, during the period of Pre-Cambrian creation. The heavier metal ores may have settled through the cooling liquid into layer veins. Sudden chills or other special circumstances may have caused fractional crystallization within the lava. Contact with metaphoric bodies may have drawn the metals out of the flow. Secondary subterraneous eruptions may have injected or deposited them

as replacements of the homogeneous and valueless mother rock. Colloidal action may have occurred in the formation of the veins. These are the chief theoretical explanations. They at least emphasize the abnormality of a mine.

A workable mineral deposit is a freak of nature. Prospecting, you look for a geological fault, a fold, or a juncture of different rocks. You know the subspecies of rock from which contemporary technique is able to extract paying metals, and the signs of these rocks such as cobalt-stain. You can make rough tests of "values". But no prospector in Canada has found such a freak as the Rand, a concentration continuous for miles. Ore deposits can be thin veins that soon peter out. And in Canada they often are. They can be sporadic in location, inconsistent in value. The Howey gold mine at Red Lake in Ontario is a low grade operation. Less than a hundred miles away is the Pickle Crow, with the highest gold-value ore in commercial quantities now being mined in North America.

Geologists once sought to explain the earlier Canadian mines, Sudbury nickel, Cobalt silver, Porcupine gold, Noranda copper-gold-zinc, and to confine them, by defining a Temiskaming sub-province of the Canadian Shield, north from Lake Nipissing to James Bay, west from Rouyn to Gowganda. But now dividends are being smelted out of parcels of rock east, west and north of those boundaries as far as Great Bear Lake. Geologically the whole Shield is wide open. Furthermore, its eighteen hundred thousand square miles or more are open in the sense of being an exposed surface. The Pleistocene glaciation sheared off all veiling encumbrances, scoured and knarled the rock. Only in the dense southerly woods must the prospector grope through overburden.

Gold is where you find it, if you can get it out. Frobisher in 1556 took to England from Baffin Land a shipload of glistening mineral that turned out to be iron pyrites. If the Hudson Bay Company men had found radium ore near their Great Bear Lake post, their canoes could not have transported it, and they would have found no one in Canada to refine it. Transportation is the key to the story of the Canadian Shield.

To reach the arable prairies of Western Canada and the province on the Pacific Coast, a railroad had to be carried across part of the Canadian Shield in Northern Ontario. Copper and the International Nickel Company's deposits were found when the Canadian Pacific Railway was put through Sudbury. The strike of silver ore that named and built the town of Cobalt

was made actually in a railway cut during the building of the Temiskaming and Northern Ontario line. This railway also opened up Porcupine and Kirkland Lake as gold camps.

The development of the Canadian Shield has been keyed to transportation, not its hardships, but its technique. Rock has to be blasted for every foot of right-of-way, and water to be expensively bridged splatters the surveyor's map. Nevertheless railways have entered the North, and theoretically could penetrate the Arctic Circle. But technologically they are heavy, volume carriers. They have made mines incidentally.

Oil drums mark the true commercial discovery of the Canadian North—like the kerosene tins in China. Drums first, for the gasoline for airplanes. Air travel is now established as the universal and exclusive locomotion over most of the Canadian Shield. Get off the train at practically any station where the transcontinental railways near the rock mass, and you will find scheduled service to established camps, and also a plane you can charter north to the limits of the continent.

Canadian air services carried 13,000 tons of freight in 1937, practically all in the North, because transcontinental flying has only just started, October 1938. Not airlight travelling-cases for the plane's blonde hostess to stow for you, but dynamite, dog-teams, diamond drills. A 2100 pound team of oxen that does rough hauling at Chibougamau was loaded into a plane with a crane, covered with a tarpaulin and flown over the bush into the camp. If a Hudson Bay Company factor had to leave his post in winter, he ran behind his overnight-camp gear on a toboggan drawn by a string of half-mastiff, half-wolf sled dogs. Sometimes he shipped furs this way. But per pound-mile air is cheaper. The Canadian railways get much mining business, where they can deliver it, but their rates do not pay interest on government's contributions to their roadbed. Commercial flying in Canada is unsubsidized. The truculent wheeled motor transport that hogs the business and the roads of the south whines helplessly in snow. Metamorphosed as tractors, the internal combustion engine does provide economical ground transport on occasion in the North. But not excepting this, say Canadian Airways Limited, "where the freight has to bear the whole cost of railway or road construction, aircraft can now compete in price with any other type of transportation except on good water routes". This is a statement of great general significance, arising from the experience given to flying by the Canadian Shield.

Government planes and ex-army fliers shortly after the European War made the first industrial applications of flight in Canada. They started patrolling the Ontario forests to spot and signal outbreaks of fire, in 1921, grounding with pontoons on the convenient northern lakes. That same summer the Imperial Oil Company, Canadian Standard of New Jersey subsidiary, chartered planes to reach a new oil strike near Fort Norman in the North-West Territories. The Dominion Topographical Survey, in cooperation with the Royal Canadian Air Force, took a series of air photographs of new country in the summer of 1922, and the following winter constructed exact detail maps from these, developing a technique used broadly since. Oblique air photos now add elevation to outline.

A good chance to make a mine of the Howey property at Red Lake on the Shield in Ontario north of Lake Superior appeared in 1925. A camp was started, materials moving laboriously over 160 miles of water and portage from steel. But the threat of an early freeze-up endangered the effort and the lives of the isolated men. Ontario Government bush-knowing pilots and pontoon-equipped planes loaded with supplies saved the situation. Likewise they invented a new transportation technique. Red Lake secured a commercial air service thereafter, over the 100 mile air route from railhead, and though an established gold-producing camp it has yet no rail or motor-road service. Noranda was the next occasion for air transport to assist the previously-stumbling exploitation of the Canadian Shield. Then Flin Flon in 1927, and Sherritt Gordon, which received all by air, forty men, thirty tons of freight and the first complete diamond drill, in August of that year.

Gold pays for planes, when people will buy gold. It pays for planes to fly in prospectors, with their canoes for local travel strapped to the wings; to fly in supplies and diamond drills for proving-up; to fly in even parts for mills and diesel or hydro-electric power: in order to fly out the gold bricks. But there was a period when gold, with weakening command over commodities, was in declining demand, the late 20's period of high prices. However, tough individualistic fliers had sunk their money in planes for commercial service in the North, and they ruggedly made themselves work, kept their ships in the air. The pontoons with which their first planes were exclusively equipped gave them flying-fields all over the North, during the brief summer. At freeze-up they were grounded—until ski runners were tried, and worked. Now the ice-surfaced,

snow-softened lakes are airports open all winter. Pilots went up in the bitterest temperatures, flying farther and farther "down" North to land in still colder weather. Their single engines froze. Then they drained the oil and heated it separately, and somebody found a blow torch—now standard equipment for winter flying—and risked a gasoline explosion warming the cylinder-block, slightly protected from the wind by a tarpaulin over the engine, the euphemistic "nose-hangar". This is still the only way to get a plane up again after a winter stop at a northern camp.

Courage and ready enterprise of pilots still contrast against perfection of instruments in the last decade's development in flying in the Canadian North. In future histories, Champlain, Joliet, LaSalle may be joined by Leigh Brintnell who made the first flight from Edmonton to Dawson City and who built the Mackenzie River Air Service, by "Puneh" Dickens who flew in 1928 from Chesterfield Inlet to Lake Athabasca, and by Canadian-trained Hollick-Kenyon, U. S. Air-Commodore for his services with Byrd in Antarctica.

Prospectors work, like pilots, at what they know, whether or not mines are enjoying stock-market popularity. The two together opened up Little Long Lac camp, and Great Bear Lake, and God's Lake which has heavy transport by water in the summer but is entirely dependent on air in the winter. Chibougamau is another camp made by winter flight, its deposits known and development funds available thirty years ago, but transportation difficulties then considered insuperable.

The increased price now offered by gold buyers has paid for a tremendous increase in the difficult and risky business of making new mines. Thus a reward has accrued to flight for opening up the Canadian Shield. The Shield itself is returning value sufficient to maintain modern industrialized life on its icy surface, with something extra for balmy financial life in the south.

The oil drums heaped on the rock at lakeside depots in the Canadian North call men through the clouds, and also cause men to turtle along the ground in one of the strangest systems of transportation the commercial world to-day can show. For comparatively short hauls of heavy freight, say machinery going a hundred miles, the northern lakes and portages have proved to be winter roads for diesel tractors, the "cats", drawing strings of double-truck sleighs, the "swings". No horses for these sleighs of the North, because one thing you can't fly

in is a load of hay. Diesels are economical, and are reliable for day-and-night runs, necessary, because re-starting in northern cold is out of the question. Manoeuvrable moving-track tractors climb the grades of the portages, negotiate tree-stumps and boulders, flat-foot over snow. The "swings" crawl over the ice, at the tail of each train a primitive caboose for the off shift of the crew. Actually these trains run in Northern Canada, and on schedule, from points on the railways to a dozen mining camps.

When you read in a mining prospectus that a winter road reaches your property, it means that a man sits hour after hour in those frigid temperatures on a stiff-sprung, fuming tractor—without a cab. If the driver were in a cab, he might be drowned. He must be able to jump, if his tons of motive-power go through the ice. He is incessantly making his way through axle-deep slush, in spite of sub-zero air. His road-bed is safely formed by the freezing of the lakes and rivers in the autumn, but then the snows descend, weighing so heavily as to sink the ice and cause water to seep over it. This water is under the snow which is a blanket, an insulation constantly being reinforced by loose fresh falls. The slush and water lying on the ice are covered and remain unfrozen, and cracks in the old ice, unmended, often let a tractor through into deep water. Smart operators put two-foot steel slats on their tractors, roll them over their road crushing the snow and helping the frost to penetrate, after every fresh fall. The transportation men are having the fun in the development of the Canadian Shield, although the big money goes to the mine owners and the lawyers and the stock brokers, a mine being a natural monopoly.

The most remarkable instance of the wealth hidden in the Canadian Shield, and the part of transportation technique in getting it out, is the Eldorado operation. Dr. Camsell, now Dominion Chief Geologist, got into Great Bear Lake on the edge of the Arctic Circle by canoe in a summer's jaunt back in 1900—and he barely got out, on foot. But he saw cobalt stains, dutifully buried them in a government report. Thirty years later Gilbert LaBine, now President of Eldorado and probably a millionaire, did a little prospecting, in the libraries at Ottawa. Some months later Leigh Brintnell on his way to Dawson City piloted his plane over Great Bear Lake, circled the shore and the islands, set it down in a cove where LaBine pointed beside some likely-looking rock. In with the cobalt LaBine noticed a black ore which could not be anything

else of value, might possibly be pitchblende. Coming out with his bag of samples, LaBine found that he had a radium mine. Further developments were not so fortuitous, but LaBine and the Canadian Government, this time through its Research Council duplicating refining methods held secret by the Belgian monopoly, brought their commercial radium out of the Canadian Shield. The price of radium has since come down from \$60,000 an ounce to less than half of that, and is still profitable to Eldorado. An industry has grown, and more directly humanitarian service has been given in the saving of lives from cancer.

But it is still the fringe of the Canadian Shield that yields the radium at Great Bear Lake, as the copper at Noranda and the nickel at Sudbury and the gold at Flin Flon. Great Bear Lake is on the fringe of the rock formation, and also at the margin bordering on convenient transportation. The Mackenzie River system, of which Great Bear Lake is a part, is one of the established trunk highways of the North. Hudson Bay Company steamers give regular summer service, with only one twelve-mile portage, between Fort McMurray, a rail-head connecting with southern Canada and the United States, and Aklavik at the river mouth. The possibilities of the inner country so far North as this are already being proved up favourably in the present "rush", by air, to Gordon Lake back from Great Slave Lake.

Closely parallel with airway transportation, the unobstructed ether waves have provided modern instantaneous communications over the rocks that would not admit telegraph poles and through the storms that would snap their wires. Ten o'clock Saturday night on the Canadian Government broadcasting chain used to be reserved for messages to men crouching by portable battery receivers in snowed-up tents and shacks on the Shield. "Walter James, somewhere in Northern Quebec: Dear Walter, Mother is well and brother George has a job, the weather here is fine"; "Alex. McIntosh, Northern Manitoba: Dear Alex., the baby has arrived, love, Molly". Now short-wave enables the camps to have their own transmitters, and keep in constant touch with camps that are neighbours only a few hundred miles away, and with their outlying fieldmen carrying receivers in their back-packs. The Government now builds radio stations in established but isolated camps such as God's Lake, which through stations hooked up with the Bell land-line system provide two-way telephone conversation wherever desired. Radio at Great Bear Lake enables tele-

grams to be exchanged with Montreal or New York in a single business day.

The Canadian Shield is becoming home to thousands of people now. They are mostly young men born in the South, and educated not in Eskimo lore but in engineering. They go in alone, often because their old homes have no place for them, but they come out rich and proud, and take wives and go back in again. They do not try to conceal their feelings of virile superiority to the South, clumping their knee-boots, loosening their leather windbreakers, disdainful of mufflers and overcoats in mild city winter.

A bride of the North is a woman with a man, needing his comradeship because she has not the sleek houses, the dresses, the shopping and the shows of the city to divert her from her dependence for happiness on that relationship. A stock of cans from the company warehouse-store is her grocery buying, no pleasure, because prices wreak distance-damage on budgets. Clothing is utilitarian—hobnailed boots, furlined slipover jackets and parkas borrowed from the Eskimos. Houses are scarce and cramped by the lack of building materials, and primitive, a real hardship being the lack of baths where water-pipes cannot be kept from frost-bursting. In the summer the beautiful lakeland, the susurrant music of leaves and waves, the clear skies of this dry climate and the varicolored rocks and green of juniper bushes, are flawed by an itch of mosquitoes and blackflies. But there's radio, and money and the future.

Not yet completely fit for human life, even the scientific life, the Canadian Shield sees its mothers flown south to hospitals to give birth. Planes are ready, and can reach the best big-city hospitals in case of any illness or accident. But the North has children, and schools for them. In winter they trudge on snowshoes or ride on toboggans pulled by their own dogs, which burrow in the snow for a warm sleep by their hitching-posts.

It's a man's life down North. It's outdoors. There's fishing and hunting. There's swagger and zest. Men have their faces frozen, and they go snow-blind as LaBine's partner did on Great Bear Lake. But the pay is high for the young engineers working for a company that is employing large capital playing for big stakes and with a conscious gambler's ready hand. The old stag prospector had a grubstake of bacon and flour, a miserly existence, lightened only by the chance of really striking it rich and having a fling perhaps as an elderly man. With the coming of the planes and such novelties as geophysical

surveys, prospecting has become capitalized and the companies' men are college-trained. Their strike will be a chief executive's post in a big operating company, with a carpeted suite in a Toronto skyscraper.

A lesser Toronto bond dealer, who turned into gold financing in 1932 with painted billboards and the slogan "Invest in Canada's Gold", took a horse to England to enter the 1938 Grand National Sweepstakes, which not the rashest investor does as a financial speculation. The Toronto Stock Exchange which absorbed the untidy old Standard Mining Exchange in 1934 erected a palace for itself in 1937, appropriately decorated the trading floor with eight tall murals, three of them relating to mining, done by Charles Comfort the artist of the International Nickel institutional advertising illustrations. The refining subject is a montage of Bessemer matte being poured into the anode mold, anodes going in narrow-gauge trams to the tank room, the operator placing an anode in the electrolytic tank, then an allegory of the gold refining process—a pot of gold at the end of a rainbow, and the operator emptying the crucible into a button. The mural on smelting shows Canadian nickel-copper sulfides being treated by the Orford process—the smelter stacks, the convertor aisle with the ladle emptying matte into a convertor, the airblast crew keeping a convertor breathing, and the nickel bottoms being separated from the copper tops. The actual mining is represented by a typical headframe of a Canadian mine with the shift coming off duty, hard-rock miners ascending to surface in a cage, a trammer with his load on an underground level, and driller and mucker working in the stope.

These mining operations and their stock-market accompaniment resulted in dividend payments of \$104,500,000 by Canadian companies in 1937, the previous year's total being \$81,000,000. \$50,700,000 came from gold and \$53,800,000 from base metals and miscellaneous. The total was more than a third of the \$305,700,000 gross total of Canadian companies' dividends for 1937, which incidentally was more than \$40 millions above 1930, the previous peak. The gross value of the 1937 mineral production of Canada was \$452 millions and a 25% increase from the previous year. Copper, up 28% in volume, yielded \$70 millions; nickel, up 29%, nearly \$59 millions. Gold shipments were the highest in history, and reached their peak in the last month of the year. Over four million ounces gold were shipped in 1937, worth \$141,877,000. These Canadian dollars were at par with U. S. dollars, owing largely to the gold

itself, which in 1936 provided 18% of the credit entering the Canadian balance of trade, and owing to devaluation of the U. S. dollar. In a sense the United States has paid for the development of the Canadian Shield. In exchange U. S. citizens have title to a share of the dividends from Canadian mines that is probably proportionately as much as the increase in the price of gold. These mines are a big enough industry for the U. S. citizen to be interested in—standing at the top of the world in the production of nickel and platinum, second in radium, bismuth and cadmium, third in gold, copper, zinc and cobalt, fourth in silver and lead.

To-day's investors in the Canadian Shield are on the ground floor, both speculatively and geographically. The established mining camps are on the margin of the known Pre-Cambrian rock occurrence. Intensive underground exploration, by drilling or perhaps by the new geophysical methods, is made attractive by the deep reserves of ore located for instance in Lakeshore Gold and International Nickel. As yet not nearly all of the surface has been explored, particularly in Northern Quebec and the Northwest Territories. Quickest results are promised from the Barren Lands, lying nude and waiting for prospectors with air-trained eyes. Planes gave geographers more knowledge of Canada in their first decade of service than had been secured in the preceding century. Planes continue to fly North, into new territory looking for new wealth.

At a point not far distant, Canadian planes will risk a head-on encounter with other planes also flying due north. Parallel lines meet at the Pole. A boundary, perhaps a frontier, is looming out of the fogs of the Arctic summer and its aurora-borealis-streaked winter night. Flight *via* the North Pole in 1937 brought two Soviet Russian planes safely from Moscow across the whole depth of Canada and into the United States, commanding your interest—or concern. This was non-stop flight, unaided by radio beacons which do not yet exist in the Canadian North, or by stops at Canadian stations. Traffic over the Canadian Shield for its local purposes may soon be able to support regular airline ground-aids. As these are installed, the stages of an international trade and travel route are marked. Down from the Pole on the other side, the activity is intense, with purposes perhaps not all disclosed. The Northern Sea Route Administration of the U. S. S. R. managed the 1937 experimental flights, and it controls an established system of weather stations, including No. 56, North Pole ice-cap or

where drifted to. An obvious purpose would be direct communication with the United States, involving all the potentialities, economic and political and even military, that go with transportation as practical as air has proved itself on the Canadian Shield. Canada has a new neighbour in the Arctic. Trader, friend, ally? Canada is between Russia and the United States. Buffer or link?