Five

MIGRATION
The Corridors of Breath

IT WAS STILL DARK, and I thought it might be raining lightly. I pushed back the tent flap. A storm-driven sky moving swiftly across the face of a gibbous moon. Perhaps it would clear by dawn. The ticking sound was not rain, only the wind. A storm, bound for somewhere else.

Haif awake, I was again aware of the voices. A high-pitched cacophonous barking, like terriers, or the complaint of shoats. The single outcries became a rising cheer, as if in a far-off stadium, that rose and fell away.

Snow geese, their night voices. I saw them flying down the north coast of Alaska once in September, at the end of a working

day. The steady intent of their westward passage, that unwavering line, was uplifting. The following year I saw them over Banks Island, migrating north in small flocks of twenty and thirty. And that fall I went to northern California to spend a few days with them on their early wintering ground at Tule Lake in Klamath Basin.

Tule Lake is not widely known in America, but the ducks and geese gather in huge aggregations on this refuge every fall, creating an impression of land in a statě of health, of boundless life. On any given day a visitor might look upon a million birds here—pintail, lesser scaup, Barrow's goldeneye, cinnamon teal, mallard, northern shoveler, redhead, and canvasback ducks; Great Basin and cackling varieties of Canada geese, white-fronted geese, Ross's geese, lesser snow geese; and tundra swans. In open fields between the lakes and marshes where these waterfowl feed and rest are red-winged blackbirds and Savannah sparrows, Brewer's sparrows, tree swallows, and meadowlarks. And lone avian hunters —marsh hawks, red-tailed hawks, bald eagles, the diminutive kestrel.

The Klamath Basin, containing four other national wildlife refuges in addition to Tule Lake, is one of the richest habitats for migratory waterfowl in North America. To the west of Tule Lake is another large, shallow lake called Lower Klamath Lake. To the east, out past the tule marshes, is a low escarpment where barn owls nést and the counting marks of a long-gone aboriginal people are still visible, incised in the rock. To the southwest, the incongruous remains of a Japanese internment camp from World War II. In agricultural fields to the north, east, and south, farmers grow malt barley and winter potatoes in dark volcanic soils.

The night I thought I heard rain and fell asleep again to the cries of snow geese, I also heard the sound of their night flying, a great hammering of the air overhead, a wild creaking of wings. These primitive sounds made the Klamath Basin seem oddly untenanted, the ancestral ground of animals, reclaimed by them each year. In a few days at the periphery of the flocks of geese, however,

I did not feel like an interloper. I felt a calmness birds can bring to people; and, quieted, I sensed here the outlines of the oldest mysteries: the nature and extent of space, the fall of light from the heavens, the pooling of time in the present, as if it were water.

There were 250,000 lesser snow geese at Tule Lake. At dawn I would find them floating on the water, close together in a raft three-quarters of a mile long and perhaps 500 yards wide. When a flock begins to rise from the surface of the water, the sound is like a storm squall arriving, a great racket of shaken sheets of corrugated tin. (If you try to separate the individual sounds in your head, they are like dry cotton towels snapping on a wind-blown clothesline.) Once airbotne, they are dazzling on the wing. Flying against broken sunlight, the opaque whiteness of their bodies, a whiteness of water-polished shells, contrasts with grayer whites in their translucent wings and tail feathers. Up close they show the dense, impeccable whites of arctic fox. Against the bluish grays of a storm-laden sky, their whiteness has a surreal glow, a brilliance without shadow.

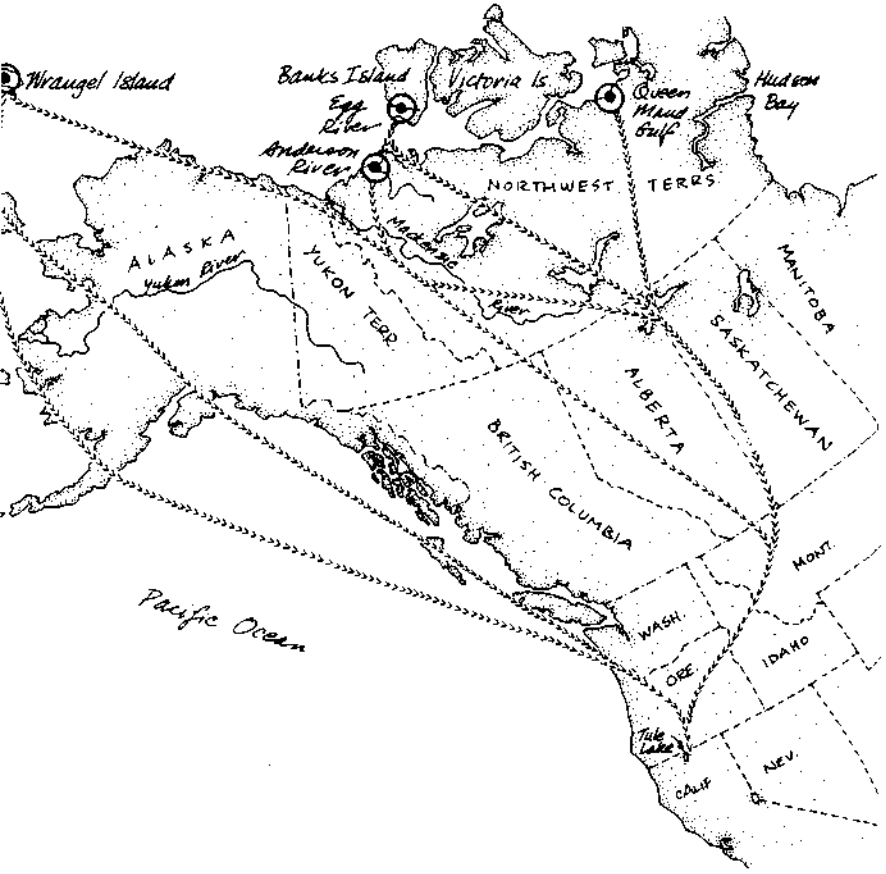
When they are feeding in the grain fields around Tule Lake, the geese come and go in flocks of five or ten thousand. Sometimes there are fořty or fifty thousand in the air at once. They rise from the fields like smoke in great, swirling currents, rising higher and spreading wider in the sky than one's field of vision can encompass. One fluid, recurved sweep of ten thousand of them passes through the spaces within another, counterflying flock; while beyond them lattice after lattice passes, like sliding Japanese walls, until in the whole sky you lose your depth of field and feel as though you are looking up from the floor of the oceán through shoals of fish.

What absorbs me in these birds, beyond their beautiful whiteness, their astounding numbers, the great vigor of their lives, is how adroitly each bird joins the larger flock or departs from it. And how each bird while it is a part of the flock seems part of something larger than itself. Another animal. Nevěr did I see a single goose move to accommodate one that was landing, nor geese on the water ever disturbed by another taking off, no matter how

dosely bunched they seemed to be. I nevěr saw two birds so much as brush wingtips in the air, though surely they must. They roli up into a headwind together in a seamless movement that brings thousands of them gently to the ground like falling leaves in but a few seconds. Their movements are endlessly attractive to the eye because of a tension they create between the extended parabolic lineš of their flight and their abrupt but adroit movements, all of it in three dimensions.

And there is something else that draws you in. They come from the ends of the earth and find this small lake every year with unfailing accuracy. They arrive from breeding grounds on the northern edge of the continent in Canada, and from the river valleys of Wrangel Island in the Russian Arctic. Their ancient corridors of migration, across Bering Strait and down the Pacific coast, down the east flank of the Rockies, are older than the nations they fly from. The lives of many animals are constrained by the schemes of men, but the determination in these lives, their traditional pattern of movement, are a calming reminder of a more fundamental order. The company of these birds in the field is guileless. It is easy to feel transcendent when camped among them.

Birds tug at the mind and heart with a strange intensity. Their ability to flock elegantly as the snow goose does, where individual birds turn into something larger, and their ability to navigate over great stretches of what is for us featureless space, are mysterious, sophisticated skills. Their flight, even a burst of sparrows across a city plaza, pleases us. In the Arctic, one can see birds in enormous numbers, and these feelings of awe and elation are enhanced. In spring in the Gulf of Anadyr, off the Russian coast, the surface of the water flashes silver with schools of Pacific herring, and flocks of puffins fly straight into the water after them, like a hail of gravel. They return with the herring to steep cliffs, where the broken shells of their offspring fall on gusts of wind into the sea by the thousands, like snow. On August 6, 1973, the ornithologist David Nettleship rounded Skruis Point on the north coast of Devon Island and came face to face with a "lost" breeding colony of



Fai/ *migration of lesser snow geese front nesting areas on Wrangel Island and in northern Canada to Tule Lake, California.*

black guillemots. It stretched southeast before him for 14 miles. On the Great Plain of the Koukdjuak on Baffin Island today, a traveler, crossing the rivers and wading through the ponds and braided streams that exhaust and finally defeat the predatory fox, will come on great windrows of feathers from molting geese, feathers that can be taken in handfuls and thrown up in the air to drift downward like chaff. From the cliffs of Digges Island and adjacent Cape Wolstenholme in Hudson Strait, 2 million thick-

billed murres will swim away across the water, headed for their winter grounds on the Grand Banks.

Such enormous concentrations of life in the Arctic are, as I háve suggested, temporary and misleading. Between these arctic oases stretch hundreds of miles of coastal cliffs, marshes, and riverine valleys where no waterfowl, no seabird, nests. And the flocks of migratory geese and ducks come and go quickly, laying their eggs, molting, and getting their young into the air in five or six weeks. What one witnesses in the great breeding colonies is a kind of paradox. For a time the snow and ice disappear, allowing life to flourish and birds both to find food and retrieve it. Protected from terrestrial predators on their island refuges and on nesting grounds deep within flooded coastal plains, birds can molt all their flight feathers at once, without fearing the fact that this form of escape will be lost to them for a few weeks. And, for a while, food is plentiful enough to more than serve their daily needs; it provides the additional energy needed for the molt, and for a buildup of fat reserves for the southward journey.

For the birds, these fleeting weeks of advantage are crucial. If the weather is fair and their timing has been good, they arrive on their winter grounds with a strange, primal air of achievement. When the snow geese land at Tule Lake in October, it is not necessary in order to appreciate them to picture precisely the line and shading of those few faraway places where every one of them was born—Egg River on Banks Island, the mouth of the Anderson River in the Northwest Territories, the Tundovaya River Valley on Wrangel Island. Merely knowing that each one began its life, took first breath, on those intemperate arctic edges and that it alights here now for the first or fifth or tenth time is enough. Their success urges one to wonder at such a life, stretched out over so many thousands of miles, and moving on every four or five weeks, always moving on. Food and light running out behind in the fall, looming ahead in the spring.

I would watch the geese lift off the lake in the morning, spirál up white into the blue California sky and head for fields of two-

row barley to feed, able only to wonder what this kind of nomadic life meant, how their lives fit in the flow of time and made clearer the extent of space between ground and sky, between here and the Far North. They flew beautifully each morning in the directions they intended, movements of desire, arabesques in the long sweep south from Tundovaya Valley and Egg River. At that hour of the day their lives seemed flush with yearning.

ONE is not long in the field before sensing that the scale of time and distance for most animals is different from one's own. Their overall size, their methods of locomotion, the nature of the obstacles they face, the media they move through, and the length of a full life are all different. Formerly, because of the ready analogy with human migration and a tendency to think only on a human scale, biologists treated migratory behavior as a speciál event in the lives of animals. They stressed the great distances involved or remarkable feats of navigation. The practice today is not to differentiate so sharply between migration and other forms of animal (and plant) movement. The maple seed spiraling down toward the forest floor, the butterfly zigzagging across a summer meadow, and the arctic tem outward bound on its 12,000-mile fall journey are all after the samé thing: an environment more conducive to their continued growth and survival. Further, scientists now understand animal movements in terms of navigational senses we are still unfamiliar with, such as an ability to detect an electromagnetic field or to use sound echos or differences in air pressure as guides.

In discussing large-scale migration like that of snow geese, biologists posit a "familiar area" for each animal and then speak of its "home range" within that area, which includes its winter and summer ranges, its breeding range, and any migratory corridors. The familiar area takés in the whole of the landscape an animal has any notion of, an understanding it gains largely through exploration of territory adjacent to its home range during adolescence. Intense adolescent exploration, as far as we know, is common to all animals. Science's speculation is that such exploring ensures the

survival of a group of animals by familiarizing them with alternatives to their home ranges, which they can turn to in an emergency.

A question that arises about the utilization of a home range is: how do animals find their way to portions of the home range they háve nevěr seen? And how do they know when going there would be beneficial? The answers to these questions still elude us, but the response to them is what we call migration, and we háve some idea about how animals manage those journeys. Many animals, even primitive creatures like anemones, possess a spatial memory of some sort and use it to find their way in the world. Part of this memory is apparently genetically based, and part of it is learned during travel with parents and in exploring alone. We know animals use a considerable range of senses to navigate from one pláce to another, to locate themselves in space, and actually to *learn* an environment, but which senses in which combinations are ušed, and precisely what information is stored—so far we can only speculate.

The vision most of us háve of migration is of movements on a large scale, of birds arriving on their wintering grounds, of spawning salmon moving upstream, or of wildebeest, zebra, and gazelle trekking over the plains of East Africa. The movements of these latter animals coincide with a pattern of rainfall in the Serengeti-Mara ecosystem; and their annual, roughly circular migration in the wake of the rains reveals a marvelous and intricate network of benefits to all the organisms involved—grazers, grasses, and predators. The timing of these events—the heading of grasses in seed, the dropping of manure, the arrival of the rains, the birth of the young—seems perfectly fortuitous, a melding of needs and satisfactions that caused those who first examined the events to speak of a divine pian.

The dependable arrival of swallows at the mission of San Juan Capistrano, the appearance of gray whales off the Oregon coast in March, and the movement of animals like elk from higher to lower ranges in Wyoming in the fall are other examples of migration familiar in North America. I first went into the Arctic with no other ideas than these, somewhat outsize events to guide me. They

opened my mind sufficiently, however, to a prodigious and diverse movement of life through the Arctic; they also prompted a realization of how intricate these seemingly simple natural events are. And as I watched the movement of whales and birds and caribou, I thought I discerned the ground from which some people háve derived so much of their metaphorical understanding of symmetry, cadence, and harmony in the universe.

Several different kinds of migration are going on in the Arctic at the samé time, not all of them keyed to the earth's annual cycle. Animals are still adjusting to the retreat of the Pleistocene glaciers, which began about 20,000 years ago. Some temperate-zone species are moving gradually but steadily northward, altering their behavior or, like the collared lemming and the arctic fox, growing heavier coats of fur as required.

Climatic fluctuations measured over a much shorter period of time—on the order of several hundred years—are responsible for cyclic shifts of some animal populations north and south during these periods. Over the last flfty years, for example, cod and several species of bird háve been moving farther north up the west coast of Greenland, while populations of red fox háve been establishing themselves farther north on the North American tundra.* As animals long resident in the Arctic respond to certain kinds of short-term ecological disaster, as was the čase with muskoxen in the winter of 1973-74, or t0 violent fluctuations in their population, as with lemmings, they reinhabit, over time, former landscapes and abandon others.

To cope with annual cycles—the drop in temperature, the loss of light, the presence of snow cover, and a reduction in the amount of food available—arctic animals háve evolved several

* American robins háve moved as far north as Baffin Island in recent years. The Eskimos around Pond Inlet and Arctic Bay, who recognized the bird from stories white travelers told them about it, first saw them around 1942. Eskimos say the robin came that far north then because there was "a lot of fighting in the south" at that time.

strategies. Lemmings move under the snow; bumblebees hibernate; and arctic foxes move out onto the sea ice. Many other animals, including caribou, walrus, whales, and birds, migrate over quite significant distances. Arctic terns, for example, fly to the Antarctic Oceán at the end of the arctic summer, an annual circuit on which they see fewer hours of darkness than probably any animal on earth. Other migratory birds that head out to sea change their ecological niche. The long-tailed jaeger, a rodent hunter on the summer tundra, becomes a pelagic scavenger on the high seas in winter.

On a scale smaller yet than these annual cycles are the migrations of animals during a season, like the movement of muskoxen; and the regular patterns of localized movement keyed to an animal's diurnal rhythms, like the hábit among some wolf packs of leaving a den each evening to hunt. (Arctic animals, as mentioned earlier, maintain a diurnal pattern in špite of the presence of continuous daylight in summer.)

When one considers all these comings and goings, and that an animal like the muskox might be involved simultaneously in several of these cycles, or that when the lemming population crashes, snowy owls must fly off in the direction of an alternativě food supply, and when one adds to it the movement of animals to the floe edges in spring, or the insects that rise in such stupendous numbers on the summer tundra, a vast and complex pattern of animal movement in the Arctic begins to emerge. Also to be considered are the release of fish and primitive arthropods with the melting of lake and ground ice. And the peregrinations of bears. And a finál, wondrous image—the great oceán of aerial plankton, that almost separate universe of ballooning spiders and delicate larval creatures that drifts over the land in the summer.

The extent of all this movement is difficult to hold in the mind. Deepening the complications for anyone who would try to fix this order in time is that within the rough outlines of their traditional behaviors, animals are always testing the landscape.

They are always setting off in response to hints and admonitions not evident to us.

The movement of animals in the Arctic is especially compelling because the events are compressed into but a few short months. iMigratory animals like the bowhead whale and the snow goose often arrive on the last breath of winter. They feed and rest, bear their young, and prepare for their southward journey in that window of light before freeze-up and the first fall snowstorms. They come north in staggering numbers, travel hundreds or even thousands of miles to be here during those few weeks when life swirls in the water and on the tundra and in the bahny air. Standing there on the ground, you can feel the land filling up, feel something physical rising in it under the influence of the light, an embrace or exaltation. Watching the animals come and go, and feeling the land swell up to meet them and then feeling it grow still at their departure, I came to think of the migrations as breath, as the land breathing. In spring a great inhalation of light and animals. The long-bated breath of summer. And an exhalation that propelled them all south in the fall.

ANIMALS define much of the space one encounters in the Arctic because the land, like the sea, is expansive and there are so few people about. Nowhere is this more apparent than in northern Bering Sea in the spring. Certain regions of the world, sea straits in particular, funnel the movements of migrating animals. This is true at the Bosporus and at Gibraltar, for example, where land birds move north and south and sea creatures east and west, as if through the throat of an hourglass. Bering Strait, however, is unique in the way it concentrates life. The arrangement of the earth's land masses is such that they come close to meeting only in the North; at Bering Strait the Chukchi Peninsula of the Eastern Hemisphere, with its birds and animals, nearly touches the Seward Peninsula of the Western Hemisphere, with its birds and animals. Moreover, the North Pacific coasts converge here, bringing together the offshore migrations of whales and pelagic seabirds, the near-shore migrations of seals and walrus, and the coastal migrations of birds like eiders.*

1`he Bering Sea itself concentrates life as well because it is an extremely rich feeding ground for marine mammals. Alany of the birds, fish, and sea mammals moving within its borders during the height of migratory activity in the spring and fall are local populations. ´The nearness of the two continents, the convcrgence of the coasts, and the size and diversity of local bird populations, in fact, háve made the Bering Strait region the very image of a remote paradise for European and American bird-watchers.

In the spring, summer, and fall of different years, 1 háve either been on the water in northern Bering Sea or flying transects over it with marine scientists. In the course of that time I háve wondered why the concentration of life here in the spring is so little known to North Americans, for the concentrations are astounding. To the southeast, to begin with, some 24 *million* migratory waterfowl and shorebirds nést and feed on the delta of the Yukon and Kuskokwim rivers (the Y-K Delta) between May and September. These include black brant, sandhill cranes, several species of eider and loon, surface-feeding ducks such as the green-winged teal and greater scaup, plovers, phalaropes, and turnstones and the entire North American populations of emperor geese and spectacled eider.t

* Sea mammals migrating up the North American coast negotiate the Aleutian barrier at Unimak Pass, providing an observer at Cape Sarichef on Unimak Island with a spectacular view. In the eastern Arctic, the convergence of Greenland and Baffin Island at Davis Strait and the presence of an extensive floe edge in Lancaster Sound concentrate the migrations of sea mammals and birds, similarly, for an observer at Cape I lay on Bylot Island.

t Alany of these particular birds—pintail ducks, white-fronted geese, and tundra swans, for example—will fly to Klamath Basin in the fall, together with snow geese that stop briefly to feed on the Y-K Delta en routě from Siberia.

In the Bering Sea itself, stocks of herring, pollock, halibut, and yellowfin sole, and what are probably the largest clam beds in the world, put this sea in a class almost by itself. From here, beginning in latě May, hundreds of thousands of chinook (king) salmon will start up the rivers of western Alaska, followed quickly by even larger numbers of chum (dog) salmon, which will be followed a week or so later by numbers as large of pink (humpback) salmon. Finally, in July, will come runs of coho (silver) and stupendous runs of sockeye (red) salmon.

Ornithologists believe that, in addition to the 24 million migratory birds nesting on the Y-K Delta in the spring, there are an additional 5 million seabirds living in northern Bering Sea, mostly auklets, murres, and kittiwakes, and smaller numbers of horned and tufted puffins, pelagic cormorants, and pigeon guillemots. And some 500,000 oldsquaw ducks that winter south of Saint Lawrence Island. Around the margins of Bering Sea, in saltwater marshes and lagoons, are yet more birds, flocks of migratory Steller's eider, long-billed dowitchers, dunlins, and whimbrels, all searching the shallows for food; plovers, turnstones, and sandpipers; and many of the species of bay and sea duck already mentioned. An observer in the coastal lagoons might také in 10,000 or even 20,000 birds at a glance, many of them in stunningly colorful nuptial plumages. When numbers fail, as they always do, one thinks of mesmerizing incidents, like the day in May 1982 when sandhill cranes passed in flocks over the village of Nome almost continuously for two hours, on their way to Russia. Or the afternoon 75,000 king eiders flew past Dali Point on the Y-K Delta in two hours.

That is only the birds, and to suggest the uncountable fish. In March, more than three-quarters of a million marine mammals are concentrated at the southern edge of the Bering Sea ice, in an area scientists call the ice front: 300,000 bearded seals, 75,000 ribbon seals, 225,000 spotted seals, 250,000 Pacific walrus, 4400 bowhead whales, and 15,000 belukhas. Living in the fast ice along the Bering Sea coast, deep within the ice pack, are more than one million ringed seals, the most ice-adapted of the seals.

In the spring, all of this animal life is poised to move north, awaiting only the fracturing and melting of the ice. Until then, they are confined to open water to the south. The ranges of the bearded, spotted, and more solitary ribbon seals overlap toward the edge of the ice front (a region 10 to 40 miles wide, depending on prevailing winds and storm conditions in the north Pacific). The walrus winters deeper inside the ice front, where there are intact floes large enough to bear its great weight. (Walrus can surface through as much as eight inches of sea ice, using their massive heads as rams, and if they are trapped out on the ice by a sudden freeze, they can walk to areas where they can break through to feed, which arctic seals can't do.) The whales move throughout the ice front during the winter months. As early as latě April, when the ice north of Saint Lawrence Island is still solid, the bowheads may start pressing north, on the Russian side of Bering Sea. If the ice is not heavy, they will be followed or accompanied by herds of belukhas. As the ice begins to open up in latě April and May, walrus will head north, followed a few weeks later by the chree species of ice seal. Almost as soon as cracks and leads begin to appear, they will be ušed for feeding by flocks of migrating king and common eiders and oldsquaw ducks.

The surface of the great expanse of ice covering Bering Sea in April and May is infinitely varied. Cracked, rafted up over itself, and refrozen where it has briefly opened, it shows a dozen shades of gray and a dazzling pattern of fractures. Or for tens of square miles it may stretch unbroken beneath a layer of snow, a nearly continuous tone of white, with only the slight irregularities called ice hummocks or the disc rows of rubble where two floes háve ground against each other to create shadows. Then a lead half a mile long and 20 feet wide will suddenly appear, revealing water dark as ink, with the facing edges of the ice being mirror images of each other. Most of the longer, broader cracks, it soon becomes apparent, tend to occur along a southwest-northeast axis. Occasionally these expand into areas of open water the size of small lakes. By the middle of May, bowhead whales are moving through

these annually recurring lead systems, northeast through Bering Strait and northward to Point Barrow. They leave behind a recognizable trail, where their backs háve rubbed the underside of the ice oř where they háve broken through in refrozen leads oř at enlarged seal holes to breathe. (These trails are evidence of the bowhead's remarkable ability to find its way from one systém of open leads to the next in heavy ice.) Because of their white chins and belly markings, it is sometimes possible to spot bowheads cruising just below the translucent ice. More often, one notices herds of white belukha accompanied by their gray calves.

If the ice ahead is still solid (somehow they know), bowheads will milí about together in the larger leads, cavorting in small groups, breaching, and even spy-hopping. Mating also occurs at this time. Walrus, bearded seal, and ringed seal may be swimming in these lead systems at the samé time. And new ice in the area will show holes with characteristically different shapes where each species of animal has broken through to breathe.

Because the prevailing lead systems encourage marine mammals to swim in certain directions and because they concentrate animals in certain places if the ice ahead is too heavy, memorable sightings occasionally occur in the ice south of Bering Strait. In April 1981, one scientist, flying along a channel three-quarters of a mile wide and about 15 miles long, counted 332 bowhead whales, nearly a tenth of the Pacific population, before he was obliged to turn back at the international dáte line (the Russian border at sea).

After the bowheads háve passed north, along with a large portion of the belukha whale and walrus populations and large numbers of bearded, spotted, and ringed seals, Bering Sea becomes the summer ground of several other species of whale. Gray whales arrive from the North American and Korean coasts, and minke whales and orcas arrive from the Pacific. Sei, humpbacks, and an occasional Pacific right whale may come as far as Saint Lawrence Island. (The samé waters rendered idyllic in May by the gentle

mating of bowhead whales seem ominous in June, when orcas are hunting walrus and gray whales with chilling precision. The walrus they sometimes abandon uneaten; and they may také no more than the tongue of a gray whale they háve drowned. The presence of diverse animals in such abundance here each year, however, testifies to a set of equitable relationships, however ruthless they may seem to us on occasion.)

The breadth of our still incomplete understanding of the Bering Sea ecosystem is exemplified by a current confusion over the identity of some of its larger parts. An unnamed whale, smaller than the bowhead and with a fiat rather than a bowed head, and with denser rib and jaw bones and a lighter-colored baleen, swims in Bering Sea. Eskimos, who refer to the bowhead as *ingitivak,* call this other whale *ingutuk.* Its existence has been known to scientists since at least the time of whaling captain and historian Charles Scammon in the 1870S, but it has nevěr been fully described. Another cetacean, even less known, is a large, brown, bowhead-type whale that might be a color phase of *Balaena mysticetus.*

A spring visitor to the village of Nome on Seward Peninsula would stand at the edge of this great seasonal upwelling of life in Bering Sea. From Cape Nome east of the village he could watch whales spouting and see walrus and seals passing, alcid birds diving for fish, and ducks flying up and down the coastline. Salmon would be coming up the Nome River. Near Safety Sound, where swans, ducks, and geese would be feeding, spotted seals might be hauled out on the beaches. Up on the tundra north of the village one might be lucky enough to encounter a remarkable open-country bird called a northern wheatear, a small thrush with as great a claim to making a prodigious migratory journey as the arctic tern. The wheatear arrives from Russia each spring with bluethroats, yellow wagtails, and arctic warblers; certain individuals may háve come from as far away as Saudi Arabia, perhaps even the northern edge of the Sahara. They fly as far east in North America as the Mackenzie River.

The northern wheatear is a reminder that all migration is not strictly north and south, and, because it is a newcomer to North America, that animals are experimenters, pushing at the bounds of their familiar areas in response to changes in their environment. Nothing is ever quite fixed for them. One afternoon a man in Nome remarked that the bowhead migration through Bering Strait was "latě this year." It was not really "latě" of course, but only part of an arrangement that diífers slightly from year to year. They are not on our schedules. Their appointments are not solely with us.

AFTER the passage of fish and marine mammals through the Bering Sea region, and the arrival of birds at their accustomed deltas and sea rookeries, there is a third great migratory spectacle to behold in the Arctic: the movement of caribou.

North American caribou are divided into three groups. The woodland caribou, the largest of the three, lives in the taiga forests of the subarctic and migrates over only relatively short distances. Peary caribou, the smallest of the three, occupy parts of the Greenland coast and northern islands in the Canadian Archipelago and also move over relatively short distances each year. Barren-ground caribou are the distant travelers. As many as 2 million of them trek hundreds of miles each year between their winter range near the tree line and well-defined calving grounds on the tundra.*

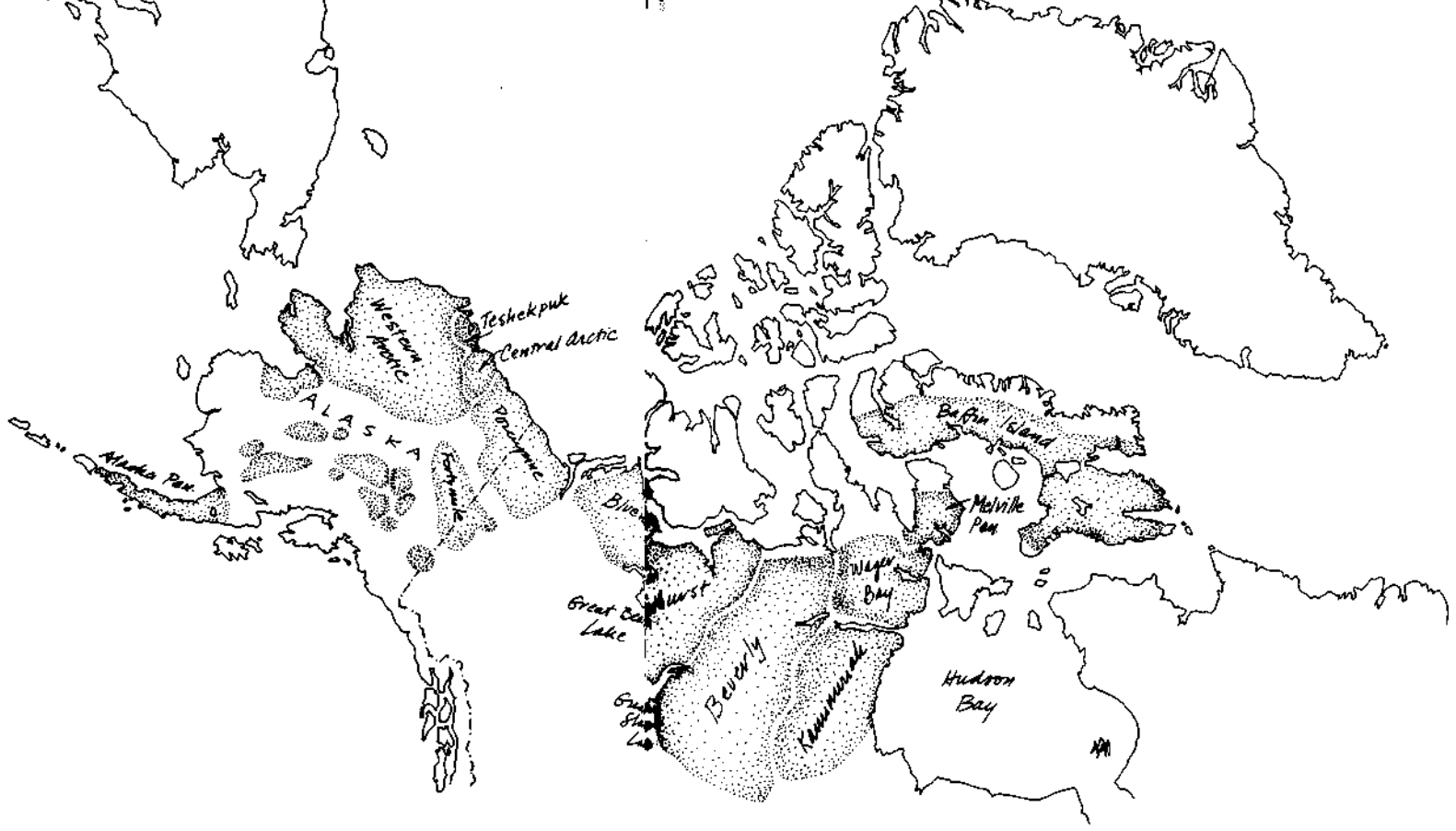
Caribou biologists recognize more than thirty different arctic herds, each occupying a different region. The ones that migrate the farthest each year are the Western and Central Arctic herds in northern Alaska; the Porcupine herd, which straddles the U.S.-Canada border; and, from west to east in Canada, the Bluenose, Bathurst, Beverly, and Kaminuriak herds.

* None of the three caribou is a reindeer. Reindeer, a separate subspecies of *Rangifer tarandus,* are the deer native to northern Europe and Asia. Of the many that háve been brought to Alaska as domestic stock, a significant number háve joined herds of caribou.

Scientists are uncertain what starts caribou on their northward journey—knowledge that they háve stored enough fat to carry them through, perhaps. They endure spring blizzards on their journeys and cross ice-choked rivers with great determination and a sure sense of bearing, but they also choose paths of least resistance over the land, often following in each other's tracks through deep snow. Pregnant cows are normally in the lead; mature bulls may be as much as a month behind the cows, or nevěr arrive at the calving grounds at all. By the end of their arduous journey the females are thin and tattered-looking. Behind them, in places where they háve had to cross rivers in a stage of breakup, there may be the carcasses of hundreds of drowned and fatally injured animals. Their calving grounds, writes biologist George Calef, appear "bleak and inhospitable. Meltwater lies in pools on the frozen ground, the land is often shrouded in fog, and the wind whistles unceasingly among the stunted plants and bare rocks." The advantages of these dismal regions, however, are several. The number of predators is low, wolves having dropped away from the herds at more suitable locations for denning to the south. Food plants are plentiful. And these grounds either offer better protection from spring snowstorms or experience fewer storms overall than adjacent regions.

Most calves are born within a few days of each other, and calving occurs at least a month before swarms of emergent mosquitoes, blackflies, warble flies, and botflies embark on a harassment of the caribou that seems merciless to a human observer. If one were to think of events that typify arctic life—the surge of energy one feels with daily gains of ten or fifteen minutes of sunlight in the spring, or waking up one morning to find the oceán frozen—one would also include that feeling of reliéf that descends over a caribou herd when a wind comes up and puts hordes of weak-flying mosquitoes to the ground.

After calving, cows and their offspring join immature animals, barren cows, and the bulls in "postcalving" aggregations of 75,000 or more animals, their numbers stretching from horizon to horizon.



Distribution of major caribou herds in the North American Arctic.

They trek slowly south, breaking up into smaller herds. The first fall storms catch them in open country, and in the cold, snowy air these "gray shepherds of the tundra," as the Alaskan poet John Haines calls them, "pass like islands of smoke." They také shelter in the short timber of the taiga for the winter.

After the herds háve gone, the calving grounds can seem like the most deserted places on earth, even if you can sense strongly that the caribou will be back next year. When they do return, hardly anything will háve changed. A pile of caribou droppings may také thirty years to remineralize on the calving grounds. The carcass of a wolf-killed caribou may lie undisturbed for three or four years. Time pools in the stillness here and then dissipates. The country is emptied of movement.

The coming and going of the animals during the short summer gives the Arctic a unique rhythmic shape, but it is to be felt only in certain places. Mostly, summer and winter, the whole land is still. The arctic explorer George De Long called it "a glorious country to learn patience in." Time here, like light, is a passing

animal. Time hovers above the tundra like the rough-legged hawk, oř collapses altogether like a bird keeled over with a heart attack, leaving the stillness we call death. In the thin film of moisture that coats a bit of moss on a tundra stone, you can find, with a strong magnifying glass, a world of movement buried within the larger suspended world: ageless pinpoints of life called water bears migrate over the wet plains and canyons of jade-green vegetation. But even here time is on the verge of collapse. The moisture freezes in winter. Or a summer wind may carry the water bear off and drop it among bare stones. Deprived of moisture, it shrivels slowly into a desiccated granule. It can endure like this for thirty or fořty years. It waits for its time to come again.

Long, unpunctuated hours pass for all creatures in the Arctic. No wild frenzy of feeding distinguishes the short summer. But for the sudden movements of charging wolves and bolting caribou, the gambols of muskox calves, the scamper of an arctic fox, the swoop of a jaeger, the Arctic is a long, unbroken bow of time. Twilight lingers. There are no summer thunderstorms with bolts of lightning. The ice floes, the caribou, the muskoxen, all drift. To lie on your back somewhere on the light-drowned tundra of an Ellesmere Island valley is to feel that the ice ages might háve ended but a few days ago. Without the holler of contemporary life, that constant disturbance, it is possible to feel the slope of time, how very far from Mesopotamia we háve come. We move at such a fast clip now. We draw up geological charts at a snap, showing the possibilities for oil in Tertiary rocks in the Sverdrup Basin beneath Ellesmere's tundra. We delineate the life history of the ground squirrel. We list the butterflies: the sulphurs, the arctics, a copper, a blue, the lesser fritillaries. At a snap. We enumerate the plants. We name everything. Then we fold the charts and the catalogs, as if, except for a stray fact or two, we were doně with a competent description. But the land is not a painting; the image cannot be completed this way.

Lying fiat on your back on Ellesmere Island on rolling tundra without animals, without human trace, you can feel the silence stretching all the way to Asia. The winter face of a muskox, its unperturbed eye glistening in a halo of snow-crusted hair, looks at you over a cataract of time, an image that has endured through all the pulsations of ice.

You can sit for a long time with the history of man like a stone in your hand. The stillness, the pure light, encourage it.

FOR years scientists háve been aware of difFerent rhythms of life in the Arctic, though they are not particularly arctic rhythms. Tundra soil cores examined by fossil-pollen experts háve shown that changes in the composition of arctic plant communities háve occurred periodically with a change in climate. Borings in the Greenland ice cap háve revealed rhythmic fluctuations in average temperature over the centuries. A careful examination of arctic refuse middens by archaeologists, paleobotanists, and paleozoologists has revealed a succession of differently equipped early human cultures, whose entries into the Arctic are also related to periods of climatic change. The animal bones found in their camps confirm parallel fluctuations in the populations of the animals they hunted.

A number of scientists feel all this information should mesh, that in some way the rhythms of human migration, climatic change, and animal population cycles should be interrelated. With a precise enough mathematics even the "nine-year lynx-snowshoe hare cycle" and the "seventy-year caribou cycle" should fit neatly into a basic pattern. Few háve sought to rigorously integrate this materiál, and many don't believe the relationships even exist, except in a generál way. Since the 1930S, however, the Danish scientist Christian Vibe has taken the possibility very seriously, and no other body of work has been so clearly linked with the attempt to find a basic period of arctic cycling, a tantalizing bit of information of enormous interest to biologists, historians, and arctic developers.

Climatic change—the advance and retreat of glacial ice in the Northern Hemisphere—is the hallmark of the Pleistocene, the

epoch of man's emergence.* Vibe, keeping this in mind, and believing whatever he learned could be applied to understanding the climatic future of Europe and America, posed certain questions for himself. Why, he asked, were seals scarce at Ammassalik on the east coast of Greenland at the turn of the century, while at the samé time they were plentiful along Greenland's southwest coast? Why did the caribou population of western Greenland crash suddenly at the end of both the eighteenth and nineteenth centuries? And what accounted for the periodic northward movements of Atlantic herring and cod in the North Atlantic?

Vibe scrutinized the records of the Royal Greenland Trading Company, which took in sealskins and fox skins, narwhal ivory, and other indicators, and by comparing these records with annual records of sea-ice movement and annual rainfall and snowfall, Vibe thought he could discern patterns. He checked his findings, to corroborate them further, by going over 232 years of fur-trading records from the Hudson's Bay Company in Canada, and by examining records kept by wool growers in southwest Greenland.

The first pattern to emerge for Vibe was a cycle of sea-ice formation and movement that lasted about 150 years, which records from arctic ships of exploration seemed to support. Vibe regarded as a key insight in this early work the fact that fluctuations in the arctic climate that were responsible for shifts of land and sea animals north and south over prolonged periods were tied to a lunar cycle of 18.6 years (the time it takés the moon to intersect the earth's orbit around the sun again at the samé spot). Because the length of this lunar cycle is not a whole number, the maximum and minimum effect it has on the earth's tides (and therefore on ice formation and weather) can oceur at different seasons of the

* Glacial periods are relatively rare in the earth's history. Scientists háve discovered only four in the last 600 million years, the last of which is still going on. The Holocene, as far as we know, is only an interglacial stage, a reprieve, between the retreat of the Wisconsin ice (or Wiinn ice in Europe) and the next glacial advance.

year, in successive 18.6-year periods. This led Vibe to posit a primáry period of 698 years for the Arctic's weather pattern, with secondary periods of 116.3 years, and what Vibe calls a basic "true ecological eyeling period" of 11.6 years.

Depending upon your point of view, either Vibe's insights are ingenious and his mathematics elegant, or his systém is inipossibly broad and complicated and of little help in understanding arctic change. His inquiry might be considered an entirely esoteric and rarefied pursuit, in fact, if it were not for two things. In the Arctic one is constantly aware of sharp oscillarion. It is as familiar a pattern of human thought and animal movement to the arctic resident as the pattern of four seasons is to a dweller in the Temperate Zone. In špite of the many manifestations of this rhythm, and the effect of sharp oscillation not only on resident animals but, probably, too, on the cultures that matured in these regions, Vibe's remains the only serious attempt at a deseription. Second, insofar as Vibe's theories explain oscillation in temperate-zone climate patterns or indicate harbingers of another ice age, they háve a significant bearing on our developing patterns of commerce and economics, especially in the Arctic.

It is easy to say that the Arctic is characterized by sharp oscillation, just as it is to say that the airs of a temperate-zone spring are felicitous, but it is difHcult to say precisely why. The basal annual rhythm of the North is winter/summer. The weeks during breakup and freeze-up are short, frequently perilous times, when strategies employed by both animals and human hunters to secure food are momentarily disrupted. The long winter and short summer constitute a temporal pattern around which life carefully arranges itself. Preparations for winter show up clearly everywhere in the land. The short-tailed weasel grows its white eoat and the collared lemming its long snow claws. Tundra rodents shift from their night-active summer pattern to a day-active winter pattern, with but a few days of irregular rhythm in between. The arctic fox lineš lemmings up in neat rows in its winter caches.

A second pattern complements this oscillation—long stillnesses

broken by sudden movement. The river you háve been traveling over by dogsled every week for eight months, and háve come to think of as a solid piece of the earth, you wake one day to find a heaving jumble of ice. The spring silence is broken by pistol reports of cracking on the river, and then the sound of breaking branches and the whining pop of a falling tree as the careening blocks of ice gouge the riverbanks. A related but far eerier phenomenon occurs in the coastal ice. Suddenly in the middle of winter and without warning a huge piece of sea ice surges hundreds of feet inland, like something alive. The Eskimo call it *ivu*.* The silenr arrival of caribou in an otherwise empty landscape is another example. The long wait at a seal hole for prey to surface. Waiting for a lead to ciose. The Eskimo háve a word for this kind of long waiting, prepared for a sudden event: *quinuituq.* Deep patience.

As I moved through the Arctic I thought often about a rhythm indigenous to this land, not one imposed on it. The imposed view, however innocent, always obscures. The evidence that there *is* a dilferent rhythm of life here seemed inescapably a part of the expression of the animals I encountered, though I cannot say precisely why. A coherent sense of the pervasiveness of such a rhythm is elusive.

The indigenous rhythm, or rhythms, of arctic life is important to discern for more than merely academie reasons. To understand why a region is different, to show an initial deference toward its mysteries, is to guard against a kind of provincialism that vitiates the imagination, that stifles the capacity to envision what is different.

Another reason to wonder which rhythms are innate, and what they might be, is related as well to the survival of the capacity to imagine beyond the familiar. We háve long regarded animals as

* Eskiino deseriptions of this phenomenon were not taken seriously until 1982, when archaeologists working at Utqiagvik, a prehistorie village site near Barrow, Alaska, discovered a family of five people that had been crushed to death in such an incident.

a kind of machinery, and the landscapes they move through as backdrops, as paintings. In recent years this antiquated view has begun to change. Animals are understood as mysterious, within the context of sophisticated Western learning that takés into account such things as biochemistry and genetics. They are changeable, not fixed, entities, predictable in their behavior only to a certain extent. The world of variables they are alert to is astonishingly complex, and their responses are sometimes highly sophisticated. The closer biologists look, the more the individual animal, like the individual human being, seems a reflection of that organization of energy that quantum mechanics predicts for the particles that compose an atom.

The animal's environment, the background against which we see it, can be rendered as something like the animal itself—pardy unchartable. And to try to understand the animal apart from its background, except as an imaginative exercise, is to risk the collapse of both. To be what they are they require each other.

Spatial perception and the nature of movement, the shape and direction something takés in time, are topics that háve been cogently addressed by people like Werner Heisenberg, Erwin Schródinger, Paul Dirac, and David Bohm, all writing about subatomic phenomena. I believe that similar thoughts, potentially as beautiful in their complexity, arise with a consideration of how animals move in their landscapes—the path of a raven directly up a valley, the meander of grazing caribou, the winter movements of a single bear over the sea ice. We hardly know what these movements are in response to; we choose the dimensions of space and the durations of time we think appropriate to deseribe them, but we háve no assurance that these are relevant. To watch a gyrfalcon and a snowy owl pass each other in the samé sky is to wonder how the life of the one affects the other. To sit on a hillside and watch the slow intermingling of two herds of muskoxen feeding in a sedge meadow and to try to discern the logic of it is to grapple with uncertainty. To watch a flock of snow geese roli off a headwind together is to wonder where one animal begins and another

ends. Animals confound us not because they are deceptively simple but because they are finally inseparable from the complexities of life. It is precisely these subtleties of fact and conception that comprise particle physics, which passes for the natural philosophy of our age. Animals move more slowly than beta particles, and through a space bewildering larger than that encompassed by a cloud of electrons, but they urge us, if we allow them, toward a consideration of the samé questions about the fundamental nature of life, about the relationships that bind forms of energy into recognizable patterns.

IN trying to discover the routě and the time of man's arrival in the New World, science has had little to work with but bits of charcoal and an occasional broken tool or weapon retrieved from ancient fires and hunting sites. There is little disagreement about how man came to North America—people migrated across a broad, dry plain called Beringia from Asia during several different periods in the latě Pleistocene. But evidence that would confirm man's arrival at some time earlier than 35,000 years ago, or even 20,000 years ago, is in dispute. The certain evidence is that people háve been living in North America for at least 14,000 years.

Assuming that man arrived in North America on foot instead of by boat, and gradually at that, he crossed from Asia either sometime before 35,000 years ago, when the Bering land bridge was open, or not until much later, about 25,000 to 23,000 years ago. (The Bering land bridge was present from about 25,000 years ago until about 11,000 years ago, but it was only during the period from 25,000 to 23,000 years ago that man could háve both crossed from Asia and traveled south to the centrál plains of North America. After that the Wisconsin Ice Age climaxed; the eastern and western North American ice sheets met, closing off the way south and separating the American prairie from the Arctic. Western Alaska remained free of ice during this period, and no doubt people continued to live farther east in Beringia until Bering Sea rose with meltwater from the ice sheets, flooding the land bridge and separating Asia and North America.)

Many archaeologists believe man came to North America in two waves. The first (the one that might háve crossed 25,000 to 23,000 years ago, or earlier) brought with it flaked stone and bone tools comparable to Neanderthal man's Mousterian tools.* The second wave came about 13,000 years later and brought with it a more advanced tool tradition, comparable to the Aurignacian tools of Cro-Magnon man.t Both immigrant groups were big-game hunting cultures, subsisting on animals like large-horned bison, ground sloth, and woolly mammoth.

How the Arctic itself, the land east and north of the land bridge, became inhabited is unknown. The early hunting cultures in Alaska were succeeded about 5000 years ago by what some archaeologists regard as a less robust and impressive cultural tradition, one distinguished only by its very finely worked small tools. These microblade cultures were very likely the first human cultures to move into the North American Arctic.

Archaeologists know of two periods in the recent past when the climate warmed enough in the Arctic to allow human beings in skin boats easy summer passage through the islands of the Canadian Archipelago. These two "climatic optimums" occurred between about 3500 and 4500 years ago and again about 1100 to 900 years ago, and people migrated into the high Arctic on both occasions.

Louis Giddings, an archaeologist with a gift for locating important prehistorie sites, discovered cultural sequences at Onion

* The Mousterian tradition, named for tools discovered near Le Moustier in the Dordogne in France, marks the high point of Neanderthal culture in the Middle Paleolithic, 40,000 to 100,000 years ago. See chart, Appendix III.

t The Aurignacian was one of several traditions that emerged in the upper Paleolithic in western Europe between ten and fořty thousand years ago, when Cro-Magnon people displaced the Neanderthal culture.

Portage on the Kobuk River in Alaska and at Cape Krusenstern, Alaska, that provided basic chronologies for Arctic cultural phases. With Giddings's findings and those of archaeologists working in northern Canada and in Greenland, it has become possible in recent years to organize a relatively coherent picture of early human occupation of the North American Arctic.

Before setting this forth, I should make two points. First, human beings migrating into this region were making a very bold move. Survival here required skills and technologies unknown to these hunters, not the least of which were qualities of a psychological nátuře. Second, the arctic migrations represent movements of very smáli numbers of people. It is not out of the question to consider that all the microblade sites archaeologists háve discovered so far from western Canada to northern Greenland were created by fewer than 500 people. The Arctic offered man scant resources, which were widely scattered and sometimes difficult to retrieve. Even at the height of their success during the Thule cultural phase, about A.D. I000, the number of arctic residents from Point Barrow to Peary Land may háve been no more than 5000.

The first people to cross into North America were probably paleo-Indians, people who settled in the interior of Alaska and spread south. The geographical point of origin of paleo-Eskimos, people who remained in the Arctic, is unknown, but archaeologists generally favor the Bering Sea region and eastern Siberia. These arctic mongoloids may or may not háve been the ancestors of modern Eskimos; in any čase, paleo-Eskimos were in arctic Alaska by about 5000 years ago, having perhaps crossed the open water of Bering Strait in skin boats. It was their culture that was typified by minutely flaked chert and obsidian cutting tools about one inch long and one-quarter inch wide. This culture and its variations are referred to as the Arctic Small Tool tradition (ASTt).

ASTt campsites háve been found as far east as Peary Land in northern Greenland (where the culture is called Independence I, after a site on Independence Fiord) and more or less continuously across the American and Canadian Arctic. Many of these sites

appear to háve been inhabited for only a single night or, at most, for a couple of weeks before the people moved on. These people hunted muskoxen, polar bear, arctic fox, arctic hare, and sea ducks, and the tools they left behind suggest theirs was a harsh and meager life. A Canadian archaeologist named Robert McGhee has written that ASTt peoples migrated into "the coldest, darkest and most barren regions ever inhabited by man." He speculates that during the winters when they were hard-pressed for food, these people "may háve almost hibernated in their unlit and unheated dwellings." One looks today upon the remains of their dwellings—a fox-bone awl, a quartz arrowhead, the ring of stones that held down their skin tents—with profound respect.

With a gradual cooling, the Arctic Oceán- ice front came farther south, and ASTt peoples apparently retreated. The next culture to make its presence known was another ASTt culture called Pre-Dorset, which appeared about 3500 years ago. This was a more communal, more technologically advanced people. They carved soapstone bowls in which they burned oil rendered from marine mammal blubber for heat and light, and they fashioned small wood sleds on which to pull their belongings. (Many Pre-Dorset campsites háve been found at caribou river crossings and at fish-trapping locations that háve been ušed by subsequent cultures well into modern times.)

Pre-Dorset peoples seem to háve been concentrated in a core area around Foxe Basin, a region of land and sea mammal abundance. During periods when the climate ameliorated, they may háve migrated out to other regions as well. The remnants of many different technologies háve been uncovered at Pre-Dorset sites. (A technology is an assemblage of tools, utensils, weapons, and other implements designed for a specific task, such as the preparation of skins for clothing or caribou hunting.) The materials for construction and manufacture háve included stone, bone, skin, ivory, antler, and, very rarely, wood. Some of the tools are highly specialized, designed, for example, for use in hunting a certain animal only in a specific season or under specific circumstances—to také a seal in

open water or, alternately, at its winter aglu. About 2800 years ago, the Pre-Dorset sites gave way to evidence of a new culture called Dorset.

Many archaeologists speculate that the Dorset culture grew out of various elements of Pre-Dorset culture. Perhaps, too, there was an infusion of ideas and technologies from a contemporaneous culture in Greenland called Independence II; or from Alaskan cultures; or from archaic Indián cultures living to the south. However they arose, Dorset people seem to háve appeared first in the Foxe Basin region of northern Canada. They had skin boats, small sleds, and better sea-hunting equipment than their forebears, and they built houses of snow.

Dorset carving is by far the most developed art in Eskimo prehistory. (The artwork of Okvik and Ipiutak culture in the Bering Sea area, contemporaneous with Dorset artwork, is comparable.) And most archaeologists agree that there is something unique about it. In contrast to other cultures, Dorset people decorated very few utilitarian objects, and single pieces of artwork, all carvings, are rather rare. The generál feeling is that the carvings were connected with shamanistic magie, and many think there is something decidedly dark about them. These caribou antler, bone, and walrus ivory carvings are of single animals, most often polar bears; of human figures and human/animal figures; and of human faces in chaotic tableaux. The representations are both realistic and stylized, and most of the carvings are of inconspicuous size.

The eye for detail is so sharp and the execution so deft that you can readily telí a carving of a common loon from one of a red-throated loon. The style, writes Canadian artist and eritic George Swinton, "exudes intensity and power . . . despite its remarkable subtlety and delicacy." The human faces in some of the carvings that seem tortured and psychotic to some viewers, Swinton compares stylistically with German Expressionism, saying that their form "emphasizes content, vigour, and involvement (as opposed to style, elegance, and detachment)." The primitive quality in them, in other words, is more brutal than fetching.

Perhaps too much has been made of this Dorset "darkness"; but the observation that Dorset art is unsettling, while the art that preceded it and followed it is not, is common among archaeologists dealing with this period. Giddings deseribes the Dorset-like art of the Ipiutak to the west, in Alaska, as "grotesque and bizarre" and the Old Bering Sea culture art that followed as "balanced and pleasing, as though the artists led a secure—even serene—existence." The circumstances under which these carvings are found sometimes augment feelings of apprehension. Froelich Rainey, excavating an Ipiutak burial site at Point Hope, Alaska, found a small carved caribou hoof protruding on a shaft from the pelvic region of a human skeleton. He cleared more dirt away to find that this long ivory shaft penetrated the entire vertebral column and emerged in the skuli, where it curved forward into the space where the mouth would háve been. It terminated in a miniatuře human hand, opened in supplication.

In Jury 1979, a young archaeologist working at a Dorset site in the high Arctic uncovered a caribou scapula that left him shaken. Both surfaces of this fiat bone were incised with scores of small human faces with gaping mouths. He remembers sitting with the scapula in his hands on a cool and overcast morning and dumbly contemplating the agonized expressions. "I was frightened out of my wits by it," he told me. Then he handed me his notes for that day and said, "Which is why the entry is so mundane." He got up twice in the night to unpack the piece and look at it, he was so disturbed.

When I háve held these objects in my hand, I háve marveled most at the skill of the carvers, and found them more provocative than dark.

THE Dorset came into their ascendancy during a period of cooling in the Arctic. During the warming trend that followed, the climatic optimum of A.D. 900-1100, they were displaced by a quite different culture called Thule (pron. too' lě). Archaeologists don't know whether the Dorset were absorbed by the Thule or forcibly driven

east and south out of the Foxe Basin area. (Remnant bands of Dorset survived in the fastness of northern Quebec and Labrador until about A.D. 1400.)

The Thule, a vigorous, highly skilled, whale-hunting culture originating in the region of Bering Strait, grew out of Old Bering Sea culture. Robert McGhee has written that Old Bering Sea people had a hunting technology "that gave them an abundant and secure economy [and] they developed a way of life that was probably as rich as any other in the nonagricultural and nonindustrial world."

Old Bering Sea culture was succeeded by a richer culture around Saint Lawrence Island, called Punuk. Punuk people may háve moved north about A.D. 900, to hunt whales and other sea mammals along the northwest coast of Alaska during the warming trend. There they either mingled with, or passed right over, a culture called Birnirk. A Punuk or Birnirk-like group then continued east across the Beaufort Sea in large skin boats, or umiaks, and established themselves in northern Canada as the Thule.

The Thule, directly ancestral to modern Eskimos, moved east very quickly. They may háve traveled the 2600 miles from Point Barrow to Peary Land, in fact, in only two or three generations. With the climate warming up, bowhead whale populations from the western and eastern Arctic likely met in Parry Channel (M'Clure Strait, Viscount Melville Sound, Barrow Strait, and Lancaster Sound); and herds of narwhals and belukhas and walrus must háve penetrated far north into the Canadian Archipelago as well. In the west, spotted and ribbon seals would háve wintered and summered farther to the north, the samé being true for gray, harp, and hooded seals in the eastern Arctic. The whole ecosystem shifted north. The sea ice and the scarcity of animals in certain seasons that had once discouraged east-west travel were no longer impediments. (The increase in average annual temperature during the climatic optimum was not much more than 3T, but the effects were dramatic. The tree line in North America, for example, shifted north about 60 miles.)

The Thule were superb hunters. They possessed an elaboráte

marine-mammal hunting technology, which they ušed from the umiak in pursuit of whales and walrus, on the sea ice, and from the kayak.* They developed the dog-drawn sled and made sophisticated refinements in the harpoon technology of the Dorset. Their winter homes were warm, semisubterranean shelters with lower walls and floors of stone and upper walls and roofs of turf over a skin covering, which was supported by whale ribs and jawbones.

The Thule stand out as a highly successful people. They compare well in spirit, though not in fact, with the Magdalenian caribou-hunting culture of Europe during the finál phase of the Upper Paleolithic. The Magdalenian period is characterized by an apotheosis in cave painting (at Altamira and Lascaux, for example) and a lavish and skillful decoration of hunting weapons and other, utilitarian objects, including beautifully carved, fine-eyed bone needles. Magdalenian hunters lived almost 10,000 years before the Thule; but they, too, flourished during a climatic optimum. This advantage, together with a knowledge of their own capacity to succeed as a culture, seems to háve infused them with vigorous confidence. Their caribou-hunting way of life, with its refined artistic overtones, was perfectly suited to the landscape they found themselves in.

The samé sophisticated kind of hunting culture continued to make ecological sense in the Far North long after farming and pastorál cultures supplanted hunting cultures in Europe during the Neolithic. The Paleolithic-Mesolithic-Neolithic sequence of Europe, thought to be a natural and even necessary progression for mankind, is a model that applies poorly in a land of permafrost and

* The umiak, a Thule invention, is an open, walrus- or bearded seal-skin boat, about 30 feet long, sometimes fitted with a square sail and a single, stepped mast. On long journeys it was commonly rowed by women, while the men followed in shorter, lower, decked-over, single-seat, and more seaworthy kayaks, free to hunt. For this reason the boat is also called "a women's boat."

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The Thule, directly ancestral to modern Eskimos, moved east very quickly. They may háve traveled the 2600 miles from Point Barrow to Peary Land, in fact, in only two or three generations. With the climate warming up, bowhead whale populations from the western and eastern Arctic likely met in Parry Channel (JVTClure Strait, Viscount Melville Sound, Barrow Strait, and Lancaster Sound); and herds of narwhals and belukhas and walrus must háve penetrated far north into the Canadian Archipelago as well. In the west, spotted and ribbon seals would háve wintered and summered farther to the north, the samé being true for gray, harp, and hooded seals in the eastern Arctic. The whole ecosystem shifted north. The sea ice and the scarcity of animals in certain seasons that had once discouraged east-west travel were no longer impediments. (The increase in average annual temperature during the climatic optimum was not much more than 3 °F, but the effects were dramatic. The tree line in North America, for example, shifted north about 60 miles.)

The Thule were superb hunters. They possessed an elaboráte

marine-mammal hunting technology, which they ušed from the umiak in pursuit of whales and walrus, on the sea ice, and from the kayak.* They developed the dog-drawn sled and made sophisticated refinements in the harpoon technology of the Dorset. Their winter homes were warm, semisubterranean shelters with lower walls and floors of stone and upper walls and roofs of turf over a skin covering, which was supported by whale ribs and jawbones.

The Thule stand out as a highly successful people. They compare well in spirit, though not in fact, with the Magdalenian caribou-hunting culture of Europe during the finál phase of the Upper Paleolithic. The Magdalenian period is characterized by an apotheosis in cave painting (at Altamira and Lascaux, for example) and a lavish and skillful decoration of hunting weapons and other, utilitarian objects, including beautifully carved, fine-eyed bone needles. Magdalenian hunters lived almost 10,000 years before the Thule; but they, too, flourished during a climatic optimum. This advantage, together with a knowledge of their own capacity to succeed as a culture, seems to háve infused them with vigorous confidence. Their caribou-hunting way of life, with its refined artistic overtones, was perfectly suited to the landscape they found themselves in.

The samé sophisticated kind of hunting culture continued to make ecological sense in the Far North long after farming and pastorál cultures supplanted hunting cultures in Europe during the Neolithic. The Paleolithic-Mesolithic-Neolithic sequence of Europe, thought to be a natural and even necessary progression for mankind, is a model that applies poorly in a land of permafrost and

* The umiak, a Thule invention, is an open, walrus- or bearded seal-skin boat, about 30 feet long, sometimes fitted with a square sail and a single, stepped mast. On long journeys it was commonly rowed by women, while the men followed in shorter, lower, decked-over, single-seat, and more seaworthy kayaks, free to hunt. For this reason the boat is also called "a women's boat."

long winters. Farmers and herdsmen did not move into the Arctic for good reason. (The Samis, oř Lapps, of northern Scandinavia and the Kola Peninsula are the only far northern people to háve voluntarily turned to a life of seminomadic herding.)

The climatic optimum that brought the Thule so swiftly to northern Greenland, and which brought the Norse to southern Greenland at the samé time, ended about A.D. IIOO. The cooling trend that followed drove the Thule out of the high Arctic (and proved disastrous for the Norse, who were dependent in part on agriculture to sustain themselves and could not adapt). The Thule culture fragmented into several distinct traditions. These cultures —Polar Eskimo living around Inglefield Fiord in Greenland, Central Eskimo living on Baffin Island, Caribou Eskimo living on the mainland to the west of Southampton Island—were the tribes that met the second wave of European explorers (after the Norse) in the sixteenth and seventeenth centuries.

The cooling trend that culminated in the Little Ice Age of 1650-1850 changed both the type and the numbers of animals living in the Arctic. As a consequence, the hunting tradition the Eskimos inherited from the Thule, its tools and methods, had to be altered or abandoned in order for the different, isolated groups to survive. They met the first European explorers, therefore, during a transitional period between a Thule phase and a more distinctly Eskimo phase in their culture.

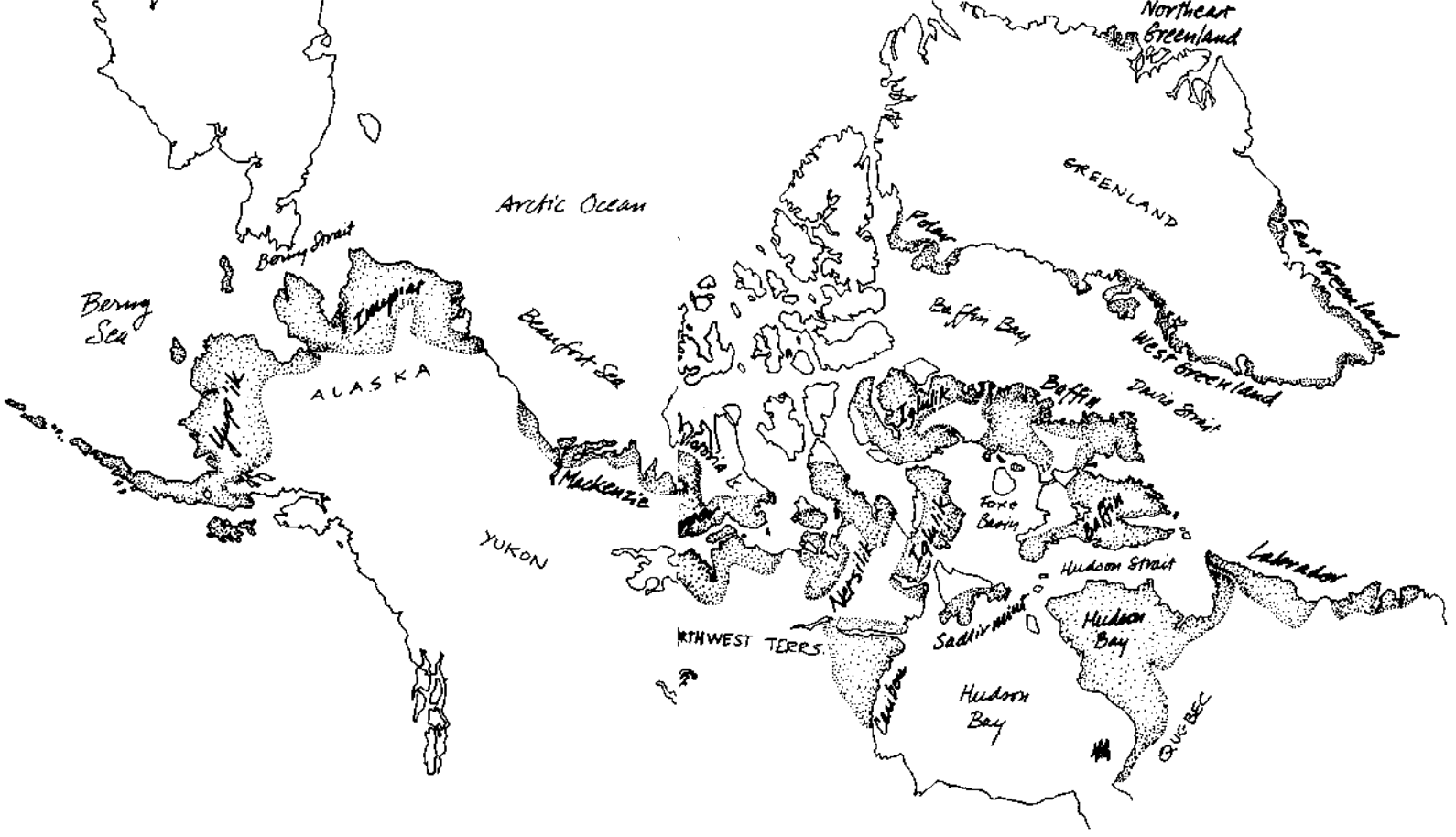
The latter transition—archaeologists regard the Thule as directly ancestral to modem Eskimos—is an important one. The tendency of almost all Europeans was to regard the Eskimos they met as brutish people living unrefined lives. No sense of transition between high and low phases in a culture, no sense of environmental necessity, no sense, even, that the various Eskimo cultures were different, informed these early observations. And these early judgments fixed an image of the Eskimo people as a backward race in the European imagination. Had the second, decisive wave of European culture met Thule people as the Norse had, instead of the historie Eskimo, they might háve taken a different view of their

culture. (Though, to judge from Cortés's response to the Aztecs, it is unlikely.)

When archaeologists sketch the broad outline of Arctic prehistory, they are inclined to make comparisons among the various cultural phases, based in part on the wealth of the respective materiál cultures, and to stress that the transitions between them occurred at different times in different places. Thus, it might háve been remnants of the earlier Dorset that the first Europeans met on the coast of Labrador, in southern Greenland, and on the Ungava Peninsula, not post-Thule Eskimos. And so, too, the ASTt cultures are called "impoverished" compared with the later Thule, or with the Siberian hunting cultures that preceded them into North America. Western society on its own has long held in low esteem human cultures that matured outside the Temperate Zone, a confusion, in large part, about what the landscapes these people lived in demanded of them.

There is a tendency among archaeologists and many modern arctic observers to look back wistfully to the period of Thule culture, to regard it as not only more highly achieved than that of the smaller groups of more nomadic historie Eskimo but also more coherent. They were the last Arctic culture to close their doors before Western man arrived. Because of this, and the obvious comparison with high cultures of the European Paleolithic, there is a certain allure about them. From their tools and homes comes a substantive feeling of energy, of passion and enthusiasm. A student working at a Thule site on Ellesmere Island told me about a harpoon head she had found. "All they had to do with it was catch walrus. But they made it beautiful," she said.

The admiration one feels kneeling over the pathetic remains of an early ASTt campsite can be very deep. What tenacity. What courage. Another sort of feeling comes over one at a Thule site. One misses any sense of remoteness or separation and feels instead profound respect. A powerful, dignified people, one imagines. The delicate and robust tools, as the student said, are beautiful. Peter Schledermann, who has excavated prehistorie sites across most of



Distribution of Eskimo tribes in North America and Greenland in historie times.

the Canadian Arctic, said to me one evening over dinner in Calgary, "Everything we are is in our spirit. In archaeology, you are examining the long line of what we are."

WE owe much of our understanding of the distinctions among the groups of historie Eskimo to a handful of exceptional ethnographers who lived for various periods of time with them—Knud Rasmussen, Kaj Birket-Smith, Diamond Jenness, Franz Boas, and Hans Steensby. Beginning in the West, these groups include the North Slope Eskimo, who perhaps retained more of their Thule heritage than the others, and who include an inland-dwelling component called the Nunamiut; the Mackenzie Eskimo, dwelling near the delta of the Mackenzie River; the Copper Eskimo, who inhabited Victoria Island and the Coronation Gulf area and traveled to the *Investigator* cache at Mercy Bay, and were the last of the historie groups to be discovered; the Central Eskimo of Baffin Island and Melville and Boothia peninsulas; the Caribou Eskimo, who dwelled on the tundra northwest of Hudson Bay; and the Polar

Eskimo, the most isolated of the groups, in northwest Greenland. (This last small group served many Arctic expeditions, including those of Robert Peary and Frederick Cook. In 1949 their centrál settlement, Uummannaq, was moved 60 miles farther north by the Danish government to permit construction of a strategie NATO air base.)

Among the Central Eskimo were other, smaller, distinct traditions, including the Netsilik, known for their soapstone carvings; the Igloolik, the people the British whalers met at Pond's Bay; and the Sadlermiut of Southampton Island, all of whom died in an epidemie in 1900 after a visit by a Scottish whaler, the *Active*. What shreds of information exist suggest that the Sadlermiut retained, perhaps, a significant amount of Dorset culture within their own tradition. Aivilik Eskimo, related to Caribou Eskimo people, now live on Southampton Island.

In modern times, of course, tribes like the Sadlermiut still disappear with regularity in different parts of the world, or they are absorbed into Western culture in a way that obscures or even obliterates their intellectual and materiál traditions. These losses seem tragic and consequential, and they are frustrating because they sometimes oceur for reasons of indifference or greed. They are not like the loss of the Thule. The Thule, one can feel, are extinct on natural grounds, an event arbitrated by the landscape. The eclipse of the Sadlermiut, however, seems to diminish us, because we are their contemporaries, because we claim to be enlightened about the intrinsic worth of life, and because we esteem compassion. The Sadlermiut were a way to understand Southampton Island. A reflection on that harsh landscape and the evidence of their success there leads to the conclusion that we lost some wisdom about life with their passing. We cannot anymore piek up their things and ask, "Why did you make this?" or "What is this for?," and hope to hear the answer that would come in any čase only once in a thousand times, the answer that reveals what it *means*. The answer that opens the timeless interior of the human mind, that collapses centuries of distance and transcends the object at hand.

Wherever I went I felt the loss of the Sadlermiut and so a sharper sense of gratitude toward those who once wrote down the observations of arctic peoples, deseribed their skills, and saw to the preservation of the objects of their culture. Even if we cannot say what an object meant, we can still marvel today at what it did and at the people who made it. With a minimum of materials historie Eskimos created a wealth of utilitarian implements, distinguished by ingenuity in design, specificky of purpose, and appropriateness of materiál to the task.*

I think first of the clothing. Winter clothing was almost always made from caribou skin. The fur of arctic fox and, in the western Arctic, Dali sheep, was warmer, but those skins were too delicate. Caribou hair is not hollow the way polar bear hair is—it consists of large, multichambered cells—but the effect is the samé: excellent lightweight insulation. The skins of adult cows, taken early in the fall, before their winter coats got too thick, provided the best combination of warmth and lightness. (Late-fall cow skins, like those of bull caribou or of muskoxen, were too heavy to be comfortable but made excellent bedding.) Caribou calf skins were ušed for underclothing and boot liners. The skins of the caribou's forelegs were ušed for boot uppers and in the palms of mittens because they resisted abrasion. The ruff of the parka was of wolverine or wolf, furs that easily shed the ice crystals that form there from breathing. The tightly spaced stitching was overcast or blind, as the situation required, to keep out

* The materials they worked with, of course, came almost entirely from the animals they hunted. Eskimos generally regarded these materials as gifts given in accordance with ethical obligations they felt toward the animals. The two parallel cultures, human and animal, were linked in biological ways and, for the Eskimo, in spirituál ways that are all but lost to our understanding today. It was the gift rather than the death that was preeminent in the Eskimo view of hunting.

wind and snow or to forestall the wicking of moisture. Sealskins were more often used in place of caribou in summer clothing because they were waterproof. They were sewn together with sinews that swelled slightly when wet (making the stitching waterproof) and were soled with a hide as tough as walrus but lighter, that of the bearded seal.

Slippers inside the winter boots were sometimes made of whole bird skins turned inside out. Waterproof rain gear was made from seal intestine. For walking quietly on the snow, boots were sometimes soled with polar bear fur.

Eskimo clothing required daily attention—sewing, softening, and drying—because it was somewhat fragile. It was lighter and warmer, however, than any clothing Western explorers brought with them to the Arctic, and after several fatal lessons, expedition leaders began to insist on Eskimo clothing for everyone. In some respects it remains superior for general use to modern Western expeditionary clothing.

Eskimos utilized the caribou completely. They made clothing, bedding, and bags from its skin and tools and weapons from its bones and antlers. Noting that fats in the caribou's leg joints congealed at lower temperatures the farther they were from the body core, they took the fat from the foot to use as a lubricant for bowstrings in freezing temperatures. (Western civilizations made the same discovery with cattle, whence neat's-foot oil.) They used the marrow of its bones for fuel; its blood in glues; its sinews for lashings, bindings, and thread. What they did not eat they cached, against the lean months of spring. (The anthropologist Richard Nelson marveled during his modern fieldwork at the still thorough anatomical knowledge of Eskimo women, at the way they could quickly cut up a large animal "into smaller and smaller pieces without a saw, without breaking a bone.")

What is so consistently striking about the way Eskimos used parts of an animal is the breadth of their understanding about what would work. Knowing that muskox horn is more flexible than

caribou antler, they preferred it for making the side prongs of a fish spear. For a waterproof bag in which to carry sinews for clothing repair, they chose salmon skin. They selected the strong, translucent intestine of a bearded seal to make a window for a snow house—it would fold up for easy traveling and it would not frost over in cold weather. To make small snares for sea ducks, they needed a springy material that would not rot in salt water—baleen fibers. The down feather of a common eider, tethered at the end of a stick in the snow at an aglu, would reveal the exhalation of a quietly surfacing seal. Polar bear bone was used anywhere a stout, sharp point was required, because it is the hardest bone.

One notices many subtle, imitative correspondences in their creations: the drag handle at the end of a thong used to pull a seal home over the ice is carved in the shape of a polar bear. The beak of a fish-hunter, the loon, forms the point of a fish spear. Appropriate or fine distinctions: a preference for belukha sinew over caribou sinew to stitch sealskin. Snowy owl or cormorant feathers chosen over others for arrow fletchings. And signs of resourcefulness: tightly wrapping fresh char, lapped head to tail in a wet sealskin, and letting it freeze to form the runner for a sled.

The sled itself was a remarkable piece of equipment. The sled runners were cross-braced with lengths of caribou antler, lashed to the runners with sealskin thongs. The bottoms of the runners were shod with a mixture of pulverized moss and water, built up in layers. On top of the peat shoeing came an ice glaze, carefully smoothed and shaved. The result was a flexible sled that could be sent over the surface of the snow with a flick of the wrist, and that moved over irregularities in the sea ice without tipping unduly.

Otto Geist, excavating a Punuk site on Saint Lawrence Island in the 1920s, made a list of items these people made solely from walrus ivory, each one designed to perform a specific task or serve a specific purpose. A dog-harness buckle. A wound pin to keep a seal from bleeding. Part of a fox trap. A tent-line tensioner. His list ran to more than a hundred items.

In *Eskimo Realities* Edmund Carpenter remarks on a well-known phenomenon, that Eskimos quickly grasp the essence of any mechanical problem and solve it. Even when the object is something they've never seen before, they will select from "scrap" or "waste" material something with the right tensile strength or capacity for torsion or elasticity, something with the necessary resistance to heat, repeated freezing or corrosion, and shape it with simple tools into a serviceable if not permanent solution. Nineteenth-century explorers remarked on this capacity often, as have modern scientists with broken outboard engines and wristwatches.

Very sharp, someone once said, these broadly smiling men with no pockets, no hats, and no wheels.

THERE is a small village in the central Brooks Range today called Anaktuvuk Pass. The Eskimos there are called Nunamiut, a group that until recently subsisted largely on caribou, Dall sheep, and moose. Originally nomadic, they spent winters in the Brooks Range and summers with relatives on the Beaufort Sea coast, trading caribou skins for sealskins and blubber. Their initial experience with modern trade goods was with such things as Russian tobacco in the eighteenth century, which they obtained from Eskimos living around the mouth of the Colville River, who had traded for it with Bering Sea Eskimos. After 1850 American whalers brought in large quantities of flour, tea, coffee, sugar, and tobacco, as well as guns, ammunition, and alcohol to the northwest coast of Alaska. The Nunamiut were less directly involved in this trade than their coastal relations, but they were profoundly affected nevertheless. The caribou herds they depended on were decimated to feed the whaling crews, and the Nunamiut were forced to abandon their life in the mountains. They shifted away from an economy based on hunting toward one based on trade. A few found seasonal employment on the coast, and most began trapping for furs in earnest.

A change came over the Nunamiut in the 1930s when the market for fur collapsed and the trading posts were closed, distant

effects of economic depression in the United States. In 1934 a handful of families, knowing the caribou population had recovered and was again migrating through the mountains, sought to return to an earlier, more satisfying way of life. They set up a camp that first year at the junction of the Anaktuvuk and Colville rivers. For a few years they continued to travel regularly to the coast, where they fished and hunted seals, but in 1939, after this short period of readjustment, they returned to their homeland in the Brooks Range.

Ten years later the promise of trade goods to be brought into the mountains by airplane and the services of a temporary teacher in the summer induced several bands of Nunamiut to gather at a place called Tulugak Lake. In 1951 this group of sixty-five people moved a few miles farther south and a United States post office was established at Anaktuvuk Pass at the skin tent of a hunter named Homer Mekiana. A permanent school was built in 1961, by which time many of the Nunamiut were staying in or near the village year-round. Today about 180 people live there. There is a village store; satellites provide both telephone and television service; and there is a new school with sauna baths and a swimming pool, built with royalty money from Alaskan oil discoveries.

This story has been repeated many times in the same sequence across the Arctic in the past fifty years. Nomadic hunters are consolidated in one place for purposes of trade; radical changes are made in the native way of life in order to adapt to a trade-based or cash-based economy; some make strenuous efforts to return to a semblance of the older way of life; and, finally, large segments of the native language are lost, and the deep erosion of social, religious, political, and dietary customs occurs under intense pressure from missionaries, bureaucrats, and outside entrepreneurs. Hunting expertise, the ability of a man and a woman to keep a family going, the kind of knowledge of life that grew from patience and determination—such attributes were not as highly regarded by the interlopers, who sought to instill other virtues: promptness, per-

sonal cleanliness, self-improvement, and a high degree of orderliness and scheduling in daily life.*

Among those in the outside culture whom the Nunamiut have counted as friends in modern times are several anthropologists and biologists who recognized a repository of knowledge in the Nunamiut, particularly about the natural history of the local landscape, and who honored them for it. Some of the Nunamiut men and women who have led balanced and dignified lives through all the changes they have had to face have become symbols of unpretentious wisdom to visiting scientists. The situation, of course, is not unique to Anaktuvuk Pass. Many scientists comment in their papers and books and in private conversation about the character of their Eskimo companions. They admire their humble intelligence, their honesty, and their humor. They find it invigorating to be in the presence of people who, when they do speak, make so few generalized or abstract statements, who focus instead on the practical, the specific, the concrete, t

I visited Anaktuvuk Pass in 1978 with a friend, a wolf biologist who had made a temporary home there and who was warmly regarded for his tact, his penchant for listening, and his help during an epidemic of flu in the village. We spent several days watching wolves and caribou in nearby valleys and visiting at several homes.

* It is easy to impugn the worth of such nebulous virtues, and to find among the interlopers venal and self-aggrandizing people. But it disparages Eskimos to see them as helpless in this situation. Most Eskimos are not opposed to changing their way of life, but they want the timing and the direction of change to be of their own choosing. "There is no insistence," a man once told me, "on living as hard a life as possible." In passing, it should be noted that many people have offered genuine assistance to Eskimos. One frequently hears praise in the Canadian Arctic, for example, for Catholic missionaries, because of their long-term commitment to a single village, their practice of learning to speak the language and to hunt, and their emphasis on good schooling.

t For a list of publications that grew out of work with the Nunamiut, see note 4.

The men talked a lot about hunting. The evenings were full of stories. There were moments of silence when someone said something very true, peals of laughter when a man told a story expertly at his own expense. One afternoon we left and traveled far to the west to the headwaters of the Utukok River.

The Alaska Department of Fish and Game had a small field camp on the Utukok, at the edge of a gravel-bar landing strip. Among the biologists there were men and women studying caribou, moose, tundra grizzly, wolverine, and, now that my companion had arrived, wolves. The country around the Utukok and the headwaters of the Kokolik River is a wild and serene landscape in summer. Parts of the Western Arctic caribou herd are drifting over the hills, returning from the calving grounds. The sun is always shining, somewhere in the sky. For a week or more we had very fine, clear weather. Golden eagles circled high over the tundra, hunting. Snowy owls regarded us from a distance from their tussock perches. Short-eared owls, a gyrfalcon. Familiar faces.

A few days after we arrived, my companion and I went south six or seven miles and established a camp from which we could watch a distant wolf den. In that open, rolling country without trees, I had the feeling, sometimes, that nothing was hidden. It was during those days that I went for walks along Ilingnorak Ridge and started visiting ground-nesting birds, and developed the habit of bowing to them out of regard for what was wonderful and mysterious in their lives.

The individual animals we watched tested their surroundings, tried things they had not done before, or that possibly no animal like them had ever done before—revealing their capacity for the new. The preservation of this capacity to adapt is one of the central mysteries of evolution.

We watched wolves hunting caribou, and owls hunting lemmings. Arctic ground squirrel eating *irok*, the mountain sorrel. I thought a great deal about hunting. In 1949, Robert Flaherty told an amazing story, which Edmund Carpenter was later successful in getting published. It was about a man named Comock. In 1902,

when he and his family were facing starvation, Comock decided to travel over the sea ice to an island he knew about, where he expected they would be able to find food (a small island off Cape Wolstenholme, at the northern tip of Quebec's Ungava Peninsula). On the journey across, they lost nearly all their belongings—all of Comock's knives, spears, and harpoons, all their skins, their stone lamps, and most of their dogs—when the sea ice suddenly opened one night underneath their camp. They were without hunting implements, without a stone lamp to melt water to drink, without food or extra clothing. Comock had left only one sled, several dogs, his snow knife, with which he could cut snow blocks to build a snow house, and stones to make sparks for a fire.

They ate their dogs. The dogs they kept ate the other dogs, which were killed for them. Comock got his family to the island. He fashioned, from inappropriate materials, new hunting weapons. He created shelter and warmth. He hunted successfully. He reconstructed his entire material culture, almost from scratch, by improvising and, where necessary, inventing. He survived. His family survived. His dogs survived and multiplied.

Over the years they carefully collected rare bits of driftwood and bone until Comock had enough to build the frame for an umiak. They saved bearded-seal skins, from which Comock's wife made a waterproof hull. And one summer day they sailed away, back toward Ungava Peninsula. Robert Flaherty, exploring along the coast, spotted Comock and his family and dogs approaching across the water. When they came close, Flaherty, recognizing the form of an umiak and the cut of Eskimo clothing but, seeing that the materials were strange and improvised, asked the Eskimo who he was. He said his name was Comock. "Where in the world have you come from?" asked Flaherty. "From far away, from big island, from far over there," answered Comock, pointing. Then he smiled and made a joke about how poor the umiak must appear, and his family burst into laughter.

I think of this story because at its heart is the industry and competence, the determination and inventiveness of a human family. And because it is about people who lived resolutely in the heart of every moment they found themselves in, disastrous and sublime.

During those days I spent on Ilingnorak Ridge, I did not know what I know now about hunting; but I had begun to sense the outline of what I would learn in the years ahead with Eskimos and from being introduced, by various people, to situations I could not have easily found my way to alone. The insights I felt during those days had to do with the nature of hunting, with the movement of human beings over the land, and with fear. The thoughts grew out of watching the animals.

The evidence is good that among all northern aboriginal hunting peoples, the hunter saw himself bound up in a sacred relationship with the larger animals he hunted. The relationship was full of responsibilities—to the animals, to himself, and to his family. Among the great and, at this point, perhaps tragic lapses in the study of aboriginal hunting peoples is a lack of comprehension about the role women played in hunting. We can presume, I think, that in the same way the hunter felt bound to the animals he hunted, he felt the contract incomplete and somehow even inappropriate if his wife was not part of it. In no hunting society could a man hunt successfully alone. He depended upon his wife for obvious reasons—for the preparation of food and clothing, companionship, humor, subtle encouragement—and for things we can only speculate about, things of a religious nature, bearing on the mutual obligations and courtesies with which he approached the animals he hunted.

Hunting in my experience—and by hunting I simply mean being out on the land—is a state of mind. All of one's faculties are brought to bear in an effort to become fully incorporated into the landscape. It is more than listening for animals or watching for hoofprints or a shift in the weather. It is more than an analysis of what one *senses.* To hunt means to have the land around you like clothing. To engage in a wordless dialogue with it, one so absorbing that you cease to talk with your human companions. It means to release yourself from rational images of what something "means"

and to be concerned only that it "is." And then to recognize that things exist only insofar as they can be related to other things. These relationships—fresh drops of moisture on top of rocks at a river crossing and a raven's distant voice—become patterns. The patterns are always in motion. Suddenly the pattern—which includes physical hunger, a memory of your family, and memories of the valley you are walking through, these particular plants and smells—takes in the caribou. There is a caribou standing in front of you. The release of the arrow or bullet is like a word spoken out loud. It occurs at the periphery of your concentration.

The mind we know in dreaming, a nonrational, nonlinear comprehension of events in which slips in time and space are normal, is, I believe, the conscious working mind of an aboriginal hunter. It is a frame of mind that redefines patience, endurance, and expectation.

The focus of a hunter in a hunting society was not killing animals but attending to the myriad relationships he understood bound him into the world he occupied with them. He tended to those duties carefully because he perceived in them everything he understood about survival. This does not mean, certainly, that every man did this, or that good men did not starve. Or that shamans whose duty it was to intercede with the forces that empowered these relationships weren't occasionally thinking of personal gain or subterfuge. It only means that most men understood how to behave.

A fundamental difference between our culture and Eskimo culture, which can be felt even today in certain situations, is that we have irrevocably separated ourselves from the world that animals occupy. We have turned all animals and elements of the natural world into objects. We manipulate them to serve the complicated ends of our destiny. Eskimos do not grasp this separation easily, and have difficulty imagining themselves entirely removed from the world of animals. For many of them, to make this separation is analogous to cutting oneself off from light or water. It is hard to imagine how to do it.

A second difference is that, because we have objectified animals, we are able to treat them impersonally. This means not only the animals that live around us but animals that live in distant lands. For Eskimos, most relationships with animals are local and personal. The animals one encounters are part of one's community, and one has obligations to them. A most confusing aspect of Western culture for Eskimos to grasp is our depersonalization of relationships with the human and animal members of our communities. And it is compounded, rather than simplified, by their attempting to learn how to objectify animals.

Eskimos do not maintain this intimacy with nature without paying a certain price. When I have thought about the ways in which they differ from people in my own culture, I have realized that they are more afraid than we are. On a day-to-day basis, they have more fear. Not of being dumped into cold water from an umiak, not a debilitating fear. They are afraid because they accept fully what is violent and tragic in nature. It is a fear tied to their knowledge that sudden, cataclysmic events are as much a part of life, of really living, as are the moments when one pauses to look at something beautiful. A Central Eskimo shaman named Aua, queried by Knud Rasmussen about Eskimo beliefs, answered, "We do not believe. We fear."

To extend these thoughts, it is wrong to think of hunting cultures like the Eskimo's as living in perfect harmony or balance with nature. Their regard for animals and their attentiveness to nuance in the landscape were not rigorous or complete enough to approach an idealized harmony. No one knew that much. No one would say they knew that much. They faced nature with fear, with *ilira* (nervous awe) and *kappia* (apprehension). And with enthusiasm. They accepted hunting as a way of life—its violence, too, though they did not seek that out. They were unsentimental, so much so that most outsiders thought them cruel, especially in their treatment of dogs. Nor were they innocent. There is murder and warfare and tribal vendetta in their history; and today, in the same villages I walked out of to hunt, are families shattered by

alcohol, drugs, and ambition. While one cannot dismiss culpability in these things, any more than one can hold to romantic notions about hunting, it is good to recall what a *struggle* it is to live with dignity and understanding, with perspicacity or grace, in circumstances far better than these. And it is helpful to imagine how the forces of life must be construed by people who live in a world where swift and fatal violence, like *ivu,* the suddenly leaping shore ice, is inherent in the land. The land, in a certain, very real way, compels the minds of the people.

A good reason to travel with Eskimo hunters in modern times is that, beyond nettlesome details—foods that are not to one's liking, a loss of intellectual conversation, a consistent lack of formal planning—in spite of these things, one feels the constant presence of people who know something about surviving. At their best they are resilient, practical, and enthusiastic. They pay close attention in realms where they feel a capacity for understanding. They have a quality of *nuannaarpoq,* of taking extravagant pleasure in being alive; and they delight in finding it in other people. Facing as we do our various Armageddons, they are a good people to know.

In the time I was in the field with Eskimos I wondered at the basis for my admiration. I admired an awareness in the men of providing for others, and the soft tone of voice they used around bloodshed. I never thought I could understand, from their point of view, that moment of preternaturally heightened awareness, and the peril inherent in taking a life; but I accepted it out of respect for their seriousness toward it. In moments when I felt perplexed, that I was dealing with an order outside my own, I discovered and put to use a part of my own culture's wisdom, the formal divisions of Western philosophy—metaphysics, epistemology, ethics, aesthetics, and logic—which pose, in order, the following questions. What is real? What can we understand? How should we behave? What is beautiful? What are the patterns we can rely upon?

As I traveled, I would say to myself, What do my companions see where I see death? Is the sunlight beautiful to them, the way it

sparkles on the water? Which for the Eskimo hunter are the patterns to be trusted? The patterns, I know, could be different from ones I imagined were before us. There could be other, remarkably different insights.

THOSE days on Ilingnorak Ridge, when I saw tundra grizzly tearing up the earth looking for ground squirrels, and watched wolves hunting, and horned lark sitting so resolutely on her nest, and caribou crossing the river and shaking off the spray like diamonds before the evening sun, I was satisfied only to watch. This was the great drift and pause of life. These were the arrangements that made the land ring with integrity. Somewhere downriver, I remembered, a scientist named Edward Sable had paused on a trek in 1947 to stare at a Folsom spear point, a perfectly fluted object of black chert resting on a sandstone ledge. People, moving over the land.