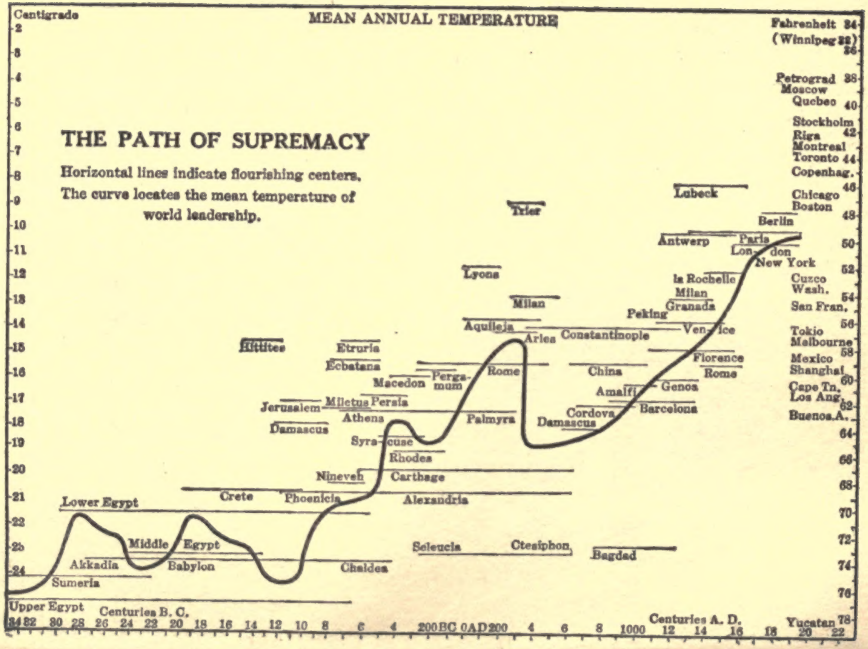
E.P. from a sketch by G.T. 1913.


MEAN ANNUAL TEMPERATURE
Centigrade
Fahrenheit
THE PATH OF SUPREMACY
Horizontal lines indicate flourishing centers.
The curve locates the mean temperature of world leadership.
Lower Egypt
Middle Egypt
Upper Egypt
Sumeria
Akkadia
Babylon
Crete
Phoenicia
Nineveh
Carthage
Alexandria
Jerusalem
Damascus
Miletus
Persia
Athena
Syracuse
Rhodes
Hittites
Etruria
Ecbatana
Macedon
Pergamum
Rome
Palmyra
Seleucia
Ctesiphon
Bagdad
Chaldea
Trier
Lyons
Milan
Aquileja
Arlea
Constantinople
Damascus
Cordova
Amalfi
Genoa
Barcelona
China
Peking
Venice
Florence
Rome
Antwerp
Paris
London
New York
Lubeck
La Rochelle
Milan
Granada
Berlin
Petrograd
Moscow
Quebec
Stockholm
Riga
Montreal
Toronto
Copenhag.
Chicago
Boston
Cusco
Wash.
San Fran.
Tokio
Melbourne
Mexico
Shanghai
Cape Tn.
Los Ang.
Buenos A.
Yucatan
Centuries B. C.
Centuries A. D.

The Northward Course of Empire

BY

VILHJALMUR STEFANSSON

WITH AN INTRODUCTION BY

DR. EDWARD WILLIAM NELSON

CHIEF OF THE UNITED STATES BIOLOGICAL SURVEY

WITH ILLUSTRATIONS AND A MAP

GEORGE G. HARRAP & CO. LTD.

LONDON CALCUTTA SYDNEY

PRINTED IN THE U. S. A.

Sydney; June 2, 1924.

Dear Taylor:

See giving you this book I am a "grafter" in the American sense — I want to profit by any expression of opinion I can get from you on its main thesis.

Professor Griffith Taylor Vilhjalmur Stefansson

A number of these chapters appeared as articles in the *World's Work* and the *National Geographic Magazine.*

PREFACE

THE idea of this book is doubtless old, though it came to me only about 1912. Perhaps it was old to the Medes and Persians. It may even have been an ancient revamping of it that led Solomon to remark that there is nothing new under the sun.

In another sense the idea is so new that the history of it can be given briefly.

The winter of 1918-1919 representatives of chambers of commerce of various European countries were touring the United States. A dinner was given them in New York and at this I was called upon to make a five-minute talk. One of the sponsors of the dinner was Dr. Albert Shaw, the editor of the *Review of Reviews*. He said to me that the idea of my talk was new. When I reminded him of Solomon's well-known saying, he replied that at any rate it was new enough to make a suitable article for his magazine. He asked me to write the article and I said I would.

Ideas, like many other things, have a tendency to expand, and in the writing my theme grew beyond the limits of the *Review of Reviews,* for they seldom print an article of more than twenty-five hundred words and I found I had ten thousand. Instead of attempting to revise and condense, I submitted it to a magazine

that sometimes does print long articles, the *National Geographic Magazine,* edited by Mr. Gilbert Grosvenor. The idea struck Mr. Grosvenor also as new and he wanted it for his magazine. But the theme eventually grew beyond the one article he wanted and into a series of four articles which (after three years of mauling over) appeared in the *World's Work* between November, 1921, and February, 1922.

Meantime, the talk at the Chamber of Commerce dinner had been quoted in the papers. My enthusiasm for the "message" also prompted me to refer to it again and again, and again and again it crept into the papers.

In New York City I am a member of the Canadian Club. Apart from Siberia there is no country to which my "message" means more than to Canada, and when the Club decided to publish its own magazine and when they asked me for a contribution, I wrote a statement of only a few hundred words, thinking it would not pass beyond the Club membership. Curiously enough, this issue of the magazine attracted the attention of some editorial writer on the *New York Times* and my little essay was copied almost in full July 18, 1920, with comments both favorable and thought-provoking.

In November, 1920, I got a letter from S. Columb GilFillan, now Professor of Social Sciences in the University of the South, in which he said he had read the *Times* editorial summary of my article. He enclosed a copy of his article, "The Coldward Course of Progress," which had been published in September, 1920. This is the brief and scholarly presentation from which

we have borrowed the graph that appears as frontispiece to this volume.

When the thesis first presented in 1918 in a five-minute after-dinner speech was published as a twenty-five-thousand-word series in the *World's Work,* it met a reception which encouraged me to expand it into a book. What promised especially well was that many teachers of geography wrote to the *World's Work* and to me asking for the material in a form that could be used in schools. If possible, I was more surprised than I was delighted to find how willing people generally are to accept fresh information and new light on even the oldest pseudo-scientific dogmas.

The first proofs of this book had been sent back to the printers, when I presented to a convention of the Association of American Geographers in New York a brief discussion on the colonization of the grasslands of the world that lie north of the treeline. In his comments on my paper Professor Ellsworth Huntington said that Professor GilFillan had written him the summer of 1915 a letter that contained the germ of the idea which Professor GilFillan later developed into his paper, "The Coldward Course of Progress," which (as stated above) was published in September, 1920. Up to now I had supposed that Professor GilFillan got the original stimulus towards the writing of his paper from my *Maple Leaf* magazine and the *New York Times* editorial cited above. Evidently this was not the case, and we derived the idea independently from a consideration of the facts of the world we live in. Professor

GilFillan or any one else might also well have derived it as a corollary from Professor Huntington's great work on "Civilization and Climate," in which the idea is implied.

So far as I know, there is one man in the world pre-eminently qualified by experience and training to pass upon the facts and arguments of this book. Through his official position, he has in his files more pertinent evidence than perhaps any other man, while the same official position puts at his disposal for consultation many trained and keen minds scarce less familiar than his with the problems dealt with. This is Dr. Edward William Nelson, Chief of the United States Biological Survey. Between 1879 and 1881 Dr. Nelson spent four years in continuous residence near the northwest corner of Alaska. His base station was in the Yukon delta, but he made extensive winter journeys both north and south. On these journeys he gathered information only a part of which he has published in his books and scientific articles. Since his return from Alaska he has done considerable field work in sub-tropical regions and has had under his direction scientific observers who have worked in every climate of the globe. As this book deals with certain fundamental considerations of climate and with its effect upon various animals and especially upon man, I submitted the manuscript to Dr. Nelson. When I found him in general agreement with the facts and with their interpretation in this book, I asked him to write an introduction for it.

The general thesis of this book lies closer to my heart than any other result of a twenty-four-year study of anthropology and geography. My anthropological interest has been largely in the movements of peoples and the causes that bring about and hinder migration and colonization. As a traveler I am chiefly familiar with the north "temperate" and north "frigid" zones. Through my fortunate connection with the Explorers Club of New York and the various geographic societies of the world, I know personally many of the travelers who have been examining and interpreting the less known countries during the last several decades. Although their results have been open to me through conversation and through books, I have felt keenly the need of criticism by the highest authorities. In that connection I have appealed to the following men and with the following results:

With regard to the Canadian Government's inquiry into the grazing resources of arctic Canada, my manuscript was read by Dr. J. G. Rutherford. By a lifetime of training and experience in helping to determine the land and livestock policy of the Canadian Pacific Railway and of the provincial and national governments of Canada, he has won to the foremost position as an authority upon these subjects. As Chairman of the Royal Commission on the Reindeer and Musk Ox Industry, he listened to the testimony of thirty-five explorers, missionaries, traders and others who had spent considerable portions of their lives in various parts of the polar regions. Many of the questions he

asked them have a direct bearing upon the thesis of this book, and his published summary of that testimony is in general agreement with it. On reading the manuscript Dr. Rutherford found himself to differ with it on two chief points. In one case the difference was only apparent, and the text has been so clarified that the apparent difficulty no longer exists. In the other case the statement has been modified so as to conform with Dr. Rutherford's view—which was really mine always, only I had overlooked a certain angle of the case.

Dr. Raymond Pearl, of Johns Hopkins University, was the chief statistician of the United States Food Administration during the war and is one of the leading authorities on the world's food supply. Professor J. Russell Smith is another leading authority on the same subject.[1] Neither of these differed in any fundamental, and most of the minor modifications and additions suggested by them have been incorporated.

Dr. Isaiah Bowman was formerly Professor of Geography at Yale and is now Director of the American Geographical Society. He is the author of many books on varied aspects of geography and is besides a distinguished explorer of the tropics and south temperate lands. Where we compare the tropics with the polar regions, his judgment combines personal experience with scholarship and has, therefore, been exceptionally

[1] See "The Nation's Food," by Raymond Pearl, Philadelphia, 1920, and "The World's Food Resources," by J. Russell Smith, New York, 1919.

valuable. All modifications suggested by him have been incorporated.

Professor Alexander G. McAdie is the Director of the Blue Hill Observatory, Readville, Mass. His studies of the atmosphere and especially his investigations carried out in coöperation with the Prince of Monaco have made him if not the leading at least one of the leading authorities on the temperature of the air over both the lands and the seas of the earth. He has read the sections on air temperature and these, accordingly, have the weight of his authority.

With regard to the navigation of ice-covered seas by submarine I have consulted two authorities, only one of whom I am permitted to cite by name. Mr. Simon Lake shares with Holland the distinction of being the best known American submarine inventor. Through several decades he has made experiments with submarines under ice. He has not read any parts of the manuscript, but the points considered have been discussed with him by correspondence and he has furnished for use in this book a photograph illustrating the operation of one of his types of under-ice submarines. Another, of which he sent a blueprint drawing, seems even better suited. Any one who desires to compare Mr. Lake's opinions with those of this book can do so by consulting his book, which is included in the bibliography at the end of this volume.

Most of the ideas as to the use of submarines under ice were developed independently of Mr. Lake or any other authority. More recently I have met an officer

of the British Navy who commanded submarines which operated under ice to the north of Russia during the World War, and I have learnt from him that most of my ideas are ultra-conservative. I have not taken the trouble to remodel the submarine discussion in this book to conform strictly with his experiences, for my opinion is already sufficiently beyond what the layman considers probable. The knowledge of the almost marvelous adaptability of the submarine to under-ice work will for a time have to remain the exclusive property of the experts themselves.

The comments and advice of these authorities, and of others whom I am not permitted to name, have given this book added certitude and me added confidence. But it must not be understood that they have assumed any responsibility as to facts and views here expressed. The responsibility for these is mine.

I know in fact that some of the greatest authorities cited above differ with me on some points (e. g., as to whether cutting large ranges into small farms will tend to decrease the world's livestock supply). I might not dare to disagree with authorities so eminent, were it not that on checking up the points where one or another disagrees with me I find they disagree with each other.

Although the members of my various expeditions and myself have taken thousands of photographs in the arctic and subarctic regions, I am by design using in this volume mainly pictures taken by others. This is to show that the difference between the arctic and subarctic regions of theory and those of fact is no less

apparent to the cameras of others than to cameras used by me. We are indebted to the following for permission to use photographs: the American Museum of Natural History, Hawthorne Daniel, Department of Immigration and Colonization of Canada, Elmer W. Ekblaw, the Holt Manufacturing Company, Dr. W. T. Hornaday, Lomen Brothers and the New York Zoölogical Society.

The graph, "Path of Supremacy," is used by permission of Professor S. Columb GilFillan and of the *Political Science Quarterly.*

Four of the chapters of this book are used by permission of *World's Work,* and the chapter on transpolar commerce by permission of the *National Geographic Magazine.*

VILHJALMUR STEFANSSON.

May 10, 1922.

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INTRODUCTION

THE brilliant and adventurous journey by Stefansson across the polar pack, "living off the country," and the substantial contributions to geography and many other branches of science brought back by himself and his staff have been justly applauded as distinguishing a notable arctic expedition. The contribution of most value to mankind brought back by Stefansson, however, is his appreciation that far northern lands are not the dread icy deserts of the popular belief but are possessed of a variety of resources and are available for occupation by civilized man.

It is true that for years fur traders, gold miners, and, in Alaska, reindeer herds, have extended north to the arctic coast, but to Stefansson belongs the credit of being the first to have the clear vision to appreciate the potential value of the North as a whole, and for several years to have carried on an educational propaganda developing the startling fact that our last frontier did not vanish when the settlement of the United States and Canada reached the shores of the Pacific, but that another vast, untamed frontier lies ready for the adventurous pioneer in the North. With appealing literary charm he has developed here and elsewhere the

story of the "livability" of the Far North, and shown that this hitherto dreaded region offers a welcome to men of the stamp of the early pioneers of America. In fact, with present methods of communication and facilities of modern life such northern settlers would have much fewer real hardships and deprivations to endure than did many of our not distant forebears in occupying what are now some of the most settled parts of the continent.

That far northern winters are enjoyable periods I can personally testify, having passed through four of them in northern Alaska. There our summers, while not unpleasant, were periods of certain limitations owing to difficulty of travel except by water routes. In winter, however, snow on the land and ice on the rivers and sea offered a free road in any direction. Midwinter was the time when the Eskimos held their festivals, coming from far villages to central points to feast and enjoy social companionship. The fur traders made their rounds to native villages in search of furs and frequently journeyed hundreds of miles for brief visits to one another. At the beginning of each winter I looked forward with keen anticipation to long sledge trips, camping at Eskimo villages or wherever night overtook us in the open. The bracing vigor of the climate gave a sense of well-being and sheer joy of living that must be experienced to be appreciated. After several thousand miles of sledging over Alaskan prairies, varied by later travel in the wilderness of lower lati-

tudes, extending to the tropics, I can fully indorse Stefansson's belief as to the keener physical enjoyment of life in these northern latitudes. This sense of physical well-being and the mental exhilaration that goes with it, no doubt, in part at least, accounts for the fascination that the North appears to exert on a large share of those who have lived there and which holds many under its spell.

The illumination thrown by Stefansson on the great northern frontier has added an increment of enormous total value to the vast area in northern Canada hitherto considered practically worthless, and the Canadian Government may well congratulate itself on this unexpected by-product of a scientific expedition. Furthermore, it has been made plain that not only far northern Canada but Alaska and the even greater territory of northern Siberia are potential sources of various useful products, especially of a meat supply on a great scale. The development of this idea is another illustration of the frequent occurrence that geographic and other scientific work may produce unexpected results of untold value to mankind.

In Alaska reindeer growing is already becoming an industry and, as a result of Stefansson's work, it is being undertaken in Baffin Land. In far northern Canada and in Alaska oil prospecting is being done, in addition to mining of other minerals, so the movement is already on to conquer our last American frontier. It has needed, however, the enthusiasm and facile pen of

Stefansson to draw aside the veil of imaginary terrors which has heretofore concealed the real facts and has delayed the opening up to the world of a vast region.

DR. E. W. NELSON,
Chief United States Biological Survey.

WASHINGTON, D. C., *February* 13, 1922.

THE NORTHWARD COURSE OF EMPIRE

CHAPTER I

THE NORTHWARD COURSE OF EMPIRE

Man, as an animal, is indeed, a tropical animal. But man, as distinguished from animals, is not at his best in the tropics or very near them. His fight upward in civilization has coincided in part at least with his march northward over the earth into a cooler, clearer, more bracing air.

For the last few centuries, and especially in America, our attention has been centered upon the proposition that "Westward the course of empire takes its way." It has indisputably taken a westerly course during the last few centuries. But it is equally indisputable and more significant (because it rests upon broader natural causes) that northward the course of civilization has been taking its way, not only through the long period of written history and of tradition, but also through that far longer period, the records of which are the skeletons of the forerunners of men and of near-men, and of indubitable men who developed a civilization through millenniums of crude stone tools and polished stone and copper and bronze and iron down to Egypt and China as our histories show them.

There are but two commonly held theories of the origin of man. Each places the spot of origin in or near the tropics, the one because the skeletons of the

anthropoids or pre-anthropoids, from which they think man descended, have been found chiefly in the tropics, and the other because tradition says the Garden of Eden was in tropical lands. With many divergences, both fundamental and superficial, the two theories agree on the geographic origin of man.

Man as an animal is not only tropical in origin but is also by the nature of his body unfit to flourish in any other sort of climate. Even those who assert he was once hairy refrain from contending that he had fur. Hairy as he was he would have shivered in Italy and could not have prospered at all in the winter climate of North Dakota or of Russia. Nor would the most thoroughgoing advocate of a meat diet pretend he could flourish through hunting until after the invention of weapons and traps. He must have lived in a country not too cold for an unclad, furless animal where vegetables and fruits could be found at all times of year to constitute either his main diet or at least the bridges over necessary gaps in the meat supply.

Then came the inventions of fire and clothing for combating the cold, and of weapons for killing the grass-eating animals upon which man could subsist though he could not directly upon the grass. With these inventions commenced the northward march of civilization, and we do not yet know how far north it will continue. At least that contention can be made, though it has to be made in the face of an overwhelming public opinion to the effect that the northward limit has already been reached.

Men at every period of history have been generally of the opinion that the ultimate limit of the northward spread of civilization had then at length been reached.

It is a reasonable assumption, deduced from what we know of later history, that even the thoughtful men of Memphis and of Babylon failed to see potentialities for much beyond barbarism in the Greece and Italy of their time. We know as a matter of recorded opinion that the Greeks and Romans not only considered the people to the north of them inferior, but believed that that inferiority must continue, largely because of a supposedly hostile climate of the lands to the north. Tacitus probably knew as much as any of his contemporaries about the lands beyond the Alps, and was merely voicing the general opinion of his time and countrymen when he said that nobody could conceive that any one, unless forced by the stern necessity of war, would willingly leave the fertile shores of Africa or the plains of Italy for the country north of the Alps, where the climate is as disagreeable as the soil is sterile. This was undoubtedly a truism of his time; but it is a fact of our time that many people live in Paris and other parts of France by choice.

Draper tells us in his "History of the Intellectual Development of Europe" that in the Middle Ages the stables of the Moors in Spain were better than the palaces of the kings of England, and we know that the Moors of that time were as certain with regard to Britain as Tacitus had been in his day with reference to France that the foggy and chilly climate was

inimical to a high development, and that nothing much was to be expected of such a country and its people. To-day there can be found as many to agree as to disagree with the contention that Britain has for a century been the foremost land of the earth.[1]

The undervaluation of the North by the Romans and the Moors is not difficult to explain. With them and in every other period of history it has rested on one ground, and does so to-day with us. Their civilization and ours had a common southern origin. The lands of the South have been the lands of known history, and their problems have been well understood. At any given time a portion of Egypt or of Babylonia may have been a desert, but the Romans and Moors and we have always understood how deserts may be irrigated and that such problems are not insoluble. But the problems of the North have never been understood, for they are not of the past but of the future. We do not know what they are and even when we learn what they are the solution is yet to be devised.

It is human nature that we undervalue the distant and exaggerate the difficulties of the unknown. My friend, Professor Ellsworth Huntington of Yale, once sent out a letter of inquiry to about two hundred

1 During the writing of this book there has been called to my attention a pertinent passage on pages 292-3 of the third volume of Pierre Duhem's "Le système du monde." There was at the University of Montpellier in the thirteenth century a man, apparently of English birth, named Robertus Anglicus, who protested there against the current teaching that England was uninhabitable because of a disagreeable climate or because of lack of resources, wherefrom he seems to have gained the reputation of being a visionary.

geographers, ethnographers, and other men of wide information in various lands, asking them among other things to give their opinion on the degree of civilization of the people of Iceland. The classification was to be made on the basis of a scale of 10, the people of high civilization being Group No. 10, and those of the darkest savagery in Group No. 1. The civilization of Iceland was graded as follows:

The Asiatics	put	Iceland	in	group	3
" Latin Europeans	"	"	"	"	4
" Americans	"	"	"	"	5
" British	"	"	"	"	6
" Germans and Scandinavians	"	"	"	"	8

Each in his own country these authorities were of approximately equal culture, rank and native intelligence, yet the Asiatics because they were geographically and culturally remote, put the Icelanders near the bottom of the intellectual scale, while the nearest neighbors of Iceland placed it not far from the top. From this classification we accordingly learn nothing reliable or valuable about Iceland; but we get instead further confirmation of the principle that we tend to undervalue whatever is remote.

To the peoples of the centers of civilization the uncolonized North has been more or less remote geographically and almost infinitely remote from a cultural and historical point of view, for the information about it was in considerable part misinformation and its history and problems lay in the future.

On the basis of distance and misinformation the North has always been supposed to be dreadful and devoid of resources. These judgments have always been wrong and this we could prove by dozens of further instances although we shall adduce only two or three.

In 1763 a great struggle had just ended in Europe that is known on the American side as the "French and Indian War," and the plenipotentiaries of France and England had met to adjudicate a peace.

They haggled over the division of spoils, notably over the political control of certain territories which they strove to acquire or retain with an eagerness proportionate to their idea of the present and future commercial value of these lands. The greatest commodity of the modern world is oil and we are now deeply concerned with oil lands; sugar was not in 1763 a correspondingly important commodity, but its future significance was realized by commercial leaders and the sugar lands were among the chief bones of contention.

It was amusing to those familiar with the history of foods to read during the late war in medical journals and elsewhere articles filled with deep concern for the health of the "civilized" nations on the score of their being compelled to get along on an "inadequate sugar ration." Sugar has been a significant element in our food for only a comparatively insignificant period. Four hundred years ago it was unknown in Europe, and honey and other "sugar substitutes" were then of scarcely greater significance in the diet of our an-

cestors than tomato ketchup is in ours. Many people lived their threescore and ten without eating a pound of honey. Three hundred years ago sugar was a luxury of kings; two hundred years ago it was still unregarded by most people. But a few realized its coming importance and so the peace conference of 1763 kept haggling about the sugar lands.

The British, feeling that they were in a position to do so, asked among other things that the French turn over to them the island of Guadeloupe. To this the French replied in substance that they disliked extremely to give up Guadeloupe as it was an island containing sugar plantations of great value to the citizens of France, and suggested they would much prefer to surrender Canada. To this the British objected that while Canada was larger than Guadeloupe, it was not good for much. There were, of course, some furs, and there were codfish on the Newfoundland Banks, but on the whole it was not a very valuable piece of property, and they much preferred Guadeloupe. After a prolonged deadlock Benjamin Franklin suggested through a pamphlet that while Gaudeloupe was more valuable than Canada, it was a distant island, while Canada was contiguous territory, and if we allowed the power of France to develop at our very door there would be continual friction. Eventually the British accepted Canada, apparently for political rather than economic reasons. And now not half of the readers of this book can find Guadeloupe without looking it up in the index of some book of reference.

In 1867 in America a great war had come to a close. During that war the side which eventually triumphed had not been supported so consistently by any major European power as by Russia. The country was grateful to Russia and it became necessary to translate that gratitude into substantial terms. To put it in modern parlance, they wanted to "slip some coin" to Russia as a reward for kindness received, and they carried out what was for that time an extremely large but otherwise quite ordinary political transaction by purchasing Alaska for $7,200,000. Such are the views of many historians as to the reasons for the Alaska Purchase. Woodrow Wilson's history seems to consider as the chief motive, the extension of the Monroe Doctrine to still another part of the American continent, while others think the United States bought Alaska for some ready money partly to show European nations, which doubted America's solvency and power to recuperate after a devastating war, that the country was not really broke.

There are still other explanations of why Alaska was purchased but none of them rests on the assumption that the territory was intrinsically worth the price. It may have been that Secretary Seward and a few others realized that the money was not an actual gift and that Alaska had a great future, although, if that was so, Seward must have been a good deal wiser in his generation than Benjamin Franklin had been with reference to Canada in an earlier one. However that be, the Republican Party and Secretary Seward were

attacked in the next presidential campaign for having spent several millions of public money for a lump of ice.

If you want to make up your mind what people really thought of Alaska at the time of its purchase and for many years after, turn to the files of the newspapers for the next presidential campaign (which resulted in the election of Grant) and you will find the Democrats attacking the Republicans on the score of the Alaska purchase. They put up a bitter fight on this issue. That in itself does not mean much, for such are the tactics of politics. But turn to the defense made by the Republicans and the lameness of it will convince you that they had no pride in what they had done, nor even faith in the future to exculpate, let alone justify, them. They felt themselves to be the pot and the best they could do was to call the kettle black. They drew a herring across the trail by calling the Democrats traitors and slaveholders; they shifted the battle to the old reliable issue of the tariff.

I am not a profound historical scholar and my memory does not go back to Grant's time, but this is history as I have read it. It was not till about 1900, when gold was discovered in Alaska, that politicians began to "point with pride" to Seward on the score of his purchase and I believe it was Franklin K. Lane (perhaps because he was born in Canada and had therefore a better understanding of the potentialities of the North) who first among cabinet officials had a vision of Alaska's coming greatness.

When first it began to dawn on the United States that Alaska was of value, it was her mineral resources they saw. This again is a common historical phenomenon. When Columbus sailed west from Spain he was ostensibly in search of a short route to the Indies. He probably did not expect to find America. At least the popular view was that he had been searching for Asia and when he returned his was one of the many exploring expeditions that have been called failures because they discovered something quite different from that which had been expected. By way of making the best of the unfortunate fact that America blocked the direct sea route to China, those who went there, unless they were searching for a fountain of youth, were commonly looking for gold and precious stones. None of them were looking for the potato, although its unheralded discovery has proved of greater value to the world than all the gold dug out of the two continents. So it was and will be with Alaska—the first things to be looked for were precious metals and furs, but the greatest things to come out of it will not be those originally looked for.

Alaska had its turn as a gold seeker's paradise, and since 1900 has been much in men's minds on that score. Later it was realized that in portions fairly accessible from the Pacific there were huge deposits of copper more valuable than the gold, and coal mines of no less promise, and unless the present industrial trend is altered, the forests are likely to become more valuable than either.

Eskimo Women of Alaska.

In 1918 there were many resources of Alaska under cultivation, of which the fisheries were only one. Of the fisheries the salmon were only a part, of the salmon the sockeye variety was only one, and of the sockeye caught only a part was canned. Yet the part that was canned was sold for twenty-two million dollars, giving in one year a return more than three times the original purchase price of Alaska.

This is merely the beginning of our realization of the accidental or vaguely designed wisdom of "Seward's Folly," for the salmon, valuable as they are, will soon be far exceeded in value by other food products of Alaska. Seattle, one of the biggest American cities, is already being supplied by the market gardens of Alaska. And the estimates of the U. S. Department of Agriculture are that within fifteen years the output of Alaskan reindeer meat at present prices per pound will be worth from forty-five to sixty million dollars a year.

More than two centuries ago the Dutch discovered Spitsbergen, the south tip of which is about 300 miles farther north than the north tip of Alaska (a fact that must, however, be interpreted in the light of the unsymmetrical nature of the polar regions as explained, for instance, in Chapter II of "The Friendly Arctic," New York, 1921). Whale and seal oil were of far greater commercial importance then than now, and this group of islands soon became an important focus of the whale "fishery." All of it was claimed by Great

Britain and all was claimed by Holland, and other countries made various claims, but as a matter of fact most of the country was for a long time controlled by the British and a small part by the Dutch. Later these "fisheries" declined in value and disappeared when Standard Oil began to furnish the light of the world. No British or other sailors made any regular visits for years; and Gladstone, as Prime Minister of Great Britain, renounced any claims that Britain might have had, saying and apparently believing that the islands could only be a bill of expense if possession were maintained.

Some years later the Hamburg-American Line and other steamship lines cultivated Spitsbergen as one of the interesting outposts of the tourist trade, exploiting that most commonplace-looking of marvels, the "midnight sun," which no one can tell from any other sun by anything but reference to a watch carrying local time.

About the beginning of our century there were in Sweden some men of foresight who proposed in the Parliament that Sweden should take possession of Spitsbergen. This proposal was promptly turned down on the ground that Sweden had no claims to Spitsbergen and did not want to have, as the country was not worth claiming.

And then it happened that some Americans visited the place as tourists and came upon some coal on the beach and some iron. On the strength of this and other evidence, engineers were sent there and reported

that the islands contained fabulous quantities of easily accessible coal and iron of high grade. An American company was organized for the promotion of these mines, and a Norwegian and an English company were also organized.

Several countries then simultaneously awoke to the realization of the value of Spitsbergen. Holland began to claim it because she had discovered it, Great Britain because she had for a long time held possession of it, and Russia and the Scandinavian countries because they had explored it and had other possessions not so very many hundreds of miles away from it. Even the Germans claimed it. Each country was a dog in the manger so far as all the other countries were concerned, and anarchy was a consequence. Though huge commercial enterprises were being undertaken, there was on the islands no police officer or judge or any vestige of recognized government, and no way of legally obtaining title to any property.

In 1913 on a visit to England I met one of the large coal mine owners of Wales, who told me that it was already then clearly foreseen by himself and all the other coal men whom he knew that Spitsbergen was soon to become one of the chief competitors, if not the chief competitor, of Wales in the coal markets of the world.

The representations of the various commercial concerns finally led to an international convention of the countries involved. This convention had met in Norway and was in session when it was suddenly and auto-

matically dissolved by the conflagration of the World War. Later the American capitalists, doubtless partly because they failed to secure support from their government, sold their holdings to the Norwegians, and Great Britain and Norway remained the two countries most vitally interested.

Now comes a chapter in the story of Spitsbergen that is humorous or tragic or pathetic according to one's attitude toward the statesmen and industrial pioneers of Britain. In the spring of 1920 the newspapers carried an announcement that the British had surrendered to Norway their political claims to Spitsbergen. I was in New York when this news was published and was interviewed on the subject by some enterprising reporters. As it seemed to me clear that Britain had a stronger claim to the islands than any other nation, and certainly a much stronger one than Norway, I gave it as my opinion that there must be behind the transaction some secret political bargain, possibly made at a time of war stress and uncertainty, and that Norway was being rewarded now by Britain for having kept her agreement. Knowing the large investment of English and Scotch capital in the Spitsbergen coal mines I did not conceive it possible that English diplomats had now succeeded in doing in the case of Norway what they had failed in 1763 to do with France, when they tried to give away (or refuse to receive) Canada.[2]

[2] When strongly impressed with their value, the British have occasionally "grabbed" remote lands, their titles to which were

Soon after the publication of this interview I went to England and found that so far as my friends knew, who were interested in the Spitsbergen mines, the unbelievable was true. Their statements may have been colored by the heat of their feelings, but they told me that the substance of the story was this: The Norwegians had said to the British diplomats at Paris that if Britain didn't mind very much they would like, please, to be given Spitsbergen. To this the British had replied in substance that they didn't see why anybody wanted those isolated, frozen islands, but if any-

by no means clear. This makes the more curious their propensity as a government to give away, under a short-sighted impression of their worthlessness, lands to which their title was clear. Apropos of certain news despatches about Wrangel Island, this propensity was recently summarized by an Editorial in the New York *Evening Post:* "The occupation of Wrangel Island, nominally for Great Britain and actually for Canada, is designed to make good a claim which could never rest on the mere fact of British discovery. It adds another to the many striking instances of the extension of British sovereignty by energetic subjects without the knowledge and even against the will of the colonial office. London cares nothing about Wrangel Island, and Ottawa little. New Zealand was saved to Great Britain in 1839 by the spirited colonizer, Edward Gibon Wakefield, only when the French were on the point of taking possession. In Hawaii in 1794 a council of chiefs asked for British protection, and a naval lieutenant hoisted the British flag, while in 1822 Kamechameha II. confirmed the protectorate, but the British government would never acknowledge the acquisition. Tahiti was discovered by the British in 1767 and a British flag hoisted, while in 1825 Queen Pomare was eager for a British protectorate; but Louis Philippe of France was allowed to take over the island. The Fiji islands all but slipped from the careless British grasp—W. T. Pritchard saved them, to the intense indignation of the colonial office. Australia for years after 1867 labored to effect British annexation of eastern New Guinea, but the British resisted until they found that the Germans had gobbled half.

"Islands, as Carlyle said of tools, belong to those who can use them. Under international law the mere hoisting of a flag, without continuing occupation, avails nothing."

body did want them badly enough to ask for them they didn't see why they shouldn't have them.

If this be a true statement, these British diplomats can at least quote an excellent precedent from Tacitus —they were repeating about Spitsbergen what he would have said about Britain nearly two thousand years earlier.

But if the diplomats at Paris happened to be ignorant about Spitsbergen, the press and public in the British Isles were not, and there arose a storm of protest. I still have a feeling that my own guess may have been right—that there was with Norway some secret British diplomatic bargain to which the politicians have not owned. But the coal men I talked with laid it all to pure ignorance. When taxed with their blunder, the diplomats had been able to reply only that the Norwegians had agreed to respect the property rights of British subjects and that capital already invested there was guaranteed fair treatment. But, these disgruntled business men said, that is not the same as owning the islands.

For Spitsbergen itself and for the world as a whole it may be just as well that Norway should be the overlord, but I have not yet talked with any Britishers who take that detached view. And certainly not the stockholders of the Spitsbergen companies. One company is said to be capitalized at twenty-five million dollars and the aggregate of the British companies is said to be more than fifty millions. These figures are not to be relied on except as meaning that British in-

terests in these very remote northern enterprises were large and would presumably soon have become larger.

Meantime the Journal of the Royal Geographical Society of Great Britain tells us that in 1918, in spite of the extraordinary difficulties due to the unsettled condition of Europe (and not to the climate or latitude of Spitsbergen) one hundred thousand tons of coal were exported. The Journal also says that the Admiralty of Great Britain has published a table of the comparative steam values of various kinds of coal, which places that of Spitsbergen higher than the best Welsh coal. It says further that while the rich iron ore of Spitsbergen is at present being exported to smelters in Great Britain this is but a transient phenomenon, for in the course of a few years local smelters are certain to be built. Spitsbergen is one of a very few known places in the world where a large quantity of easily accessible hard coal is found in close proximity to large quantities of easily accessible iron ore of high grade.

It has always been easy for people of that type of mind known as "practical," "sound," and "conservative" to prove that lands as yet of no value cannot possibly ever be of value. In striking contrast to this type of mind is that of the born explorer, who must above all things be a man of imagination. Henry Hudson, the second navigator to reach those islands, noted in his journal in the year 1607 that he had no doubt Spitsbergen "would be profitable to whoever should adventure it."

Chief of the arguments against the value of Spits-

bergen fifteen years ago was that it was located in an arctic sea which, although it could be navigated at certain seasons, could not be profitably navigated because interrupted navigation was said to be never profitable. This same argument is at present being advanced most convincingly against the feasibility of the Hudson Bay route which the Canadian Government is developing as a means of contact between the prairie provinces and Europe, by way of Hudson Straits. Although the argument sounds convincing when pronounced with conviction, actual trial has failed to confirm it. I have talked with an able mining engineer who at one time was in charge of the mines of the American firm, Ayer and Longyear, in Spitsbergen, and he has told me that he believes coal can be so cheaply mined and transferred from Spitsbergen to Europe that Spitsbergen will drive Newcastle and Wales out of the continental coal markets north of their latitude, which means among others those of the White Sea and the Murman Coast and the northern half of the Scandinavian countries.

"All very interesting," the critics may say, "but it is a long lane that has no turning. Tacitus was wrong when he said people would never by choice live as far north as France; the Moors of the Middle Ages were short-sighted when they undervalued the possibilities of Britain; it is strange that as astute a man as Franklin thought a small tropic isle like Guadeloupe commercially more valuable than Canada; Seward was wise

in buying Alaska and Gladstone a simpleton to want to renounce Spitsbergen. But surely there must be somewhere the limit to Northward progress. Have we not come to that limit now?"

We have not come to the northward limit of commercial progress. There was many a pause but no stop to the westward course of empire until we came to the place where East is West. In that sense only is there a northward limit to progress. Corner lots in Rome were precious when the banks of the Thames had no value; the products of Canada were little beyond furs and fish when the British and French agreed in preferring Guadeloupe. But values have shifted north since then and times have changed. Times will continue to change. There is no northern boundary beyond which productive enterprise cannot go till North meets North on the opposite shores of the Arctic Ocean as East has met West on the Pacific.

CHAPTER II

THE NORTH THAT NEVER WAS

If the average American or European university graduate has ten ideas about the North, nine of them are wrong. So far as the victims of American education are concerned, I know from experience. As to the Europeans, I judge them by their books and conversation.

I happened to be born a British subject in Manitoba which is British territory, but my parents moved to the United States when I was only a year old and I have been through the regular mill of American education—common school, high school, and university to the Bachelor of Arts degree at the State University of Iowa. I then had three years of post-graduate study at Harvard, held a scholarship and two fellowships there, and even became an instructor in a minor capacity. It is, therefore, reasonable to suppose that during the period of my formal and informal education I absorbed the same general type of misinformation as does the average American. When I went North and became an explorer I found that nine out of ten of my ideas about the polar regions were wrong, and from that I infer that if you are an honor graduate of some university you are probably in as bad a case.

When I was a student at Harvard, Samuel McChord

Crothers was preaching just across the way from us. It was a delight to listen to him, whether in church or in the lecture room, and from that delight I passed to the equal joy of reading his essays and books. The reading of one of these essays may not have been exactly a turning point in my life, but it was an event that had a lasting effect on me. The essay was on the advisability of founding a university of unlearning. Wherever I have gone since, but especially in the polar regions, the opening of each new vista has brought a further endorsement of the general wisdom of that proposal.

Doctor Crothers said that this and other lands are filled with schools and colleges engaged in teaching us things that are not so, and it would be a highly desirable thing if there could be established in each country at least one well-known institution where you might go and unlearn a few of them. This he proposed to call in each country the National University of Polite Unlearning.

For many years it has been a large part of my activities to say in lectures and writings and conversation that the Far North, both in the western and eastern hemispheres, is destined to be colonized in the same general way as were the Western prairies of the United States half a century ago, by the same type of people, and with a resulting civilization not fundamentally dissimilar. This assertion is met in the minds of readers or listeners by small armies of objections. The things you think you know about the North arise in

a body to declare that the contention is absurd. On such occasions I think of myself as a professor in Doctor Crothers's University of Unlearning. With the initial advantage of knowing what the reader or listener thinks he knows about the North (for I knew those things myself once and believed them until I went North and found they were not true), I proceed as follows to demolish his misknowledge.

1. Nearly if not quite the most fundamental wrong idea about the North is that the North Pole is the coldest place in the northern hemisphere, and that the polar regions are far colder in the coldest part of winter than any countries that are now inhabited by the average civilized European or American. When we stop to think about it, we see we have really always known that this could not be true—as will appear below.

Besides minor considerations, there are three main factors that determine what the possible minimum temperature of any place may be. These are latitude, altitude, and distance from the ocean. We see at once that the North Pole has in a high degree only one of these three qualifications for being extremely cold. Certainly it is at a high latitude. But the North Pole does not lie high above sea level, for it is located in an ocean which Admiral Peary, at the time he visited the Pole, found to be more than twelve thousand feet deep. And if it is not above sea level neither is it far away from the ocean, for it lies in the ocean. Possessing only one of the three main qualifications

for being extremely cold, it naturally is never extremely cold. Those who theorize about it generally agree that the minimum temperature there seldom if ever drops below sixty below zero, Fahrenheit. However, that is a matter of theory. No one has as yet spent an entire year at the North Pole. It need not be more than a year or two, and in my opinion it will not be more than a decade or two, until somebody goes to the North Pole, stays there a year,[1] and brings back to us a coherent account of how cold or warm it is there from day to day for the twelve months. The main handicap in an attempt of this sort would be the mobile nature of the fractured floating ice that covers the vicinity of the Pole. It seems probable that after being formed in the part of the ocean that lies between the North Pole and Alaska, the ice masses drift across the polar area at the rate of perhaps half a mile per day. They are bound for the Atlantic; their destination is the ocean to the north of Iceland and Norway, where they meet the warm waters that farther south make up the Gulf Stream,[2] are melted, and disappear. Any one who made his camp at the North Pole would learn through astronomical observations after a few weeks that he was no longer at home and would have to pick up his bed and walk back to the North Pole. Apart from that, living there a year would be easier

[1] For one of the methods by which this could be done easily, see "The Friendly Arctic," especially the account of the 1914 "Ice Trip" and of Stonkerson's Beaufort Sea journey of 1918.

[2] In this book "Gulf Stream" is to be understood as that combination of wind currents and water currents which modify so profoundly the climate of the north Atlantic lands and seas.

than some polar achievements that are already history.

If the actual minimum temperature of the North Pole is a matter of theory, we are in no doubt about the temperatures of the north coast of Canada or Alaska. For more than twenty years in the case of Canada and about forty in the case of the United States there have been weather bureau observation stations on the north coast of North America. I have spent in the polar regions ten winters and thirteen summers myself and during most of that time I have carried reliable thermometers, so that I could say from my own experience how cold it is up there in winter and how warm in summer, but I prefer to quote the records of the Canadian and American weather bureaus. I have written both of them and asked them to give me the lowest temperature ever recorded in the Canadian station at Herschel Island on the north coast of Canada near the mouth of the Mackenzie River, and the American station near Point Barrow, at the north tip of Alaska, about 250 miles north of the arctic circle. The replies in both cases were identical: "We have never recorded anything lower than 54° F. below zero."

The other day I was reading over a report of the meteorological observations of my arctic expedition of 1913-18, made by the second-in-command, Dr. R. M. Anderson. He says, "The lowest temperature of the winter (1915-16) was 46° below zero," or about like Saranac Lake, New York State, which is a winter resort. Temperatures as low as 50° below zero are

rare on the north coast of North America and there are many winters when 45° or 46° below is the lowest record.

After asking the United States Weather Bureau for the lowest record applicable to the north coast of Alaska, I inquired for the lowest temperature ever recorded in some settled portion of the United States in some average American community where a good many Americans live in comfort. They replied that in a small town near Havre, Montana, they had registered 68° below zero. Almost as low temperatures have been recorded in Havre itself, and Havre is a typical American town of four or five thousand inhabitants, with stores and shops, with schools and little children going to school, with churches and people going to church[3] at a temperature fourteen degrees lower than it ever has been known to be on the north coast of North America and about ten degrees lower than it probably ever is at the North Pole. And Havre is not by any means the only place in the United States where

[3] The methodist clergyman at El Centro, California, told me in 1921 that his and the other churches of El Centro (a town of ten or twenty thousand Americans) suspend church services for several weeks every summer because no one can come because of the heat. There is no such period of suspension of activities at Havre, even when the cold for days and weeks is more intense than at the North Pole. Churches and high schools and kindergartens may have their attendance lowered by blizzard or cold, but they seldom if ever close even for a day of emergency. There certainly are no protracted and regular periods of suspended activity, such as you find with the churches in several of those American towns where the extreme summer heat ranges from 110° to 122° in the shade (as Yuma, Arizona, El Centro, California, etc.).

the minimum cold is lower than on the north coast of North America.

I lived for fifteen years in Pembina County at the northeast corner of North Dakota, and as a small boy I used to go two and a half miles to a country school at a temperature as low as I have ever seen it in my journeys along the coastline or over the moving sea ice in the polar regions. All the other little boys and girls did likewise and none of us realized that we were heroes doing it. Since then, much better dressed and outfitted and in every way better able to take care of myself, I have done the same thing as a polar explorer, and have been counted a hero for doing it. At my birthplace in Manitoba the minimum government record is 55° below zero, one degree lower than the minimum for the north coast of North America. Accordingly, if you happen to be living in Manitoba or Dakota or Montana and want to become a polar explorer, about all you have to do for a proper outfit when you start north is to leave at home a few of your clothes.

I once said substantially this in a lecture at Kalispell, Montana, and noticed that my audience did not seem to be particularly pleased. After my talk a number of them came to me and, after first saying that my talk had been interesting on the whole, they went on to say that they resented the way I ran down Montana and hoped that I would not do it outside the state. "Here in Montana," they said, "we realize that 60 below zero is not particularly dreadful and that you

can go about your ordinary work without discomfort at such temperatures, but people outside the state might not realize it and might get the wrong idea from what you say."

I replied by saying that I was merely using Montana as a yardstick. The merits of Montana are perfectly well known, not only in the state itself but in Florida and Kentucky and California and Europe. When you speak of a yardstick you do so because everybody knows how long a yard is. The merits of Montana are almost as well known as the length of a yard. When you think of Montana you think of vast herds of cattle and sheep and horses that run out all winter without a barn and without hay, and do pretty well at a temperature lower than that of the north coast of North America. I was merely comparing a place well known to be excellent with another place little known and supposed to be disagreeable. I was not running down Montana but praising the North.

Coming back to the principle enunciated above, we see we have always known Montana ought to be colder than the North Pole,[4] for of the three main factors which determine extreme winter cold—latitude, altitude, and distance from the sea—the North Pole has only latitude while Montana is reasonably far north, is reasonably high above sea level even in the towns where people live, and is far away from any ocean.

[4] This is a discussion of minimum temperatures. Mean temperatures are considered elsewhere.

The combination, accordingly, produces extremely low temperatures in winter.

A moment's thought will show, however, that on the basis of these factors the coldest point in the northern hemisphere cannot be in North America, for the same factors have a higher value on the larger continent of Eurasia. Accordingly, we find the cold pole of the northern hemisphere in Siberia, north of Yakutsk, where, by figures published by the Royal Geographical Society of Great Britain, the temperature goes down to 92° below zero in winter. Other sources equally respectable give the minimum temperature at 96° below zero. And this is a settled community. They do not cultivate tropical fruits at Yakutsk nor, indeed, wheat or Indian corn, but they do have oats and barley and rye and garden products, and some of the people are the blond type of European, very much like the rest of us in complexion and characteristics, although showing just now a slightly higher percentage of Bolshevism.

2. A complement of the idea that the North is dreadfully cold in winter is the notion that it is also cold through the entire summer. It is possible to maintain that the winters are dreadfully cold, but only by agreeing that the winters of northern Vermont and Saranac Lake and Minnesota and Montana are also dreadfully cold. But no one can even glance at the Weather Bureau records for summer temperatures in polar regions and maintain that in any sense of the English language the summers there are "always cold."

Climate may be classified in various ways. One of them is to make a division between continental and insular climates. The ocean is a great stabilizing influence. In the tropics it acts generally as a refrigerator and in the polar regions as a radiator. Even the warm waters of the Gulf of Mexico are colder than the surface of the land in Texas in summer, and accordingly the sea breezes keep Galveston and Corpus Christi reasonably cool. I was told at Fort Bragg, on the west coast of California, last summer, that since the town was built the temperature there has never risen above 85° in the shade, for the ocean breezes are continually blowing across it. But fifty miles inland beyond a range of mountains they frequently have a temperature of 110° in the shade. Remembering that this is true of Texas and California, we are prepared to hear that the coastlines of the polar regions are never warm in summer. Five miles from the ocean at Point Barrow the temperature probably seldom if ever rises above 75° in the shade, which is ten degrees colder than the similar record for Fort Bragg, California, both places being at sea level and near the sea. But fifty miles inland in California gives you a temperature of 110° in the shade, and a hundred miles inland in Alaska will give a temperature approaching 100° in the shade. I inquired from the American Weather Bureau last fall as to the highest temperature ever recorded under ordinary Weather Bureau regulations by their observation station at Fort Yukon in Alaska, four miles north of the arctic circle. They

replied that the highest temperature at that particular place was 100° in the shade. New York City and Montreal are both places recognized as frequently uncomfortably hot in summer. Yet either of them is likely to be cooler on a given July day than is Fort Yukon, in the Arctic.

Any one can find out from the Weather Bureau that the temperature in Alaska north of the arctic circle has been known to rise to 100° in the shade and I imagine any one can find out by writing to the officers of the Church Mission Society of the Episcopal Church of the United States at 281 Fourth Avenue, New York, just how it feels in Alaska when the temperature is 100° in the shade, for that organization has maintained a mission and hospital at Fort Yukon for several decades. The summer of 1921 I was at Yuma, Arizona, when the temperature was 111° in the shade and nobody seemed to be suffering. In Chicago or New York it is common to see streams of perspiration on people's faces, but in Yuma the air is so dry that the perspiration is evaporated as fast as the mechanism of the skin pours it out. It is well known that in the commercial freezing plants low temperatures can be secured by evaporating ammonia, and that doctors can freeze the human skin as the basis for minor surgical operations by spraying it with a warm liquid which produces a lowering of temperature through rapid evaporation. Through a similar principle the skin of the human body is a wonderful self-cooling device, but it works well only in dry climates. At 111° in Yuma

we felt almost cool through the rapid evaporation and did not suffer. A month later in Chicago at 93° in the shade I heard much complaining and believe there was a deal of actual suffering.

The climate which is intolerable in Chicago at 93° is the same kind of steaming heat you have at Fort Yukon, Alaska. The summer of 1918 I was convalescent from typhoid at St. Stephen's Hospital at Fort Yukon. That summer the temperature did not go to 100° but it did go to 97°. The hospital is a three-story building and on that day most of us moved out of the upper two stories into the cellar. Archdeacon Hudson Stuck, who was in charge of the Mission, not only slept in the cellar but as near to the cool and damp cellar floor as he possibly could.

I have just consulted a new edition of a widely used American school geography and have found the statement that "north of the arctic circle it is always cold." Either the author is unfamiliar with the Weather Bureau records or else he has a peculiar idea of the meaning of ordinary English words.

How far wrong they may be who guess that the summer will be cold in places where the winter is cold, is strikingly shown by the Encylopedia Britannica account of Verkhoyansk, a town in Siberia about 75 miles north of the arctic circle. This town is at or near the Cold Pole of the earth. It has a minimum record of —93.6° F., which is 125 degrees below the freezing point of water, 54 degrees below the freezing point of mercury, 39 degrees below the greatest cold

recorded at the north tip of Alaska and 20 or 30 degrees lower than the estimated minimum temperature of the North Pole. If summer temperatures were necessarily low where the winter is cold, we would expect a chilly July at Verkhoyansk. But we find the thermometer not infrequently above ninety in the shade. The maximum record is +92.7°, or well above the hottest summer days of London or San Francisco and presentably hot for July in Rome or New York. As the sun does not set for weeks in midsummer and the nights are consequently hot, it is not surprising that certain cereals and garden vegetables can be cultivated at what is (in winter) the coldest spot north of the equator.

3. After considering the minimum temperatures of winter and the maximum temperatures of summer, we come next to a consideration of the length of the seasons. It is true, generally speaking, that the farther north you go in the northern hemisphere the longer the winter and the shorter the summer. However, this has far less of a "practical" meaning than is commonly supposed. A Sicilian may think that a winter of three months' length is intolerable and if he insists that it is intolerable you can't very well argue with him, but you can at least prove to him that numerous prosperous people live in a climate where there are three months of winter. There are those who are used to three months of winter who insist that six months of winter would be intolerable, but you can similarly show them

that there are prosperous cities (such as Winnipeg, for instance) where you have winter nearly half the year. But in Winnipeg you will in turn meet people who say that while five or six months of winter is no serious handicap to economic development, nine months of winter would be insuperable and intolerable. The argument is of the same nature and in its essence no more tenable than that of the Sicilian who thinks that even the shortest winter is unbearable.

It will be said that you cannot raise wheat or corn where the winter is nine months long. That is true, but this does not necessarily form a serious argument against the value of the North. You cannot raise cotton in Iowa, but you can raise corn; you cannot raise corn profitably in most parts of Manitoba, but it is one of the greatest wheat countries in the world; and you cannot raise wheat profitably on the arctic circle, but you can find something to take the place of the wheat. What that something is, we shall leave to be specifically answered in a later chapter. The general objection must, however, be answered at this point, if only partially and tentatively. This can best be done by suggesting a new version and a new application of an idea similar to the one Tennyson had when he said, "Better fifty years of Europe than a cycle of Cathay." I shall not contend here, although I may later on, that the climate of the North is such as to make our lives delightful to you or me, but shall for the moment confine the consideration to a "lower" form of life than ours—that of the plant kingdom.

A botanist (I hope the reader will not mind my not hunting up his name, for the war is recent and he was a German) some decades ago laid down the general principle that the growth of plants depends not primarily on the number of months of suitable climate but rather upon the number of hours of sunlight. It can be shown mathematically that the total number of hours of sunlight in a year (if we disregard cloudiness) is least at the equator and becomes greater (because of refraction) as you go north. Undoubtedly temperature has an effect upon rapidity of growth but still sunlight as light rather than as heat seems to be the main factor. This explains the rhapsodies of the ordinary tourist who comes back from the Yukon or from Alaska with stories which the stay-at-home does not believe, but which are nevertheless true, about the wonderful size and marvelously rapid growth of the ordinary garden flowers when they are planted under the midnight sun.

Not being a botanist I do not vouch for the statement, which I believe to be true, that many plants not only stop growing during the hours of darkness but also are sluggish in resuming their growth when the first beams of the morning sun strike them.[5] It is something

[5] A botanist friend tells me that many plants do not grow at all during the hours of sunlight, but only during the hours of darkness. Obviously this could not be true of polar plants, for in that case they would not grow at all during the summer, for the daylight is perpetual. However, my botanist friend thinks that a plant will grow much faster during a night that follows an eighteen-hour day than during a night that follows a twelve-hour day. There is, accordingly, no disagreement as to the results of prolonged sunlight in accelerating growth.

like starting a motor car that has been allowed to get cold. In midsummer a plant has say thirteen growing hours out of the twenty-four in Texas, fourteen or fifteen in Minnesota, twenty up on Great Slave Lake, and twenty-four hours on Great Bear Lake. Another way of stating it is that in the South the plants work single shift and in the North double shift. A plant on the arctic circle, therefore, has almost as much growing time in one month as it has in two months in the southern United States. The northern summer when measured by plant opportunities for growth is much longer than it may seem to be when you glance carelessly at the calendar. On the north shore of Great Bear Lake, just north of the arctic circle, the mosquitoes came out the first week in May, and the lake was not frozen over till late in November, 1910-11. Measured that way, the arctic summer there that year was nearly seven months. Let us call it five, "for conservatism."

But see what sort of summer we have up there. On the Coppermine River north of Great Bear Lake, about fifty miles north of the arctic circle, I remember one period of three weeks when there was not a cloud in the sky, the sun beat down upon us the twenty-four hours through, and the heat rose to the vicinity of 90° in the shade every afternoon without dropping lower than 70° or at the lowest 60° at night. Those three weeks were certainly equal in opportunity for plant growth to six weeks of Texas, and they were by no means the whole summer. The mosquitoes that came

out early in May divided their reign with the sandflies that did not cease tormenting us until in September. The mosquitoes did come out at the earliest spring, but the summer lasted beyond the sandflies.

Then it is to be remembered that grass does not ordinarily spend all the summer in growing. Most plants, especially those of a semi-arid climate, grow for only a few weeks and then ripen and turn yellow. From the point of view of grazing animals they may be nourishing and valuable the whole year though they grow for only a few weeks or perhaps months. It is obvious, then, that the northern summer is amply long for the development of the wild forage plants, and so it is. This is one of the considerations which show that the North is the greatest potential grazing area of the world, but that is a point we can develop fully only a little farther on in this argument.

4. That the ground in the polar regions is always covered with snow, whether winter or summer, is another of the widely-spread wrong notions. Before going further we must realize that there are two ways of looking at this question. If I meet a Mexican and ask him, "Is there always snow in Mexico?", he can answer me either yes or no and defend either answer. If he says yes, he is thinking about the mountain tops; if he says no, he is thinking about the vast average of his country.

Even in the tropics there is permanent snow on the mountain tops if the mountains are high, and even in

the remotest arctic regions the snow all disappears from the land in summer, unless it is fairly high land. Take, for instance, the north coast of Alaska. There is a range of mountains commonly considered a branch of the system of the Rockies which runs about straight east from Cape Lisburne, toward the mouth of the Mackenzie River, leaving to the north a triangular coastal plain with a total area two or three times that of New York State or a little more than that of England and Scotland put together. This is a real prairie. In winter it is thinly snow-covered and the grass in most places can be seen sticking up through the snow. In summer it is green with grass and golden with flowers and there is never a speck of snow. As seen from the sea, the mountains to the south of this coastal prairie look high, for they rise from low land, but their actual altitude is less than six thousand feet. In this range you may find some small snowbank in a deep ravine or in the lee of a hill that faces north, but nothing large enough to justify in ordinary usage the name of glacier. You cross this first range of mountains and come to a second one nine or ten thousand feet high. This altitude is great enough and here we do have permanent glaciers, although probably none nearly as large as those found in the state of Washington, the Washington glaciers being larger not merely because of greater altitude but also because of much heavier precipitation.

We learn from the school books a great deal about the iciness of Greenland, and if we did not learn it

from the school books we should learn it from the hymn book's "From Greenland's icy mountains to India's coral strand." But the hymn book is more correct and more careful in its statement than the ordinary geography, for the geography says that Greenland is icy and lets it go at that, but the hymn book specifies "From Greenland's icy *mountains,*" and that is exactly correct.

The mountains of Greenland are icy and Greenland is mostly icy because it is mostly mountainous. It is a mass of high mountains in a region of heavy precipitation. Just to the east is the Gulf Stream and from the warm waters of the Gulf Stream there continually rise clouds of vapor that are carried to the west and condensed into snow against the mountain tops, somewhat as we have a nearly perpetual snowfall upon the high slopes and tops of the Cascade Mountains in Washington and British Columbia.

The Greenland mountains are icy not primarily because they are northerly, but rather because the precipitation upon them is heavy and because they are high. Admiral Peary proved this about thirty years ago. Somewhat north of the middle of Greenland he climbed into the interior and found, as everybody expected, that Greenland there as well as farther south is covered with inland ice. He traveled north and the season was summer. He was going toward the region which is popularly supposed to be coldest and iciest and he traveled at first over ice-covered land. But he finally came to the end of the ice and snow and

found before him large stretches of prairies and hills, green with grass and golden with flowers, with bumblebees and butterflies and birds and herds of grazing animals. Peary was upon the northwest coast of the most northerly land in the world, but because it was lowland it was free of snow in summer.

Since then further exploration of the north of Greenland has confirmed Peary's view of the extensiveness of these ice-free districts. It is the most northerly possible land, so far as we yet know, and that emphasizes the generalization which I shall repeat, for it is important and admits of no exceptions: *Any land, even in the tropics, is permanently covered with snow if it is very high; and no land, even in the polar regions, is permanently covered with snow unless it is high.* Of course you may have a narrow strip of lowland at the foot of glacier-infested mountains, and the glaciers may pour out upon the plain, but this lowland ice has its birth in the mountains and so the exception to our rule is apparent and not real.

We see then that in northern Alaska an altitude of five thousand feet is not enough for perpetual snow where the sun can shine. Ten thousand feet is enough. But you have a great deal more snow at the ten thousand foot level in the state of Washington or the province of British Columbia than you have at that level in northern Alaska or the northern Yukon. This is because of difference in precipitation.

British Columbia is commonly considered the warmest province in Canada, but because of high altitude

and heavy precipitation it contains over three-fourths of all the permanent snow and ice in continental Canada. Nearly all the rest is in the high mountains of the territory to the north—the Yukon.

5. A corollary of the idea that the North is covered with snow even in summer is the one that it is a region of heavy snowfall. This is far from being true. If you take a map of North America and place your pencil near the southwestern corner of Alaska on the coast of Bering Straits, you may draw a line east, along the south coast some fifty miles inland. When you come east to British Columbia your line turns south, still keeping fifty or a hundred miles inland. When you come near the international boundary your line will run east following the boundary between the United States and Canada, roughly. This is the line of heaviest snowfall. South of that line, generally speaking, you have less and less snow and north of it you also have less and less snow.

By the figures of the United States Weather Bureau, snowfall in winter in Missouri or Virginia is heavier than on the north coast of Alaska, while we believe that the snowfall in Virginia or the Highlands of Scotland is many times as great as on the north tip of Greenland or on the northerly islands discovered by my expedition of 1913-18.

In the north polar regions there is, then, to begin with, very little snow on the ground at the end of winter. We have already said that in some parts of

the polar regions the temperature is 100° in the shade in the summer. It would have to be a very peculiar kind of snow if a little of it, more or less covering the ground in winter, would last far into the spring. Of course, it does not last long but disappears like magic. For two or four or five months, according to just where you are, you have green prairies and flowery meadows that are a delight to the eye and would be delightful to every sense, but for the unbelievable plague of insects—mosquitoes, sandflies, horseflies, and the like. In the development of the country these will prove a drawback next in seriousness to the wall of ignorance that surrounds the northern lands. China's wall of masonry was never a very efficient barrier. A wall of misinformation is more effective, more difficult to tear down.

CHAPTER III

THE FRUITFUL ARCTIC

Apparently on my mere say-so, the following chapter asserts about the North various things which are the opposite of common beliefs. Two years ago this would have been embarrassing for me. Even those who might have admitted that ten years beyond the polar circle, traveling on the average two thousand miles per year on foot, had given me ample opportunity to study conditions up there, could still have questioned my veracity or my judgment, if not both. But now we can get in one place and in compact form weighty if not conclusive support for enough of the more essential statements of this chapter so that the reader will be inclined to say: "Since the points of the argument which I can check have full support, the rest of the argument and the conclusions are probably all right."

The authority in question is the report of the Royal Commission appointed at Ottawa by Order in Council of date May 20th, 1919, to investigate the possibilities of the reindeer and musk ox industries in the arctic and subarctic regions of Canada. This report traces its origin back to a series of letters and interviews I

had with the Honorable Arthur Meighen, then Minister of the Interior for Canada and later Prime Minister. After Mr. Meighen had become in general convinced that the subject was important and deserved the attention of Parliament, he arranged that I should address a joint meeting of members of the Senate and the House of Commons. The presentation of the case for the great food-producing resources of the North was satisfactory enough to Parliament so that Mr. Meighen felt justified in appointing a Royal Commission to investigate the possibility of domesticating the musk ox and of introducing domestic reindeer—both with a view of making the northern prairies (commonly miscalled "barren grounds") producers of domestic meats on a commercial scale. I was a member of this Commission, but being already prejudiced through having lived more than a decade in the North, no real judicial function rested in me, but in the other three Commissioners only. For this and other reasons I resigned from the Commission in February, 1920.

The Commissioners could scarcely have been more happily chosen. Dr. J. G. Rutherford, a veterinarian by profession, had become, through a lifetime of study and practical work, nearly or quite the leading stockman of Canada. He was chairman. J. S. McLean is manager of the Harris Abattoir Company, the leading meat packers of Canada. J. B. Harkin is Commissioner of Dominion Parks, and in that capacity has charge of Canada's successful work in preserving

the American bison, and is a leader in game conservation and kindred activities.

The Commission, during a service of two years, examined thirty-five witnesses—missionaries, fur traders, explorers and others—men who had spent in the North anything from one to thirty or more years. According to their own testimony these thirty-five witnesses had spent in the arctic and subarctic regions of Canada, or (in a few cases) Alaska or Siberia, a total of two hundred and eighty-nine years, or an average of more than eight years each. The testimony is many hundreds of thousands of words. It has, however, been admirably epitomized by Doctor Rutherford in a hundred-page report that has been submitted to the Canadian Parliament. This is now a public document, open to all. These are the findings which, supported by ample testimony, have given Canadians assurance that the glamorous and romantic but eternally frozen and forever worthless North is a myth. In its place Doctor Rutherford's report has given them a commonplace, but livable and valuable North.

This report will support enough of the contentions of this chapter and this book (without contradicting any of them) to give it a general aspect of established truth. If you think some statement extravagant, compare it with the official report. You may find the report more soberly worded as to conclusions and recommendations, for I know and love the North and Doctor Rutherford judges it merely by testimony. But you will find the facts the same in this book and in the

report, except that the book covers a greater variety of subjects than fell within the scope of the Commission's inquiry.[1]

It is difficult to see how any of the wrong ideas about the North obtained such wide circulation and such a firm hold. But it is especially difficult to see how the idea can ever have arisen that the Far North is devoid of vegetation, or that if there is vegetation it is only mosses and lichens. An actual canvass of the school geographies and a reading of the encyclopedias will nevertheless leave you with that impression. And yet every botanist will tell you that the contrary is true.

That mosses and lichens everywhere prevail in the school book accounts of the Far North, while in the North itself they are inconspicuous as compared with the flowering plants, would seem unbelievable if it were an isolated untruth. As a matter of fact the school books are full of just that sort of misinformation. We, the common people, believe it, although the specialists have always known better.

There is perhaps no more striking instance of misknowledge than the classic of the ostrich which hides his head in the sand when he is frightened. Some twenty-three hundred years ago there was living in Greece an interesting but not particularly reliable

[1] The report will probably be in print by the time this book is published. To secure it, write to the Department of the Interior, Ottawa, asking for the report of the Royal Commission on the Reindeer and Musk Ox Industries.

writer, Herodotus.[2] Apparently he first put in circulation in Europe the story that there is a bird in Africa, gigantic of body and conspicuous on the open plain, yet so foolish that when he is frightened he hides his head in the sand and imagines that if he cannot see his enemy his enemy cannot see him. It interested the Greeks greatly that there should be some animal so much more foolish than humans, and they probably began at once to use this story as the basis of what with them corresponded to sermons and editorials. Children have found the idea interesting, and moralists useful ever since. The Romans copied it from the Greeks and the Renaissance writers from the Romans and we have it in our school books, not as a Little Red Riding Hood story which we know to be fiction, not as an Alice-in-Wonderland story which nobody believes, but as a sober, supposedly scientific fact which we believed in our time and which children believe to-day.

I believed it for about thirty-five years until I became the housemate of Carl Akeley, who knows Africa at least as well by experience as I do the North. One evening after dinner we were talking about big game hunting and he remarked that the ostrich is nearly the canniest big game animal of Africa, and one of the most difficult to approach. When I said I didn't see

[2] I have tried to check up the literature of the ostrich story. Although I have found references saying that the story was started by Herodotus, I have been unable to find the story itself in his extant writings. I have not been able to trace it in the classics back beyond Diodorus and Pliny, but it seems obvious that the story was already a classic in their time.

how it could be very difficult to approach an animal that stands in the open and hides his head in the sand, Akeley replied that he does that only in the books.

I have since asked many African travelers who have all said that they never saw anything to lead them to believe that any ostrich ever hid his head in the sand when he was frightened. I asked Colonel Roosevelt about it once. He replied in substance that while in Africa he had been greatly interested in this. He had inquired from various white men who had never seen any evidence of it, and from various negroes who had never heard of it. His comment was: "You see, those negroes had not had the advantage of American education!"

Although I accepted for half a lifetime as a fact the story of the ostrich, I can now see that no testimony is required, but only a moment's serious thought, to show that it could not be true. Just imagine what you would do if you were a leopard or a lion or a hyena and were hungry in a country inhabited by foolish birds that stood around with their heads buried. I think if I were a leopard I would go up and bite their necks. Obviously every ostrich in Africa would be killed within a year if they did not know every trick of hiding and fleeing and fighting that is needed to get along in this difficult world.

In spite of common sense and testimony, ostriches with their heads in the sand have prevailed in our literature for more than two thousand years. So it is not particularly remarkable that the mosses and lichens

of the North, without any reason in sense or in fact, have prevailed in our books for a number of centuries.

My first year in the Arctic I saw everything through a haze of romance and did not for a while realize that it was a very commonplace country. But during the nine more years I spent there the realization kept gradually growing on me that one of the chief problems of the world, and particularly one of the chief problems of Canada and Siberia, is to begin to make use of all the vast quantities of grass that go to waste in the North every year. The obvious thing is to find some domestic animal that will eat the grass. Then when the animal is big and fat it should be butchered and shipped where the food is needed.

On my last polar expedition I sailed north the spring of 1913. We did not hear about the war for more than a year after it started, and during the entire course of the war we received fragmentary and indefinite news of it only three times during the five years. We came south just in time for Armistice Day. While in the North I had not realized clearly the conditions, but on coming south I found that in our absence people in America had been on rations and in Europe they had been starving, not only our opponents but even our allies. It became pressing then to do something to get either the Canadian Government or some large corporation to begin the development of the meat-producing resources of the North. This led to my advocacy of those plans which have since been taken up in Canada and which will be described in a

future chapter on what Canada and Alaska are already doing in the way of commercial meat production.

I commenced the advocacy of government action in Canada by laying my ideas and tentative plans before Mr. Meighen. It did not take me long to convince him that the matter was of great importance and that it demanded immediate investigation. If the investigation bore out my contentions it would be of manifest importance that something should be done at once. The world in general needed more food to eat and Canada needed it if not to eat at least to sell. If she could produce food and harbor colonists on her northern no less than on her western prairies, she had before her, in terms of population and wealth, a national destiny hitherto undreamt. She must investigate; and if the facts justified it, she must act.

It is said with some truth that Americans are fond of bragging, and yet Page was able to write from London to Wilson with equal truth: "We have the leadership of the world in our hands and we are the only people who don't know it." The same mixture of self-glorification and over-modesty is found among Canadians who make vast but vague general prophecies about the great future of Canada and in the next breath deny them by under-rating what must always be the foundation of power—the geographic extent of their habitable and productive lands. Just what does it mean to shout loudly, "This is Canada's century!" and then say (as one of their leading politicians is commonly quoted as having said), "Canada is a nar-

row strip along the northern frontier of the United States, varying in width from fifty to one hundred and fifty miles and capable of supporting no more than fifteen million people." To have any foundation for the idea that Canada will one day be a country equaling even a third of the United States in population you must recognize the productivity and habitability of all her territories. Otherwise she cannot have square mileage of habitable land equal to or exceeding the United States. And you can come to that belief only after unlearning most of what most Canadians think they know about most of Canada as to climate, soil, vegetation, accessibility, and the like. Just now we shall proceed to lay one of the corner-stones upon which shall rest a new conception of the future of the North by considering its fitness to become the world's chief storehouse of domestic meats. In general we shall talk about Canada, but nearly every statement will apply also to northern Siberia, and will have there an even wider meaning, for as Asia is larger than America, so is arctic Siberia, both in area and resources, an even vaster country than arctic Canada. The prairies of arctic Alaska are only one-tenth as large as those of arctic Canada, yet even in Alaska our argument applies to an area several times that of England and Scotland put together.

Arctic lands can produce as much meat per acre as those stock lands of the south that are too dry for cereals, and can, therefore, equal them in the population that is directly fed from the land. But no stock

Reindeer, Drift Logs and Tall Grass along the Polar Sea.

Cotton Grass on an Arctic Meadow.

land can equal in production a cereal land, for reasons discussed in another part of this book. So far as the argument applies, this presages a sparse population for the North. But great cities have arisen in deserts about mines and oil wells, and the northern lands will gain in population according to the luck they have in minerals. In another chapter we deal briefly with the prospects in that field.

With respect to the grazing resources of the Far North, we shall take the educated Canadian, American, or European as we find him, already misinformed. At first he considers it revolutionary and unbelievable that the northern half of Canada is a vast pasture. But it is true. The world's largest area of grass lands is undoubtedly in northern Eurasia and to it only is Canada second. Northern Norway, northern Sweden, northern Finland, northern Russia, and northern Siberia are mountainous in some parts and forested in others, but in general they form together a great prairie land variously estimated at from four million to six million square miles, or anything from the full size of the United States to one and one-half times that area. But in northern Canada we have the next largest grazing area in the world, one and a half or two million square miles of prairie land, equal to half the area of the United States. There are some mountains and some rocky hills. In some places there are alkali flats without vegetation and in some places there are forests. But in the main it is a verdure-clad prairie. Whether in square miles or in tonnage of flowering plants, the

grazing areas of the Argentine or of Texas are insignificant in comparison.

These grass lands are not only the northern portion of the continent but also the islands that lie north of Canada, even to the north coast of the most northerly of them. The vegetation is only in part of a typically polar nature, strange to southerners. In part it consists of common plants, such as various sedges, bluegrass, timothy, goldenrod, dandelion, bluebell, poppy, primrose, anemone, and the like. More than 115 species of flowering plants are known to exist in Ellesmere Island, the most northerly of the Canadian islands. Sir Clements Markham says in his "Life of Sir Leopold McClintock" that in the polar regions in general there are 332 species of mosses, 250 lichens, 28 ferns, and 762 species of flowering plants. In any such numerical summary Markham would have been safe in saying "more than" for each of these numbers. New knowledge of the polar regions is continually adding to the number of species no less than to our estimates of the tonnage per square unit of area.

The preponderance of flowering plants over nonflowering is conspicuous in the number of species, but it is more conspicuous in tonnage. I think there can be no doubt that for every ton of mosses and lichens on the lands beyond the arctic circle there are at least ten tons of flowering plants. These are more conspicuous not only because they are more numerous but also because they are less modest in their habits of growth. A further difference is that such

plants as grasses and sedges grow afresh every year while certain species of lichens cropped by herbivorous animals require many years to replace themselves (some species from five to ten years).

The United States Government is just now making the first detailed studies of the grazing possibilities of that part of Alaska which is arctic—the northern third. These have confirmed the views which I had published some years earlier to the effect that the grazing in the North, as represented by grasses and other flowering plants, is far in excess of that represented by mosses and lichens.

The stockman who learns that vegetation abounds in the North will ask whether you can raise cattle or sheep up there. The answer is that you could if you wanted to, but it would not pay. During the years 1918-21 I have talked with many cattlemen in such places as Alberta, Montana, and Arizona and it is clear that during at least the latter two of these three years cattle raising has not paid. The chief trouble is that in most of these places you have to feed and shelter cattle for part of the year. By the time you have plowed the land, planted alfalfa, bought all the required machinery, put the hay into stacks, erected barns, and fed your cattle, though it be for only two or three months in the year, you have put more money into them than at present prices you can get out of them.

If it does not pay to raise cattle in Idaho where you feed them for three months in the year, it would not

pay to raise cattle in the polar regions where you would have to feed and shelter them at least six months in the year. But it would pay famously to raise cattle in Montana or Idaho if you did not have to feed them or stable them and did not have to worry about the possibility of a blizzard coming once every few years to kill off part of the herd. Correspondingly there should be a profit in raising any domestic animal in the North if that animal required no shelter or feeding and produced meat that commanded a fair price. We have such an animal in the reindeer.

The first objection commonly made to reindeer is that they are a wild animal. Apparently many people have the idea that about the only tame reindeer there are are the half dozen that Santa Claus drives around about Christmas time. But reindeer were domestic before history began. They are as domestic as sheep. The records of China show that in the fifth century of our era there were numerous domestic reindeer in northern China, and King Alfred the Great tells us that when he was king of Britain there were domestic reindeer in Norway that took there the place of the cattle of England.

Should any one desire evidence of the docility of the herds of domestic reindeer to-day, he can find it in any library in Chapter 18 of John Muir's delightful "The Cruise of the *Corwin*," a book mostly written in the early '80's of the last century although not published until 1917. Muir is as good an example as Burroughs to show that natural history can be fas-

cinating without being faked. No one ever seriously questioned the accuracy of his observations. In this chapter he tells us in substance that many reindeer in the herds which he visited in northeastern Siberia were as tame as Mary's lamb, and that in general the herds were as docile as the average flock of sheep.

There has been irregularity of usage as to the words "reindeer" and "caribou." The usage seems to be crystallizing now. We speak of reindeer when we mean domestic animals and caribou when we refer to those that are wild. There are many kinds of reindeer and many kinds of caribou. In general, reindeer are smaller than caribou, but the biological differences between the smallest reindeer and the largest caribou seem to be less than those between corresponding breeds of cattle, as for instance Jerseys and Guernseys on one side and Shorthorns and Polled Angus on the other. We may be able to tell the difference between Jerseys and Guernseys, but it is doubtful if they themselves can or at least do. Similarly, the zoölogist may distinguish learnedly between caribou and reindeer, but they themselves appear unaware of any strangeness. When a band of one meets a band of the other they mix with perfect freedom. This characteristic is of great value for the animal breeder. The domestic reindeer being smaller than the wild caribou, the United States Biological Survey looks forward to increasing by a third or a fourth the weight of carcass of the domestic reindeer of Alaska during the next ten or twenty years by crossing them with the larger

varieties of wild animals, such as the Osborn caribou.

Those who have no personal familiarity with the polar regions find it strange that these animals flourish there. But they are native animals. Each creature flourishes best in a peculiar environment of its own. Cattle and giraffes can fend for themselves in the South, but would die in the North. Reindeer and caribou flourish in the North, but would probably not get along very well in the tropics. They are in no more need of shelter from a blizzard than a Texas steer needs shelter from the rain, nor are they more likely to freeze to death than a giraffe is to die of sunstroke. The reindeer is no more likely to starve to death in the North because the ground is lightly covered with snow part of the time than a fish is to die of thirst because the ocean is salty all the time.

So far as I know, no man has ever seen any evidence of caribou being cold in winter or of their being seriously incommoded by a blizzard. I used to be a cowboy in my early days in North Dakota. I know how cattle behave in a sleet storm, for I have more than once followed them as they "drifted" before the wind when no one could stop them. The behavior of caribou is just the opposite. For more than ten years I have in winter made my living in the Far North by hunting them, and as a hunter I know their habits even better than I did those of the half-wild cattle as a cowboy. If I am hunting caribou toward sundown of a winter's day and see a band just before dark too far away to approach them while there still

is shooting light, and if that evening a storm blows up and a blizzard rages for two or three days, as has often happened, I look for that band of caribou to move about five miles in twenty-four hours directly against the wind. If it is a three-day storm, I would look for them at the end of it fifteen miles to windward and would probably find them there if they had not been scared by a wolf meantime or interfered with by some special cause, such as open water or a precipitous cliff.

We have here, therefore, animals that are in no need of shelter from storm or cold. The only time reindeer might conceivably need it would be the calving season in the spring. It is true that calves are sometimes frozen to death during the first five or ten hours after birth, but this happens so rarely that the death rate among reindeer calves in Alaska during the last twenty years has, according to the figures of the United States Department of the Interior, never been as high in even the worst years as the average death rate among range calves (cattle) in Montana or Alberta.

Next comes the quality of the meat. This question can be answered in many ways, although none is more conclusive than the evidence as to price.

Stockholm, Sweden, is one of the fine cities of Europe with a population of between three and four hundred thousand people. I wrote a letter to the Chamber of Commerce of Stockholm and have received a long reply which may be summarized as follows: Reindeer meat has been on the market in Stockholm for several

decades. Apparently it was looked down upon in the beginning as an inferior meat because produced by a people looked upon as inferior—the Laplanders. Gradually, however, the meat increased in favor, until something like ten years ago it came about to the level of the various common domestic meats. It is now sold in the city by the hundreds of tons each year and last winter the average price of reindeer meat ranged from equality up to twenty-five per cent. higher than that of beef for corresponding cuts.

Another answer as to the quality of reindeer meat is found in the American market. The winter of 1920-21 the Alaska firm, Lomen and Company, of Nome, shipped to the United States sixteen hundred reindeer carcasses which were sold to the best clubs and hotels for prices between three and four times as high as corresponding cuts of beef. At a time when the big meat packers were selling the best American beef in New York City wholesale at eleven cents a pound, reindeer meat was being sold wholesale for thirty-five or forty cents a pound, depending on the quantity purchased.

Several hundred typical Americans have now been living for many years on reindeer meat in Alaska. Once upon a time the city of Nome imported large quantities of beef. The import of beef has lessened partly because the city gradually lost its population, but the beef importation decreased at a far more rapid ratio than the population because of the gradual encroachment of reindeer meat, until now the amount

of beef imported into Nome is negligible. It may be argued that the price had something to do with this change, for in Nome reindeer meat has been somewhat cheaper than beef, but any one will find on inquiry that the people who live in Nome do not consider the price to be the determining factor, but rather the quality of the meat. For every man there who says beef is better than reindeer you can now find another who says reindeer is better than beef.

Not long ago I had a conversation with a man who had lived in Nome for twenty years. He told me that Nome, the winter of 1920-21, was about the only place on the west coast of Alaska that had any ordinary domestic beef. Now and then during the winter, visitors came in from out-lying districts where no meat was available except reindeer, and my informant said he had noticed and had also heard it commented upon by others, that the visitors when they went to hotels or restaurants seldom ordered domestic beef, as would have been the case had they been tired of the reindeer meat in the localities where they had been living. Commonly the first meal of meat eaten after arrival in Nome was reindeer meat. This informant said that something like three people out of four in western Alaska are now of the opinion that reindeer meat is better than beef.

It must be said that this opinion has been gaining ground only slowly. When I first ate reindeer meat in Nome restaurants (1912) I heard many comments to the effect that it was not so nourishing nor so well

liked on the average as beef. How the idea started that the meat is not nourishing is difficult to say. Somebody probably said it and others took it up. That the taste was considered inferior was due to unfamiliarity. Through six or eight years of custom the same people are now of the opposite opinion.

However, there will be no difficulty in introducing reindeer meat into the United States or into any civilized country on the score of prejudice. The thing has already been tried out and it is found that the demand is vastly greater than the supply. This will probably always remain the case, for great as are the ranges of the North they will never supply as much meat as the world would like to have. Meat production in other lands will decrease so much more rapidly than the northern reindeer production can increase that the world's total meat supply in proportion to the mouths there are to feed will probably never again be as high as it is this year.

Here, then, we have the answer to the old question, "What is the North good for?" It is going to become the greatest meat-producing area of the world and eventually the only area where meat is produced on a large scale. This will not be because the South could not compete with the North if it wanted to, but rather because the South is not going to want to compete.

When I was a youngster, it was twelve or fifteen miles from my brother's cattle ranch to the nearest ranch to the east and I never knew how far the nearest neighbor was to the west. It might have been a hun-

dred miles. Now the farmhouses in that section are on the average less than a mile apart and they raise cereals where we raised cattle. The same story is being repeated everywhere. A good example is the Yakima country in Washington. When I first heard of it it was a horse country. That memory is preserved by the name of a section out there which is the "Horse Heaven" to this day. A little later Yakima became a sheep country and then it became a country of orchards and market gardens. That is the course of events in Texas and in the Argentine and in most parts of the tropical and temperate zones. The wild lands of yesterday are the vast cattle ranches of to-day and the cereal farms of to-morrow, while day after to-morrow they will be cut up into market gardens and dairy farms and chicken yards and towns and cities.

Up to the present one of the main reasons for the cultivation of stock in such countries as Ohio or Ontario has been the value of manure as a fertilizer. But the rapidity of advance in chemistry and engineering is increasing almost in geometric progression. We are already taking nitrogen directly out of the air and it will not be long till doing that will be cheaper and more convenient than the production of manure for our gardens and fields. Then will vanish one of the great reasons for the production of beef cattle in southerly climates. Undoubtedly they will for a long time be cultivated as luxuries.

There are various estimates to show the extravagance of a meat diet. All agree that if you first feed corn

to a hog and then eat the hog you are losing the food value of a large part of the corn. Some say you are losing six-sevenths of it and others estimate the loss as high as thirteen-fourteenths. In any case, it is an extravagance—a consideration which will force the world gradually toward vegetarianism as the increasing population begins to press hard and harder upon the sources of food.

Being fond of a simple diet and of single-course meals, I had overlooked one of the advantages of reindeer meat until this was called to my attention by a friend who happened upon a copy of a magazine devoted to the interests of cooks and chefs. Here I found an enthusiastic article about reindeer meat as especially welcome because it introduces variety into the rather monotonous meat side of our menus. Though this idea struck me as novel and academic, it will doubtless appeal to many as practical and important. Indeed, I am probably one of a very few who never would have thought of this aspect of the case.

When you come to think of it, there is an astounding variety to the cereal, fruit and vegetable side of our bills of fare as compared with the monotony on the meat side. We have developed elsewhere [3] the principle that a man or dog, or indeed any animal, that is used to a large variety of foods will take kindly to one more variety, but that a man or animal used to

[3] "The Friendly Arctic," pp. 61-65, and "Food Tastes and Prejudices of Men and Dogs," *The Scientific Monthly*, December, 1920.

half a dozen or less varieties of food is very difficult to induce even to sample a new variety. The extension of this principle would indicate that most of us look eagerly for new fruits because we are accustomed to many fruits, and are reluctant to try new meats because we are accustomed to very few. Personally, I think that this factor in the laws that determine human taste in food will be important and will operate against the introduction of any new meat. It is through the good fortune that we are habituated to thinking of venison and through the accident that reindeer meat differs scarcely at all from beef and ovibos differs not at all, that we shall have no difficulty in introducing these meats. While a few people will refrain from tasting them, the demand of the others who want them will always be in excess of the supply of either or both of these meats.

But against the conservative tendency just mentioned will operate the factors that have caused such jubilation over reindeer among the professional chefs. If you can once get people to assume the same attitude towards new meats that they do towards new vegetables and new fruits, there will be a continually increasing cry for variety in meats. Within the last few years sweetbreads and guinea-fowl and other new meat items have been introduced and have become very popular, although twenty-five or fifty years ago they aroused feelings of aversion and even horror. It is possible that reindeer is coming upon the market just after the corner has been turned, and that the people who want

variety in meats are already becoming more numerous, at least in our cities, than those who are horrified by variety. From the point of view of these no less than the professional chefs, reindeer and ovibos (and indeed any other new fish, flesh or fowl) will be welcome.

People who do not consult the census returns are in the habit of laughing at the Malthusian doctrine of the increase of the world's population. But those who look at the census returns do not laugh. His was not a prophecy but a mathematical calculation, and it is coming true as rapidly as he said and as inexorably as things do which go by mathematical law. Professor Raymond Pearl, the chief statistician of the United States Food Administration, said during the last year of the war that, unless some new source of meat be found and if population increases the next half century at the same rate as the last half, steaks will be within fifty years as hard to get as caviar is now. He had not then thought of the possibility of large-scale meat production in the Far North, but even now he has modified his conclusion only slightly. The North will produce great quantities of meat but never nearly enough. The most enthusiastic of us do not dream that the increase of the northern herds can keep pace with the increase of the world's human population and at the same time compensate for the decrease of cattle in the South as the ranch lands there are progressively converted into farms and gardens.

The grazing experts of the United States Government estimate that you can support permanently in

certain parts of Alaska one reindeer for every thirty acres of land. This estimate will probably hold in general for about two million square miles of Canada and Alaska and for between four and six million square miles of northern Eurasia. As an absolute quantity this means a large supply of meat, but relatively to the demands of the world as the world is to-day it is not large. With reference to the world of a hundred years from now, if we avoid destructive wars and do not adopt birth control, this supply, vast in itself, will be insignificant.

But such as it is, it will be the one main source of meat supply seventy-five or a hundred years from now. So far as I can see, the chief food output of the North will be meat until some new food plants are invented that can withstand summer frosts. My own family now has a farm so far north in Saskatchewan that we lose the wheat crops by frost often enough to take up all the profit. It is foolish for us to continue raising wheat so far north, and eventually no one will try it. The cardinal mistake of the northern United States and Canada from an agricultural point of view is that they are trying to gather grapes from thorns and figs from thistles. It is almost as foolish to try to raise wheat on Slave Lake, although you can do it, as it would be to raise ostriches in Iowa, which you could also do.

Eventually the animals and plants of such northern districts as middle Saskatchewan will not be the plants and animals which the colonists are now cultivating. They cultivate them now not primarily because the

land or climate are adapted to them, but primarily through their own conservatism in trying to do as they have always done and through the conservatism of the world markets which demand in general the sort of food products they always have had. But unless the world begins to manufacture food directly out of the air through chemical processes, it will soon have to reconcile itself to deriving from every district those foods which can there be produced without going into violent conflict with natural conditions.

Now and then the newspapers have headlines about somebody discovering a new kind of wheat that ripens in five or ten days less time than some other. These discoveries are chiefly of academic interest, for the northward limit of wheat or of any cereal is determined not by early autumn frosts but by the sporadic mid-summer frosts. There is not much point in breeding an earlier kind of wheat. There would be great point in doing what probably cannot be done, the developing of a frost-resisting wheat. Until that is accomplished the northern limit of profitable wheat cultivation will remain about where it is now and is more likely to move south than north. Rye and oats and other cereals can be cultivated a little farther north, but in the country to the north of the tree-line none of these can be produced at a profit now nor under any commercial conditions similar to the present.

I do not profess to see very far into the future, but so far as I can see the North will not produce any food on a commercial scale except fish from its waters

and meat from the grasses and other plants that grow native and without human encouragement. Because it can produce no other food, fish and meat will be the great food products of the North, and of these, meat will for some time be the greater. I do not undervalue the resources of the ocean; I suppose that the time will come when men will begin to farm the seas somewhat as they now cultivate the lands. That consideration I am leaving out for the present.

But long before that time will come, northern Alaska will fulfil the prophecy of E. W. Nelson, the Chief of the United States Biological Survey, who has said in testimony before a Congressional Committee that within twenty years the annual reindeer output of Alaska will be 1,250,000 carcasses per year (equal, therefore, to about 3,000,000 sheep, for a reindeer weighs more than two sheep). And if Alaska with its estimated two hundred thousand square miles of grazing land can give us an annual turnover of one and a quarter millions of reindeer, Canada with its two million square miles will give us an annual turnover of ten or thirteen million carcasses, the equivalent of twenty-five million carcasses of sheep, which is more than the total production of Canada to-day in all forms of domestic meats. Canada cannot do this within fifty years, for the industry there is just being started. It is, however, being started with the advantage of the Alaskan success before our eyes and progress will, therefore, be a great deal more rapid than it was in Alaska.

Lest it be thought that these prophecies are extravagant, we shall tell here the story of a prophecy now fulfilled.

In 1903 there were approximately 6,000 reindeer in Alaska, the natural increase from 1,280 animals that had been imported from Siberia in small driblets between 1892 and 1902. In May of that year Gilbert Grosvenor, the editor of the *National Geographic Magazine,* wrote for that magazine an article in which he prophesied that within fifteen years there would be more than a hundred thousand domestic reindeer in Alaska, the descendants of the original 1,280 animals, and that within twenty-five years reindeer meat would appear on the American markets. The publication of this article was greeted with a storm of ridicule, and especially from Alaska. Grosvenor received one letter, for instance, from a member of the United States Geological Survey who said in substance that he had practical knowledge of Alaska while Grosvenor was only a theorist; that he had seen the places which Grosvenor talked about and could assure him that no such thing was going to happen; and that Grosvenor was making himself and his magazine ridiculous by indulging in any such day-dreaming.

When the fifteen years were over, the 6,000 reindeer instead of having increased merely to 100,000 had increased to more than 120,000, (and are now estimated at more than 200,000, for the herds double in numbers every three years). The meat instead of appearing on American markets ten years from now, appeared

five years ago. At least 10,000 reindeer steers are now in northwestern Alaska ready for butchering, but lack of cold-storage facilities may prevent the shipping of more than from 3,000 to 5,000 to Seattle in 1922. At 1920 prices the 10,000 are worth $370,000 at Nome, Alaska, and will be worth $600,000 when they get to Chicago, the increase in price covering both freight and the profits of middlemen.

Thus has Grosvenor's ridiculed prophecy come more than true. The herds are double what he estimated, and the market value of the product is already measured in hundreds of thousands of dollars per year ten years before he thought the first marketing would begin.

But it is incorrect to speak of "Grosvenor's prophecy"—it was really an estimate of future increase based on past records, and then divided by two "for conservatism." Those who disagreed with Grosvenor were really denying his facts. For men of a certain temperament it is always easy to do that. But the facts keep marching on.

CHAPTER IV

THE LIVABLE NORTH

The first chapter of this book was a brief summary of world history from the point of view of the northward march of civilization. This northward march has been continually retarded by two classes of obstacles, the real and the imaginary. Of these the imaginary have been by far the more formidable. The real but secondary difficulty has been that the problems of the North have been new problems and that a solution had to be found exactly as men had already found solutions for such southern problems as irrigation. The main unreal difficulty has been the fear of imagined handicaps. That there has been serious work in solving real problems no one will wish to deny; this book is attempting to show that the solution has been made trebly difficult by mental attitudes for which Nature should not be blamed.

We are conquering the difficulties of the North faster as time goes on. It was more than a thousand years from the time when the Romans thought that no civilization could exist north of the Alps until the civilization north of the Alps was really on a par with that of Italy. But it was only a century from the time when Benjamin Franklin thought that the little island of Guadeloupe was worth more than all of

Canada until second-rate cities in Canada had become more important than the whole island of Guadeloupe. It was only a few decades from the time when even Seward's friends tacitly admitted that "Seward's Folly" was the correct name for Alaska until the Republicans began to "point with pride" to the purchase and to rank it among the glorious achievements of the party. By analogy we may expect that it will require only a decade or two for the same progress in knowledge and revolution in sentiment with regard to the northern prairies that are still called "Barren Grounds" and are still supposed to be worthless.

It may be said justly that argument from analogy is never safe, and for that reason the second and third chapters took up in detail and showed the falsity of all the main contentions upon which has been based the common view that the North is uninhabitable and worthless. It was supposed to be worthless because of excessive winter cold, but we have shown that there are many prosperous districts now inhabited by Europeans and Americans of our average type of civilization that attain a minimum temperature in winter equal to or colder than the minimum temperature recorded for the north coasts of Siberia, Canada, or Alaska. It has been commonly supposed that snowfall in the North is heavy, but we have shown that the snowfall of Virginia or Germany is heavier than that of northern Canada or of northern Alaska.

We have pointed out that the growth of grass and other plants is measured not by the length of the sum-

mer in months but by the number of hours of sunlight, and that there are as many hours of sunlight in three months of arctic summer as in five months of a tropical summer, giving the northern plants, therefore, in reality almost twice as long a growing time as the careless reasoner assumes them to have.

It seems to be light rather than heat that makes a plant grow fast. But if it were heat, the polar plants would not be badly off. A fairly simple mathematical calculation shows that from the first week of June to the second week of July the earth receives from the sun more heat per square mile per day in the north polar regions than in the tropics.[1]

If these be startling truths to the layman, they are commonplaces to the advanced students of meteorology. In a short book, statements must be made pointed and brief. Whoever wants a full grasp of the principle enunciated in the preceding paragraph, for instance, can get it from page 12 of Professor R. de C. Ward's "Climate" (a standard text book on climatology).

But the polar winter at its coldest is about as cold as the winters of Montana, Manitoba, or Russia and is even longer. We accordingly still have to deal with people who say that no ordinary Europeans or Americans will ever live in large numbers in a climate where the winter lasts through considerably more than half the year. Here as in the rest of our discussion we may well borrow light for the future from a consideration of the past.

[1] See footnote to p. 255, *post*.

Some of that light we can get from a romantic but little-known story of the administration of President Grant.

The Republican Party had accepted the political burden of "Seward's Folly" with not particularly good grace. At that time in the unregarded country of Iceland there were violent political agitations against the Danes similar to the recent Irish agitations against Britain, and a young man by the name of Jon Olafsson had written such bitter denunciations of the ruling class of Danes that a warrant was drawn for his arrest, whereupon he fled the country, escaping to England and later coming to the United States. This was about the same time that many ordinary colonists left Iceland to settle in Manitoba. Most of the immigrants to Manitoba and other parts of America made a living from their farms or else by manual labor, but the young political exile was a university man of the type who preferred to live by his wits. He soon learned from the American newspapers that Alaska was a white elephant on the hands of President Grant's administration, and this gave him an idea in which, as he told me himself later, he had from the start complete confidence as a source of livelihood for himself for a year or two, although he never took it seriously as a thing to be carried out. He went to Washington and represented to President Grant that the Icelanders are a highly civilized and in many ways admirable people, but that they are above all Europeans inured to the hardships and privations of the North and would,

therefore, make the only people who could be expected to colonize Alaska satisfactorily. According to his presentation of the case, this was the one chance for the Republicans to make Alaska a productive country and thus to justify the purchase. As said, Olafsson himself knew the argument to be pure bunk, for the climate of Iceland in winter is only about as rigorous as that of Scotland, as any one can find out by consulting the weather bureau records. The average American, including President Grant, was, however, of the opinion that Iceland was a dreadfully cold country and upon this ignorance Olafsson based his scheme for securing a pleasant and profitable job.

The idea struck the President and his advisers favorably and they had a ship placed at the disposal of the young Icelander, enabling him to travel along the various coasts of Alaska. In that connection he also made short journeys up some of the rivers and made reports that proved valuable with regard to the salmon fisheries. Among the varied publications of the Government are few more interesting than Olafsson's account of his summer outings in Alaska. They are especially interesting when one knows the romantic background. In the way of colonization nothing ever came of these reports. Icelanders no doubt can colonize Alaska but they have no special fitness for doing so and they have never done so. Even in the gold rush there were probably not more than three or four of them among a hundred thousand people who sought Dawson and Nome and the various northern gold fields. Alaska

is, however, coming into her own through the efforts of other nationalities. When I was last on the north coast of Alaska there were several people living there who had been born in Portugal, in the southern United States, and in the Hawaiian Islands. There were also Norwegians and Frenchmen and New Englanders.

My father moved into Manitoba several years ahead of the railway and at a time when the Government in England had about the opinion of Manitoba that Grant's administration had of Alaska. The Canadian Pacific Railway was being planned, however, and the question arose in Great Britain whether Manitoba might possibly prove a suitable country for British colonists. To determine the facts in the case a commission of learned men was selected. It sat in England and had the power to summon witnesses from Manitoba and the Canadian West generally, to determine the climate and resources of those districts and to decide the probability of their ever becoming the home of a considerable number of British colonists. These witnesses were explorers, trappers, traders, and missionaries who had, most of them, spent several years in the Middle West of Canada and who testified about the climate and resources truthfully from ample knowledge.

To inquiries about the minimum temperature of winter the committee received the answer that the thermometer drops to fifty and fifty-five degrees below zero occasionally. "This," said the judges, "is a typical polar temperature," and that is correct. Forty

years of Government weather bureau observation on the north coasts of Alaska and Canada have confirmed this committee in their opinion that minimum winter temperatures there are similar to those of southern Manitoba.

With regard to the storminess of winter, the witnesses testified that now and then there are dreadful blizzards. At the beginning of the storm the ground may be covered with a foot or two of feathery snow. In the violence of the gale this snow fills the air so thickly that if you hold your hand before your face you cannot count your fingers. Of course, you could count them if you had goggles on. When any one says you cannot count your fingers in a blizzard he means that the instant the eyes are opened they are filled with the flying snow and have to be closed again. The testimony was correct. There are such storms in certain parts of the northwestern prairie states and of the midwestern Canadian prairie provinces, not every year but once or twice a decade. The committee was justified in concluding that the blizzards of Manitoba and Saskatchewan are typical polar blizzards. Many others have verified that and I can add my testimony, for after spending twenty years in North Dakota and ten north of the arctic circle, it is my best opinion that at least one blizzard which I remember from North Dakota was worse than any that I have yet seen in the Far North. This is testimony amply confirmed by the men from Dakota, Montana, and Manitoba who now live in northwestern Alaska or northern Canada.

On the basis of reliable testimony which fills a huge volume, the British committee concluded in substance that the climate of southern Manitoba and the Saskatchewan is unsuitable for colonization by average Europeans and that in such a country no people will live permanently except fur traders because they are eccentric, missionaries because they are self-sacrificing, and Indians because they do not know any better. But since then there has grown up in the country which was the very center of all the testimony the city of Winnipeg, with its three hundred thousand inhabitants, the third largest city in Canada, the Chicago of the Canadian west, and growing as rapidly and substantially as any city in Canada.

Since the publication in a magazine of the above contrasting of Manitoba's gloomy future as seen in the past with its brilliant present as seen to-day, I have received many communications on the subject. The point of view is important and never seems to be too firmly established, so I quote two of these.

Mr. Lonsdale Green, of 5639 Kenwood Avenue, Chicago, has written me in part as follows:

"Do you recall reading the two books by Sir William Butler, "The Great Lone Land" and "The Wild North Land?" The first one was written in 1871 and the second in 1874. I want to quote from the second book, written after the experiences of the first. Writing from the location of Prince Albert, which was then a waste space, he says:

" 'Those who in summer or autumn visit the great prairie of the Saskatchewan can form but a faint idea of its winter

fierceness and utter desolation. They are prone to paint the scene as wanting only the settler's hut, the yoke of oxen, the waggon, to become at once the paradise of the husbandman. They little know of what they speak. Should they really wish to form a true conception of life in these solitudes, let them go out towards the close of November into the treeless waste; *then*, midst fierce storm and biting cold, and snow-drift so dense that earth and heaven seem wrapped together in indistinguishable chaos, they will witness a sight as different from their summer ideal as a mid-Atlantic mid-winter storm varies from a tranquil moonlight on the Ægean Sea.'

"Butler was a good writer and the above is a good description, *but* there is quite a large city right at the place where the above was written, and as Sir William died only eleven years ago he lived to see it."

My friend, Hamlin Garland, has just called to my attention the following passage from pages 110-111 of his "A Son of the Middle Border" (New York, 1920):

"One such storm which leaped upon us at the close of a warm and beautiful day in February lasted for two days and three nights, making life on the open prairie impossible even to the strongest man. The thermometer fell to thirty degrees below zero and the snow-laden air moving at a rate of eighty miles an hour pressed upon the walls of our house with giant power. The sky of noon was darkened, so that we moved in a pallid half-light, and the windows thick with frost shut us in as if with gray shrouds.

"Hour after hour those winds and snows in furious battle, howled and roared and whistled around our frail shelter, slashing at the windows and piping on the chimney, till it seemed as if the Lord Sun had been wholly blotted out and

that the world would never again be warm. Twice each day my father made a desperate sally toward the stable to feed the imprisoned cows and horses or to replenish our fuel—for the remainder of the long pallid day he sat beside the fire with gloomy face. Even his indomitable spirit was awed by the fury of that storm. . . .

"We met our school-mates that day, like survivors of shipwreck, and for many days we listened to gruesome stories of disaster, tales of stages frozen deep in snow with all their passengers sitting in their seats, and of herders with their silent flocks around them, lying stark as granite among the hazel bushes in which they had sought shelter. It was long before we shook off the awe with which this tempest filled our hearts."

While the above quotation from Garland is as truthful in fact as it is forbidding in tone, it is not the whole picture. The book from which the quotation is taken does give the whole picture, but it will suffice to note here that the very farms over which this particular blizzard swept were bought and sold fifty years later at prices ranging from two hundred to five hundred dollars per acre. For Garland wrote about Iowa.

The truth to be deduced from all this is that people will live in any place if the financial returns are adequate. If I could promise the readers of this book a twenty-five per cent. increase in their wages or a twenty-five per cent. increase in the profits of their business, a considerable proportion of them (by no means all, of course) would move to Iowa, Prince Albert or Winnipeg.

There are many who through long custom have

grown to like the climate of Winnipeg. But many live there disliking the climate, just as many feeling similarly live in London and New York, Montreal and New Orleans, Calcutta and Petrograd.

It seems reasonable that even a commission of wise men in Britain would be more easily deceived about the true future of Manitoba than the Government of Canada itself at Ottawa. But eastern Canadian opinion even in 1922 is being swayed by great newspapers, the editors of which in some cases have never been west of Lake Superior and in other cases have never been there except in summer. It is not in reality remarkable, therefore, that the Government at Ottawa in the '70's was misinformed. In order to realize that some of the speeches made in the Ottawa Parliament against the building of the Canadian Pacific Railway were at the time seriously intended and generally believed to be sound, one has to appreciate the fact that there are between the East and Midwest of Canada climatic differences corresponding to South and North, and must remember the principle that the South has always been misinformed about the North and fearful of it. Unless we understand how firmly grounded at the time were the misbeliefs about the winter cold of the Prairie Provinces and its effect upon vegetable and animal life, we cannot get a true view of the history of that time, nor can we honor as they deserve the pioneers of the Lord Strathcona group who had the vision to build the Canadian Pacific Railway.

The speeches in Parliament of Sir Edward Blake

and others against the building of the trans-continental railway are now classics in Canada and are there the best known examples of unconscious humor. The English language was taxed to its capacity in showing the absurdity of the project. The argument said in substance that the expense of building the road would be so great that even were we to accept the most optimistic view of what resources the prairie provinces might develop, a reasonable freight tariff to the Atlantic would never pay for the axle grease of the freight cars. Opponents of the road were willing to concede that if anybody had the incredible folly to squander that much money the road could be built. They admitted further that it could undoubtedly be operated in summer; but it was preposterous to suppose that it could be operated in winter. There followed the self-evident conclusion that the railway could never be profitable, for "no enterprise can be profitable if it is operated only half the year."

It is hard to realize that this argument was once applied in good faith to what is now with some justice called "the bread basket of the world" and to a railway which is commonly conceded to be one of the greatest of all railway systems. Few investors in railway securities are more fortunate than those who own Canadian Pacific shares. The enterprise made many of its builders fabulously rich, laid the basis of a prosperity, on the average high, for tens of thousands of homes in the "desolate wilderness" through which it passes, and maintains passenger and freight schedules as re-

liable and a service in every respect as good as any of the great railway systems of the world.

About the most fundamental proposition in esthetics is that we like what we are used to. People of a southern origin, on the average prefer warm climates, and most Europeans and Americans live in countries where there is summer more than half of the year. There is also in such places as Italy and Florida a carefully planned campaign to "sell climate" to the rest of us. It is, therefore, not strange that the words "a good climate" should be synonymous with "a warm climate" in the public mind. But when one stops to think about it, doubts at once appear.

"By their fruits shall ye know them," is the principle on which to judge climates no less than cabbages and kings.

In the early part of the seventeenth century there were in England people now known as Puritans or Pilgrims who were not locally popular and were forced to emigrate. Some of them went to the West Indies and some to Massachusetts. If you had inquired at that time from the man in the street in London he would have said that the Barbadoes have a good and Massachusetts a bad climate. But whatever we now think of the comparative "goodness" of these climates, the average reader will readily admit that he knows little about the subsequent history of the colonists who went to the West Indies and that probably most of their descendants would now fall under the classifica-

tion of "poor white trash," while the descendants of the Plymouth colony are commonly considered to have been the backbone of the American nation and are supposed to have furnished a high percentage of the men who made our present-day western civilization.

In the war of 1776-83 the American colonists were not a unit in their opposition to Great Britain. Those of them who in that struggle were known as Loyalists or Tories found their situation unpleasant after the war, and many of them emigrated, some to the Maritime Provinces of Canada and others to the West Indies. The man in the street would again have said that those who went to Canada went to the worse climate. But the descendants of those who moved to the West Indies have made but slight impression on history and are now in the main lost to view, while those who went north have furnished one of the most important elements that went to building the Canadian nation. To-day their descendants are in positions of power and prominence and are developing a civilization and a government that the world has to reckon with.

When we stop to analyze the expression "a good climate" we find that what we really mean is a good climate for loafing. Secondarily we may mean a climate where all sorts of vegetation flourish rankly. Without denying the value to the world of coffee and cotton and sugar, we are constrained to admit that the most important crop of any country is the people. No climate can rightly be considered good, though bananas and yams may flourish, if men decay. Human energy,

mental and physical, is developed to the highest degree in the northern climates. It may also in some cases be developed to a high degree in southern countries, notably on plateaus and where the sea breezes blow freshly.

We need not go into such elaborate arguments as those of Ellsworth Huntington's book "Climate and Civilization" to prove to any thoughtful man that so long as we have a competitive civilization and so long as public opinion continues to allow the energetic and the powerful to take whatever they wish from the lethargic and the weak, so long will the North continue to dominate the South as it is doing to-day, for it produces the one crop that matters—men of unsleeping energy and restless ambition.

On the principle of esthetics referred to above—that, generally speaking, we like what we are used to—we would expect to find a substantial majority of the population preferring summer to winter in any country where we have summer more than half the year, and a substantial majority preferring winter to summer in any country where we have winter more than half the year. If you make due allowance for the powerful effect of the organized advertising of the South through commercial mediums and the unintended glorification of the South through the fact that the literature we have inherited (a product of the past and not the future) was mostly composed in southern countries—when you have made these and some other just allowances for forces that influence opinion, you

will see in a canvass of any country that summer or winter are preferred by the population roughly according to this principle. Not to burden the argument with too much proof, we shall consider merely the two typical northern communities the information about which is most readily accessible to the readers of this volume. We shall take one community from the northern prairie and another from the northern forest.

Judge G. J. Lomen has recently been appointed by President Harding judge for the Second Judicial Division of Alaska. He is a typical American, born in the Middle West, educated at the State University of Iowa, and was for some time a resident of Minnesota and a member of the Legislature of that state. But he had the pioneer spirit and the fever of the 1900 gold rush got into his blood, so he moved to Nome, Alaska, and has lived there for twenty years. A year ago I had a conversation with him from which I gained the information about to be given. For fear my memory might not be quite correct, I have checked it by submitting the draft of the present statement to his son, Carl J. Lomen, who has also lived in Nome for twenty years, but who happens to be now on a visit to New York.

At the peak of the gold rush Nome was a city of thirty or forty thousand inhabitants. Later when substantially normal conditions prevailed, it was a city of ten thousand or more. Property passed gradually into the hands of larger and larger corporations, and machinery began more and more to take the place of

hand labor, reducing the population of the community correspondingly. Then came the war with its rise in prices of goods, which really means a drop in the value of gold, and there had to follow an exodus from the gold country.

When Nome had dropped to a town of about two thousand inhabitants, it was so well known to Judge Lomen that his conversations and inquiries practically amounted to a taking of a vote of the whole population as to whether they preferred winter or summer, and he assures me that while no actual count was made, the opinions expressed to him indicated that with men, women, and children all voting, at least three out of four would have cast a ballot in favor of the winter climate of the North as compared with the summer climate. It must be remembered that in point of birth and ancestry of its citizens Nome is a typical American town—its people born in the United States, Canada, and the various European countries. There are also a few negroes and Asiatics.

There are many who have business in Alaska but who live in San Francisco or other southerly places. It is common to hear these people say that the summer climate of Nome is delightful, but that they would not live there in winter for any money. They have either never tried it or have wintered there only once. Few will like a northern climate the first year who are brought up in a southerly one, and it is merely in accord with our principle that these people would not like their one northern winter. That they do consider

the summer climate pleasant is the significant thing, for the people who have lived in Nome for fifteen or twenty years and who know the winter as well as they do the summer are seventy-five per cent. in favor of winter. If you admit the testimony of those who have been in Nome only in summer to prove that the summer climate is pleasant, you will have to allow the testimony of those who have lived there many years to prove not only that the winter is to them pleasanter than summer, but also that the winter is entitled to be considered from an absolute point of view a pleasant season.

Nome has in summer a climate strongly affected by the ocean. In winter Bering Sea is in the main frozen over and at that time the climate is that of a northern prairie, or substantially that of Dakota. The winter temperature is in fact nearer to that of South Dakota than of North Dakota, for fifty below zero is rarely recorded and there are few winters that go lower than forty-five degrees below zero.

But the city of Dawson in the Yukon is in the mountains and in a forest. The temperature there in winter drops about fifteen degrees lower than it does at Nome and lower than any inhabited part of the United States except certain cities and towns in Montana. In talking with the "sourdoughs" of the Yukon you may get the impression that seventy and even eighty degrees below zero have been recorded, but the Canadian Weather Bureau, which has maintained observation stations there for more than twenty years, will vouch for nothing lower than sixty-eight below,

which is the same figure as that given by the American Weather Bureau for the village of Gladstone near Havre, Montana. Dawson, then, has the "continental" type of winter climate and it also has that type of summer climate, for the thermometer goes to the vicinity of one hundred in the shade. This is the time when flowers and vegetables grow so rapidly at Dawson that their development seems magical even to those who know the tropics.

The weather bureau records of Dawson are not significant from our present point of view, for they are in stark figures and these have no direct bearing on the question of whether people do or do not like the weather. To find out about that you must ask people who have been there, rather than meteorologists or statisticians. I have talked with hundreds of men who have lived there but shall quote only the typical opinion of Mr. D. A. Cameron, to-day the manager of the Canadian Bank of Commerce in Toronto, but formerly, for many years, manager of the branch of that bank in Dawson. Being a great city, Toronto has a climate that is well known. It is generally said to be similar to that of Cleveland, which many consider better than Chicago, for instance. At dinner in Mr. Cameron's home I once inquired whether he preferred the winter climate of Toronto to that at Dawson and received the reply, "There are no two opinions in this family. My wife and daughter agree with me; we all prefer the winter climate of Dawson." Mr. Cameron went on to say that that was the general opinion

of those whom he knew who had lived in Dawson two or more years, or in other words had lived there long enough to get over the predisposition in favor of a "temperate" climate they had brought with them from a country where summer is longer than winter.

The "popular" explanation of why the people of Dawson complain less of their "severe" winters than others do of weather less cold, is that there is a fundamental difference between cold as registered by a thermometer and as registered by your skin. We discuss "sensible" cold and utter much bromidic wisdom about its not seeming cold "because it is so dry." Admitting all that may be said about "sensible" cold, there remains the fact that most healthy persons who live mainly outdoors in such a climate as Dawson *get to like cold as cold.*

While we have for Dawson no systematic inquiry like that of Judge Lomen for Nome upon which we can base a statement of probable percentage of a vote as between the climates of summer and winter, we have adequate evidence to show that not only do the residents of Dawson prefer the polar winter to winter on the Great Lakes in such places as Toronto and Chicago, but they also, as a matter of personal comfort, prefer the extreme cold of the Yukon winter to the extreme heat of the Yukon summer.

Obviously the reason why those who are used to both prefer extreme cold to extreme heat is not that cold is in itself pleasanter. The reason is rather that we have made nearly perfect a series of inventions

which protect us against the cold. Within doors and even without we can neutralize the cold by lighting a fire; we can shut it out by building houses and by putting on clothes; and we can keep warm by eating suitable food for internal fuel and by taking exercise to speed up the bodily functions. But what can we do against the heat? We may wear a helmet or carry a parasol; we may dress in Palm Beach suits and live mainly on tomatoes and lettuce, and even at that there are few who bear the heat of midsummer without complaint whether it be in Texas or Iowa, in Winnipeg, Edmonton, or Dawson. The poorest hovel has a suitable means of dealing with the winter cold, but there are not half a dozen of the most luxurious hotels in the western hemisphere that have an adequate cooling system to meet the distress of July. Even the poor can fight the cold successfully; it is only the rich whose circumstances allow them to flee the heat.

It is my experience that when I tell a man that two thousand people in Nome prefer winter to summer, I thereby do not succeed in proving to him that winter is pleasant, but only that there are two thousand exceedingly eccentric people living at Nome. We are scarcely laboring the point. then, by citing more testimony.

Dr. E. W. Nelson is Chief of the United States Biological Survey and by profession a naturalist and a student of climate and of its effect upon plants and animals and man. Dr. Nelson now lives the larger part of the year in Washington, but he has experienced

the winter climate of Florida and other parts of the southern United States and owns a farm in California. Many years ago he spent four winters near the northwest corner of Alaska. In the Cosmos Club in Washington I asked him a year ago whether he preferred the climate of Washington or of California to the climate of Alaska. He paused before answering, "If I were to speak offhand and as I feel, I would say that I preferred the Alaska climate to any in which I have lived. But it may be that what I am thinking of is not really the climate itself but rather how I felt while up there. I have never in my life either before or since been so exuberantly healthy, and you like it anywhere if you are in exuberant health. Accordingly, I will not say that I prefer the climate of Alaska to the climate of Washington or California, for I probably should not if I went there at a low stage of vitality. But I will say that I spent much of my time outdoors both winter and summer while there and that I have never enjoyed myself so much year in and year out as I did the four years in Alaska."

Dr. Nelson said, in other words, what may be stated as follows: The northern winter is not pleasant for lying around outdoors in idleness. It is a climate for activity, not only because you enjoy that sort of climate if you are active but also because activity becomes second nature and a joy when you live in that sort of climate. A quotation from a friend of mine is another way of saying the same thing: "When I am spending January at Miami I want a cocktail before

dinner, but I never do at Lake Placid or in Algonquin Park."

That the opinions of men who live in the North differ inevitably from those of explorers and tourists, is seen to-day whenever we come in contact with employees of the Hudson's Bay Company or trappers who have resided in the polar regions. It happens occasionally that the opinions of experienced whalers and of officers of the Royal Canadian Mounted Police agree with those of the tourist and explorer, but in such cases it will be found that the tourist point of view appears only among officers who have spent their arctic winters in (what they considered) the comfort of their ships or barracks. Those whalers and policemen who have hunted extensively or made outdoor journeys agree generally (in my experience) with the fur traders and trappers.

That this is not a peculiarity of the twentieth century is shown interestingly by a manuscript of the thirteenth. "The King's Mirror" (Speculum Regale) was written by a scholar who may not have visited Greenland but who (all critics agree) was familiar with Greenland through conversations with men who had lived there, and probably also men born there. So far as I know, this document is not available in English. I have, accordingly, myself translated from the thirteenth century Old Norse sections of Chapters 19 and 21 to indicate what men who had lived in Greenland thought of it, no less than to show what scholars of eight centuries ago thought of the habitability of the polar regions and

of the tropics. I have based this on the AM Codex 243, Folio B, as published at Munich in 1881 by Dr. Oscar Brenner.

Chapter 19.

"But those who have written about the nature of the world in the manner of Isidore and other learned men have said that in the heavens there are certain zones under which the earth is uninhabitable. One of those is so hot that no one can live there because of heat and scorching, for whatever thereunder is will burn. . . . Men have also said that there are two zones in the heavens the lands under which are so cold that because of the cold it is no easier to dwell under them than it is to dwell under the other because of the heat. In these zones the cold has so much power that the water renounces its ordinary nature and turns into ice and all the lands cover themselves with glacier. The like is true of any seas that may lie under this belt. It would seem from this (theory) that there are five zones in the heavens,—the land under two of them habitable and under three of them uninhabitable.

"All the lands are habitable that lie between these zones of freezing and burning. It seems reasonable that of these lands some are warmer than others and these lie nearer to the zone of burning. But those lands which are cold lie nearer the zones that are cold, for there frost can exert its power. . . . It is considered certain that Greenland lies on the outer margin of the world to the north and I do not believe that there is any land beyond it, but only the great ocean which encircles the world. . . . But as you (my son) enquired whether the sun shines in Greenland and if the weather is fair as in other lands, I want you to understand for certain that the sun shines there gloriously and the country is considered in general to have a good climate. But there is a great difference between day and night, for when it is winter, nearly the whole of it is one night. And when it is summer nearly

all of it seems as if it were one day. When the sun is highest in the sky, it gives much light and cheer but no extreme heat. Still it has enough power so that where the ground is thawed (i.e., where there are no glaciers) she warms up everything so that the earth produces valuable and fragrant plants. People may therefore well inhabit that land. . . ."

Chapter 21.

". . . As you have said that it seemed to you strange that the land (Greenland) should have weather that could be called good, I will tell you how this is. When evil weather happens, it may take on more violence than common in other lands by reason of strong wind, keen frost and quantity of snow. But usually this bad weather is in short spells and there are long periods between, when the weather is good although the climate is cold. (This cold) is due to the nature of the inland ice."

Any one who is a specialist is continually astounded by the colossal ignorance of the whole world upon his specialty, be it epidemiology, electricity, or polar research. On railway trains I ride in drawing rooms, which I cannot afford, and in hotels I shut myself up in my room to avoid answering everlastingly the same series of questions, one of the most obnoxious of which is whether I do not suppose that I like the North chiefly because I am of Norse descent. For one thing, my descent is partly Irish and that much at least of my blood is not particularly northerly. For another thing, there is no real reason to suppose that Norwegians or Swedes or any other northern nationality

get along better in the North than those from southern countries, except in so far as they are less obsessed by a fear of the North and are in the beginning a little more familiar with the technique of how to remain comfortable in that sort of climate. And still it cannot be supposed that people brought up in Norway or Iceland would know how to deport themselves in really cold weather, for they do not meet cold weather in their own countries, except perhaps a few who live in the higher mountains.

If you want any evidence to show how little Norwegians understand about being comfortable in a polar climate, take the narratives of their polar expeditions. The best example is Nansen's "Farthest North," a delightful book, full of adventure and illumined by literary charm. By his own telling, Nansen must have been extremely uncomfortable in the North; and if that is clear it is no less clear that his discomforts lose nothing in the telling. Then turn to Peary (of American-French descent) whose immediate preparation for his northern work was surveying in Nicaragua. Peary did have hard times at first, but he got through that stage of his work more quickly than his Norwegian competitors. But perhaps that may not seem quite so striking as the fact which ought to be well known that the Duke of the Abruzzi with an expedition largely Italian followed in the footsteps of the Norwegians, and in a short voyage, which did not give them time enough to acquire in the North much knowl-

edge of the technique of northern work, nevertheless exceeded the best Norwegian records.

The scientists tell us that life first had its beginnings in the seas and morasses. Land not covered or sponge-soaked in water had no plant or animal upon it. Then (perhaps because the ocean was crowded) some of the seaweeds learned to become land weeds; sea animals began to make furtive excursions ashore and thus snails and amphibians were developed. Doubtless these early land-pioneers were then looked upon as unfortunate if they had been crowded out of the water, or foolish if they had left it voluntarily. Possibly those opinions may still be held among the plants and animals of the sea.

Though the scientists agree that life had its first birth in the water, they are not at one as to where on this earth it happened. Commonly we assume it was in the tropics. Others say the tropics were then too hot for life and that it must have originated near the poles. But they are rash who speak confidently about the temperature limits between which life may exist. Little as we yet know about the fundamental nature of life, we do know that living things grow and perpetuate their kind in the hot springs of the Yellowstone at a temperature near boiling, and in snow on the floating ice of the polar ocean at 50 degrees below freezing. While we may hazard a guess that life probably started at a warmth halfway between the known extremes of life temperatures, it would be rash to say

it cannot have started at the equator or the pole because of the heat of the one or the chill of the other.[2]

But our sciences are in hazy agreement that in known times terrestrial life-forms are traceable farthest back in tropical regions. There live (with a few exceptions) our most ancient and aristocratic families of worms and birds and beasts. Among mammals at least we have only comparative newcomers in the polar lands. The polar ocean contains many forms that are considered among the most ancient of water dwellers.

Whether some fundamental urge, some inherent tendency of the common life stuff, drove plants and animals from the sea to the land (possibly because they were capable of a higher development on land) has, so far as I know, remained to this day an uninvestigated problem.

But the other question, of why and how plants and animals move from a warmer to a colder region but seldom or never back, has been studied if not solved. For the present, we have little light on the why. Several students have discussed for us the particular animals that have moved from the steaming lowlands to the cool mountains (probably as the mountains were developing) and from the tropics to "temperate" and "frigid" lands. The most readily accessible writings on this subject are those of Dr. Frank Chapman whose style is as lucid as his facts are definite. He shows in

[2] For some account of animals that can stand repeated alternation of heat and cold from 70 degrees F. below freezing to the vicinity of boiling, see "Heart of the Antarctic," by Sir Ernest H. Shackleton, Vol. II, pp. 239ff.

particular how birds will through centuries force their way higher and higher up a mountain, adapting their bodies to the cooler weather as they climb, but have never been known to undertake a similar fight to force their way down a slope or into a sweltering jungle.

It has been shown that "cold blooded" animals, such as reptiles, will stand a falling much better than a rising temperature. If the normal heat of the environment is, say 90° F., the animal will probably become sluggish without dying if the temperature drops to 40° F., and remains there for a considerable period, but will die if it rises to 140° F., and stays there.

The power of the human body to adapt itself to changed conditions is similar to that of the birds studied by Chapman. It is a commonplace in England that the sons of the princes of India acquire not only European culture but stronger bodies at Oxford, while the sturdiest English stock decays on the plains of India. Gandhi and Tagore may blossom there to genius and may live to an old age, for they are of the stock that had not fought its way north, but Kipling was sent to England for his schooling, and he would have sent his children to grow up in England had he remained in India. There are, of course, social and other reasons why Englishmen in India send their children to England. But over and above these is the climate to which few Europeans have been long exposed without at least a taint of physical and mental degeneracy. The Englishmen in New Zealand have their native climate with them and are bringing up,

and educating there, families that for every sturdy mental and physical virtue are the full equals of any of their neighbors' children that for social or family reasons may have been sent home to the Old Country.

We may argue (though scarcely successfully) that it is for social reasons rather than climatic that there has grown up in the Indian civil service the uniform custom of sending children back to England. So, let us rest no conclusion on the India-England case (since one authority in ten may dispute it) and turn to a situation not one in a hundred will dispute—that tropical people are usually healthy in "temperate" regions, while arctic people are not usually healthy in the tropics or even in the "temperate" zones.

The negroes who now live in the United States are as healthy and energetic as those who live in tropical Africa or in Central America. The negroes who live in Michigan are on the average as healthy and active as those that live in Louisiana or Nicaragua.[3] But although not one in a hundred would dispute this, there is a still less debatable case.

In the arctic whaling fleet that used to sail from New Bedford and San Francisco there was always a considerable percentage of "colored" men of the follow-

[3] During the writing of this book the following interesting letter has come from E. C. Hathaway (P. O. Box 793, Philadelphia):

"I am reading . . . your articles (in the *World's Work*) on 'The Resources of the Frozen North.'

"In the last article you speak of the adaptation of the people from the South Seas to arctic climate, as well as Portuguese, Italians, etc.

"In the ante-bellum days when the Underground Road was in

ing classes: negroes from the southern states, from the Cape Verde Islands and the Canaries; and South Sea Islanders from Fiji, Guam, Samoa and the Hawaiians. Many of these found their first winter in the Arctic disagreeable because they did not know how to dress and take care of themselves. But they got to like the Arctic, which is shown by most of them re-shipping on whaling voyages. However, their liking or disliking the arctic is beside the point. The point is that by the uniform testimony of the whaling captains (confirmed by Peary and other explorers who had negroes in their crews) these tropical people were as healthy on the average as were the sailors of European ancestry, and both were as healthy in the arctic (usually more so) as in New Bedford or San Francisco.

Now compare this with the cases of Eskimos brought south. This has seldom been tried, for the results have been so disastrous. An attempt made by Peary is typical. We quote Dr. Ales Hrdlicka: "Anthropological Papers, American Museum of Natural History," Vol. 5, part 2:

"In 1896 Lieutenant Peary brought six of the Smith Sound natives to New York, and they were housed in the Museum. However, scarcely had they arrived when the majority of them

operation from the Southern States through to Canada there were a great many negroes who escaped into the Dominion. These men founded a colony near Woodstock where they and their numerous progeny lived. In the northern part of Maine and Canada you will find them now working on lumber operations. It used to seem rather strange to me to see negroes with the skin pigmentation provided for a tropical climate stand the climate better than white men. It is a fact, however, that they do, and they make most excellent lumbermen."

began to cough and became infected with the bacillus of tuberculosis. Within less than nine months four of them died from acute phthisis, one had to be sent back, the same fate threatening, and one, a boy of about eight at that time, after having been adopted and brought up in New York and after having passed through the initial stages of lung, as well as light grades of gland and skin tuberculosis, was, at his demand, also sent back to his native country."

It is not simple to explain why plants or animals may migrate north and not south, but we can easily explain in the scientific patois of to-day why the negroes can move north, why the Eskimos cannot move south, and why the English can more easily move north than south. The keys to the problem are those magic words of our twentieth century scientific jargon *micro-organisms* and *immunity*.

In the North the uncivilized Eskimo lives his life of exuberant good health in a comparatively germfree atmosphere. He is not frequently attacked by germs and so neither he nor his ancestry have developed immunity against them. When you bring him south, he is attacked by hosts of strange germs and his sturdy good health either crumbles before their first charge or succumbs to their persistent siege.

In the South the negro fights from infancy arrays of the deadliest germs and so have his ancestors before him. There has been developed both an individual and a racial immunity. When the negro or South Sea Islander moves to the north coast of Alaska or Siberia he leaves behind his enemies of the microbe class and meets instead (for a part of the year at least) the

strange new enemies of snow and cold. We understand little as yet how to protect an individual or race against germs. Our immunology and preventive medicine are still in their infancy and so we cannot guarantee the southgoing Eskimo against germ attack. But we can guarantee the negro against his new enemies of the frost, for we have fought cold and storm successfully for thousands of years, and can show him how to protect himself.

We do show him. We teach him to dress in woolens and furs, to make fires for warmth and to build houses that store up for comfort and safety the warmth the fire has made. These and other tricks the South Sea Islander acquires in his first year on a polar coast and has begun to feel himself at home there by the beginning of the second. By that time the southgoing Eskimo has died of some germ disease in New York.

The human body has a normal temperature not far from 98° F. and must be kept about that level. But the weather is sometimes warmer and sometimes cooler. With that situation man deals artificially by having fires and clothes and houses for warmth, breezes and baths and awnings for coolness. Of the artificial temperature controllers, those for heating have been found much the more efficient. If the temperature is thirty degrees below that of our blood we find little difficulty keeping warm inside our houses and inside our clothes. But at thirty degrees above blood heat we find it difficult to keep cool.

If our artificial heating devices are better than those

for cooling, the same is even more true of our natural heating and cooling systems. The principles are the same. We keep a house warm or an engine going by burning fuel; similarly we utilize food as fuel in our natural heat and power plants to keep our bodies warm. Our commercial refrigerating plants evaporate liquids for their purpose, and similarly we perspire to keep our bodies cool.

A simple experiment will show the comparative efficiency of our heating and cooling systems. Take a square meal for your stomach's sake and a drink of water to supply your sweat glands. Wear no clothes and sit still in a room at 78° F. (20° below body heat) and you will be comfortable (if you are a normal healthy person). Then raise the temperature to 118° F. (20° above body heat) and see how you like it. If you drop the temperature to 58° F. you may have to move about (thus speeding up your heating apparatus) to keep warm: if you raise the thermometer to 138° F. it will not be many hours till you begin to feel as if your life might be in danger. In animal experiments of this type it is generally found that if one set are exposed to heat which eventually causes death, other animals of the same sort exposed to a corresponding lowering of temperature suffer no permanent harm in the same period, both sets being supplied with food and with water to drink.

These considerations throw further light upon the facts stated above—that tropical peoples get along with the arctic winter better than arctic people do with the

perpetual summer of the tropics. (The arctic summers, even on lowlands far from the sea, are unpleasantly hot for a few weeks only).

In a workaday world our natural heating and cooling processes conflict seriously with each other. Activity promotes oxidation, oxidation means heat, and the production of heat in the body means a cancellation of part of the efficiency of the cooling system. This is all very well in a cool climate, even advantageous, where the weather allows the sweat glands to take temporarily a complete rest. But in weather above 80° F. and especially above 90° F. the production of internal heat is a serious matter, for the body will burn itself out if its internal temperature rises above 100° F. Therefore, no long continued strenuous activity can fail to injure the health of tropical peoples, except in very dry climates where the perspiration is quickly evaporated from the skin, giving efficient natural cooling. This explains, I think, why the high civilizations of the tropics have generally been connected with semi-arid or arid countries. But an arid country cannot produce much food except where irrigation is possible (or where floods take place, as in Egypt). The tropical lands that have the needed human energy seldom have the natural resources upon which that energy can be profitably expended. The tropics are, therefore, at a fundamental disadvantage at any stage of the earth's history when there are people of more energizing climes to compete with them.

We have here an explanation of the inevitable back-

wardness of the humid tropics. Because of their vegetable and other riches we shall continue to seek them eagerly. But will it not be their destiny to be exploited by outsiders rather than to be developed by their own populations?

Many say the mind does not function properly in a warm, humid climate. Others insist, and with much to fortify their arguments, that some of our highest thinking has been done in the tropics. But then Egypt, Palestine, Arabia, Peru are semi-desert. In the humid tropics seers and saints may flourish—men of much thought and little action. With abnormal thyroid development the saint might even have the energy to become a prophet. But armies of disciples to translate the thought of the prophet into action are not likely to come out of the tropics unless from deserts like Arabia.

There have been high civilizations in humid countries, such as Yucatan. But these civilizations are not known to have had the energy to withstand outside competition. They seem generally to have depended for their material achievements (such as the building of public works) upon slave or other forced labor. If they have not decayed from within they have been overthrown by more energetic people who came from the north of cool winters, from the mountains of cool nights or from the deserts where the body's cooling system works well.

From my own experience I could tell many stories of the adaptability of southerners to the North, a thing that is well known also from the writings of other northern travelers. Peary tells us again and again in

his books, and he emphasized it to me personally, that the best traveling companion he ever had was Matt Henson, a typical American negro. Nearly every whaling ship in arctic waters, whether on the Atlantic or the Pacific side, has carried in its crews one or more of one or another kind of southerner. These men have usually averaged as high as north Europeans in their ability to stand cold and in their enjoyment of the northern climate.

But none of these stories is more striking than that of my old friend Jim Fiji whom I first met on the north coast of Canada in 1906 when he had already been there for many years.

When the World's Fair was held in 1893, one of the exhibits was a young man who had grown to maturity in the Samoan Islands and had been brought to Chicago as a part of the exhibit of "native races." This young man was James Asasela. When the Fair was over, he drifted to San Francisco with an idea of getting back to the Samoas. He could not speak much English, so he went down to the waterfront to see if he could find a ship that looked as if it would take him home. He saw a small sailing ship that had several "Kanakas" aboard, natives of the Hawaiian Islands. He could not speak to these Hawaiians, but he knew what people and country they belonged to, so he went to the officers of this ship and asked for a job, for he thought they were sailing for the Hawaiian Islands. Two or three months later he found himself in the Arctic. "Jim Fiji" from the tropics now had

to spend the winter with a whaler at Herschel Island, two hundred miles north of the arctic circle, on the north coast of Canada. He found it hard, for he did not know how to take care of himself in the cold. He froze his face and his fingers and shivered and was miserable, and he has told me that he would have given anything to be out of it and home. But it was a three-years' voyage, and during the next two years he learned how to clothe himself properly and how to protect himself from frost, and he liked the last year so well that when the vessel got down to San Francisco he immediately shipped on another whaler to go north again. And at the end of this three-year voyage he liked the North so well that when the ship turned home he asked permission of the captain to remain behind.

Jim Fiji has lived in that country ever since, trapping and occasionally working for whalers or traders, and he worked three years for us on our expedition of 1913-18. I have known him since 1906 as one of the finest men in the North, and consider him one of my good friends. He has been industrious and frugal, has caught many foxes, has sold his furs at favorable prices, and now he has money in the bank. The amount is a subject on which he is reticent, for he has in that respect the instincts of a miser. He will give you any food or clothing or other articles he has, but when anything has once been turned into money it never gets away from him. Some say he is worth ten thousand dollars and others say forty thousand.

In 1917 his hair had turned nearly white and he was getting to be an old man. Although I am a great believer in the North, it struck me one day that it might be no bad speculation for Jim Fiji to go back with some of his riches to the Samoan Islands and settle down. I suggested to him that a good thing to do would be to go south with us to San Francisco, put most of his money into Liberty Bonds, take a few thousand dollars to the Samoas and buy an estate on which he could live. This idea struck him very favorably and thereafter we had many talks about what he was going to do. He told me how you could get a man down there to work for you all day for five cents, and he had great visions of what he was going to do with his plantation. Among other things, I was to come and visit him some time down there. He knew how fond I was of the Eskimo foods and he described in detail the peculiar Samoan foods which he was going to give me to see how I liked them.

At the end of my 1913-18 expedition I came east to Ottawa and New York and Jim Fiji went to San Francisco. Some months later I went out to San Francisco and the day after I got there Jim Fiji called on me. I was surprised to find him still there, but he explained that when he got there he heard that one of his cousins was on the way from the Samoas and so he thought he would await his arrival before starting for home. When this cousin arrived he told him, among other things, that wages had gone up and that you no longer were able to hire a man for five cents per day. Various

other things had changed for the worse, but the main thing that worried Jim was that he found he did not like the winterlessness of San Francisco and, as the Samoas were in that respect even worse, he had decided that he did not care to go back after all and his intentions now were to buy another trapping outfit and go back to the Arctic.

This is what he has done. In the spring of 1919 he was taken north by Captain Pedersen of the *Herman,* and Captain Pedersen tells me he landed Jim on Cape Bathurst, the second most northerly point on the Canadian mainland. He expects to live there the rest of his life.

It seems to me impossible to deny that in such countries as Missouri or Scotland winter is unpleasant, and that in such countries as northern Canada or Alaska summer is unpleasant. I have often argued with southerners who know only the unpleasant southern winter and have occasionally succeeded in making them understand that winter may be pleasant, though they have never found it so. I have often argued with Eskimos who know only the unpleasant northern summer and have never succeeded in proving to them that any reasonable person could like Florida or Italy, for Eskimos are narrow-minded, lacking education and a liberalizing experience. I do expect to have better luck with the readers of this book in trying to prove to them that many reasonable persons like winter better than summer, for their minds have had more oppor-

tunities for broadening. But I don't expect much better luck.

If stories without number and with the same moral as the foregoing still leave some unconvinced that you can ever get any large numbers of southerners to become fond of winter and to colonize the Far North, these are only the intellectual children and grandchildren of those who said there never would be anything but a fur-traders' village where now stands the great city of Winnipeg. All we can do with such is to urge them to take good care of their health so they may live to see history once more repeating itself.

Having gained from this experience the idea that a wise man may learn from the experience of others, though a fool learns only from his own, I have long ceased trying to explain to Eskimos that winter being essentially pleasanter than summer is only a matter of opinion, but I still keep urging on my more cultured and broader-minded southern friends (in connection with my ideas and plans of northern commercial development) general principles and specific evidence showing that a man or woman may be perfectly normal and still delight in a climate that is winter more than half the year. The general principles do not need to be reiterated. They are few and simple. But they need to be enforced by much testimony to show they really work. So I keep on telling story after story of the type of Judge Lomen's, Dr. Nelson's, Cameron, the banker's, and Jim, the Samoan's.

CHAPTER V

THE ESTABLISHED ARCTIC INDUSTRIES

Writing a pioneer book, we concern ourselves little with matters that are commonly known or with such detail of exposition as falls legitimately within the domain of chambers of commerce or the immigration departments of the countries concerned. The agricultural possibilities and the demonstrated agricultural achievements of the Mackenzie valley, the Yukon, Alaska or Siberia will receive the less space here because they are continually getting wide publicity elsewhere.

When I made my first journey down the Mackenzie in 1906, I saw strawberries and other fruit being already successfully cultivated in the gardens of the Roman Catholic Mission at Fort Providence, 2,200 miles north of New York, 1,000 miles north of Winnipeg, and 500 miles north of Edmonton, then the northern railway terminus. From the Mission at Fort Good Hope we purchased potatoes that had been raised about twenty miles south of the arctic circle. I have talked with traders who hold the northerly record of raising carrots and cabbages in the Mackenzie delta, more than a hundred miles north of the arctic circle. Wheat and other cereals are grown at Fort Providence and Fort Simpson, and it may be said in general that the ordi-

nary cereals such as rye and barley and most garden vegetables, though probably not tomatoes, can be grown on the arctic circle in the Mackenzie valley and near Great Bear Lake.

The Department of Agriculture at Washington and the Chamber of Commerce of Seattle will furnish detailed information with figures as to hay and wheat, garden produce and dairying, as far north in Alaska as one hundred miles south of the arctic circle and even to the circle itself.

While it is true that most of the common garden vegetables can be cultivated almost anywhere in about half of Alaska, and while it is true that wheat and strawberries have been successfully cultivated north of Slave Lake on the Mackenzie River, and while similar success in arctic Europe and Asia has been even more notable, I still think it a mistake to pride ourselves on these endeavors. They are rather symptoms of one of our most serious economic ills. They are but another series of attempts to gather grapes from thorns and figs from thistles.

Our chief domestic animals and nearly all of our food plants are tropical or subtropical in their origin. With regard to the plants this may be considered inevitable, for in our present state of knowledge we are aware of no important plants, either growing wild or cultivated in a northern climate which can furnish any large amount of food for direct human consumption.

Our remote ancestors who first domesticated animals lived in the south with tropical animals for neighbors.

The Camp of the Oil Drillers near Fort Norman, just South of the Arctic Circle.

A Subarctic Field of Grain—near Dawson in the Yukon.

These have retained under domestication their tropical or sub-tropical natures (in some cases even accentuated by coddling) and they are congenitally unable to fend for themselves in an arctic environment. It is "poor business" to try to raise ostriches in Minnesota or in Germany; it can be done but it would not pay. It is scarcely less unwise to try to raise cattle in Montana and Alberta. It can be done and has paid under the economic conditions of say ten years ago. It is not paying very well now. My own family have tried for years to make a living by raising both wheat and cattle in middle Saskatchewan under difficulties which are inherent, not in the country, but in the system we have employed. Not until the world is much more crowded than it is to-day and not until food prices rise far above those which the farmer can secure at present, will it pay to shoulder the difficulties and hazard the risks of wheat and cattle cultivation in lands where wheat and cattle are not native.

In a sense it is possible to gather grapes from thorns and figs from thistles, for the wheat and cattle farmers of the northern countries are doing it continually. It seems to me that one of the greatest industrial reforms of our time will come when the food producers of the world take to heart this Biblical text, cease their profitless endeavors to force the hand of Nature, and begin to adapt themselves to conditions by producing in each locality that food product which experiments shall show to be of those available the most nearly native.

Generalizing, we may say that it is sensible to pro-

duce cattle in such climates as those of Texas and the Argentine. In climates like those of Manitoba or of Russia we should use the yak or the American bison or some animal developed by careful breeding upon the basis of hardy native stocks. Farther north, as this book specifically argues, it is insanity to try to raise cattle, it would be folly to try to raise bison or yak, and sensible only to cultivate the reindeer and ovibos and whatever other animals can be found or bred that are equally or better suited to the local conditions.

If the farming and garden possibilities of the sub-arctic are already well known, other enterprises in those regions are better known. Once upon a time fur was considered the only thing of value to come out of the North. There is still fur, and the rise in prices has nearly kept step with the decrease in quantity, so that even now the fur output is to be reckoned with. Moreover, it has already been demonstrated that foxes and other animals can be raised with profit under conditions of semi-domestication, and "fur farming" is an established and promising industry. In certain districts sealing and whaling have been carried on for centuries and are as well known as the fur trade. Gold mining through the various stampedes and through the agency of our novelists, is equally in the public mind when one thinks of the North.

With regard to Alaska, it is of especial interest that among the many puzzled historians who have tried to decipher the riddle of Seward's purchase, there are several who think he did it to improve the credit of

the United States by showing the country was not broke. His method of showing it was to hand out $7,200,000 in gold, and these historians say that the full value of that gold was presently received by the country through the improved credit abroad secured by this display of hard cash. Seward does not appear to have expected repayment from Alaska in kind, but the accepted estimate of the gold production there between 1867 and 1920 is $319,665,000. Although gold is by no means the major source of Alaskan wealth, Seward's venture has already been repaid in gold alone forty-four times over.

It is a commonplace now that in Alaska both copper and coal are sure to prove of more importance than the precious metals, and the same will probably apply to both iron and oil. The Canadian Yukon as well as Alaska has been productive of gold and there are few thoughtful people who will not readily agree that, square mile for square mile, arctic Canada promises as well in minerals as does Alaska. Oil has been struck in both countries but, so far as the arctic developments are concerned, the leading ones are in the Mackenzie basin, where there are actual flowing wells just a little south of the arctic circle with indication of oil for a thousand miles along the Mackenzie, both north and south of the present main prospect.

We do not emphasize the fur and minerals of arctic and subarctic lands and the agriculture of the subarctic section, because doing so is no novelty. Neither shall we say much of the fisheries in spite of their great

money importance, for salmon and cod and herring no less than gold and fur have long been associated in the public mind with the northern countries. It is worth pointing out, however, that one of the important conclusions of oceanography is that the amount of animal life per cubic mile of ocean volume is probably least at the equator and in a general way increases going away from the equator either north or south, until reaching such northern waters as those of Alaska and Norway and the northerly waters of Canada, where in salmon and herring and cod, in whale and seal and walrus, and in a great variety of other life forms, we have one of our chief resources against the time when, as many think, the whole world shall be short of food. Some of these foods are already popular on our tables; others will readily become so with use. Even should they never become favorites in the United States or France, they might still be of no less value to the world as a whole as the favorite foods of some other country. The Japanese now hunt whales for food. If they like to live on whale meat or on rice, it would be foolish for us to quarrel with their taste just because we do not agree with it, for it leaves that much more wheat and beef for the rest of us.

Although well established in several countries, the reindeer industry is to most of us more novel than fur trading, whaling or gold mining, or almost any of the major northern industries.

The origin of reindeer domestication is an unsolved

problem, archæologically, ethnologically, and historically; it is unsolved both as to time and place. The common belief is that the reindeer bones found with those of our European ancestors of the ice age are those of wild animals, though some have thought that they were even then domestic. Opinions differ here with regard to reindeer somewhat as they differ with regard to the horse which was one of the favorite foods of Europe from the remotest times down to the Middle Ages when the Church at length, through heretic burning and other devices, compelled our ancestors to curb their appetites for the flesh of animals that do not split the hoof.

But though authorities vary as to the extreme antiquity of domesticated reindeer, there are none who dispute the Chinese historical records which show them to have been at least fairly common in northern China, or to the north of China, in the fifth century of our era. Neither is there any doubt of the historical validity of the reference to the domestic reindeer of Norway made by King Alfred of England in the latter part of the ninth century. It does not necessarily follow, however, that the earlier historical proof for reindeer in China shows that they are any more ancient there than in Europe. Many have argued for an origin in some intermediate part of northern Asia.

Not only are the local origin and antiquity of the reindeer industry unknown, but its present volume in Asia is little understood. Commodore Bertholf told me that when in 1901 he was sent by the United

States Government to purchase on behalf of Alaska some hundreds of Tunguse deer, he went to Petrograd to secure official permission both for his own overland travel northeastward through Siberia and for the purchase of the reindeer. He was astounded to find that the officials with whom he dealt in Petrograd did not even know that there were domestic reindeer in northeastern Siberia. This was a curious ignorance, for scholars both in Russia and in other lands had known of the industry for centuries; but it shows at any rate that no official statistics were then available.

Neither do any statistics seem to be now available either for the industry of to-day or for its standing at, say, the beginning of the World War. We know in general that from the west coast of Norway to the east coast of Siberia on Bering Straits there stretches a (probably) unbroken chain of nomad herds. It has been reported from points thousands of miles apart in this vast area that single families considered only moderately well-to-do own five to twelve thousand reindeer. The reindeer of Siberia, then, are to be estimated by the million and ten million.

It is only in the limited area adjoining Norway, Sweden and Finland that the meat of domestic reindeer is a factor in commerce. In Helsingfors, Stockholm, and Christiania, reindeer is a standard meat, sold by the hundred tons in the same markets with beef and mutton at prices ranging from equality with beef to twenty or twenty-five per cent. above (as, for instance, in Stockholm the winter 1918-19). In the

north of Siberia, both in the interior and along the coast, export of meat is unknown and the export of skins so difficult that, practically speaking, the people live upon the reindeer herds direct. They eat the meat, dress in the skins, ride the animals in some places and drive them in others, and employ the milk in one district more, in another less and in some apparently not at all. In some places houses, tents and boats for river or ocean travel are also made of reindeer hides.

In the past and even recently reindeer have been so common and cheap, for instance, near the shores of the Kara Sea, that among the chief articles of export have been the skins of grown animals, and particularly those of unborn and new-born calves which command a market in Europe as a fur for women's wear. In certain districts and at certain times at least, great numbers of reindeer have been butchered for the hides alone or the hides and tallow, allowing the flesh to go to waste. Although the daily papers tell us that thousands of people are dying in Russia from hunger, we can reliably infer from knowledge dating back only a few years, that the northerly parts of that country are now so abundantly supplied with food that were a trader to penetrate those regions, he could secure for a nominal price almost any number of reindeer hides from animals that would be butchered for the purpose, the flesh rotting or being eaten by dogs or wolves.

The World War did something towards bringing western Europe to realize the accessibility of northwestern Siberia by a sea route around the north tip

of Norway. Companies have already been formed to take up, as soon as economic conditions become stable, the erection of packing plants and the instalment of refrigerator steamers to bring this cheap, delicious, and already popular meat to London and Paris. The difficulty of bringing the meat to the world markets increases, of course, as one goes east beyond the Kara Sea, but the recent journeys of Captain Sverdrup and others are convincing us rapidly that the handicaps are not serious. The route is not as long as that which brings Argentine beef to England, only half as long as that which brings Australian mutton; furthermore, the problems of refrigeration are much simpler in the northern than in the tropical oceans, an advantage which to a degree compensates for whatever difficulty there may be in meeting with occasional ice.

Should the Japanese and Chinese or the people of Hawaii and San Francisco develop a taste for reindeer meat, the herds of northeastern Siberia are readily available to ships plying to the north Pacific and the northeast arctic portions of Asia.

A glance at any map of the Trans-Siberian Railway shows that the reindeer meat of the north Siberian prairies can be brought by river steamer up the great north-flowing rivers, either to the railways that have already been built or to the ends of spur lines that can be run north from the present trunk line to the head of navigation of such rivers as the Lena. It is not suggested that these spurs would be built for the single purpose of bringing reindeer meat south. That indus-

try is merely one of many potentialities that make the railway development of Siberia as inevitable as was the railway development of the prairies of central North America.

Whether we estimate the domestic reindeer of north Siberia in tens or in hundreds of millions, we know, at any rate, that those vast prairies are capable of supporting a great many more than they do now. That growth will inevitably follow the coming development of a European market by ships plying from France and England around Norway to the north coast of Siberia. But the industry awaits a new type of development in Canada and is already receiving it in Alaska.

Few if any white men have lived with the Eskimos on such terms of intimacy as I. Through ten years of residence, they have become as my own people, whose language I speak fluently if not quite correctly and whose thoughts and needs I understand, perhaps not correctly, but at least as correctly as they do themselves. Most observers look upon the Eskimos from what the observers consider a superior point of view. They have ideas about their needs both spiritual and material which the Eskimos either never had or have only recently learned with difficulty from their preceptors.

When I first lived among the Eskimos of the Coronation Gulf district who had never seen a white man, I found them more nearly satisfied with their condi-

tion than any people I have lived with of any social class in any part of the world. Their average of bodily health was at that time so high that when my immediate successor among them, Mr. Jenness, referred to them as people "without any serious ailments," I thought the expression no more of an over-statement than is justifiable for emphasis.[1] Certainly I can imagine no healthier people on the average.

These uncontaminated Eskimos considered fat meat and lean meat ideal foods and they had plenty of both; they considered fur clothes entirely satisfactory, and nearly every one had at least one complete new suit that had never been worn; they were satisfied with the climate of the country and with its resources; they had no desire to travel and no idea that any condition could be better than their own. When we came among them with firearms, steel butcher knives, and steel sewing needles, they envied greatly the needles which were vastly superior to their copper ones and envied only secondarily our butcher knives, which were indisputably better than their copper knives. The rifles they did not covet until we and traders who came a few months afterwards had been among them several months.

But it is the common view of white men that even these Eskimos are badly off, though they do not know it. There are some who consider the inability to appreciate their own wretchedness as one of the evils

[1] "The Copper Eskimos," by Diamond Jenness, The Geographical Review, August, 1917, Vol. IV, No. 2.

that most needs to be alleviated by our civilizers. In that effort we eventually succeed completely. An Eskimo may be considered to have emerged from his savage state when he has become thoroughly dissatisfied with his country and condition and has learned to complain to us in broken English about his inability to buy canned goods and ready-made shoddy clothing in the quantity he desires.

Had I been in Alaska in the early '80's of last century, I should not have sympathized with the Reverend Sheldon Jackson, who saw the destitution of the Eskimos from the ordinary white man's philanthropic point of view and who conceived the idea of turning them from huntsmen into nomadic herdsmen to provide food and clothing for themselves and their descendants. I should have given grudging assent, saying that if we would only leave the people alone they would be perfectly all right; but that the possibility of their being left alone being only an academic question, it was perhaps a good thing to introduce reindeer. I should probably have been blind, as Sheldon Jackson himself seems to have been, to the fact that this enterprise, which he conceived as a philanthropy and carried through with philanthropic motives always as a driving force, was going to attain not only the ends which he had in view but also the totally different result of becoming one of the chief industries of Alaska.

Sheldon Jackson has attained his object fully, for the reindeer are making the Eskimos economically in-

dependent. More than that, the astounding success of the reindeer industry, which has been far beyond the predictions and hopes of its early advocates, is pointing the way to the ultimate colonization of all the arctic prairies, both of Alaska and Canada, by ranchmen of the type of Texas and Montana and Alberta cattlemen of fifty and seventy-five years ago, the reindeer taking the place of the Longhorn.

It is commonly enough supposed by those partially familiar with the reindeer industry in Alaska that it started with breeding stock from Norway. This impression arose from the fact that in 1897 Congress was stampeded with stories of imminent starvation in the gold mining camps and was induced to appropriate money for rescue purposes. A considerable part of this money was used to purchase something like five hundred Norwegian reindeer steers, which were brought with a loss of less than one per cent. from Norway to New York and thence to Seattle and the south coast of Alaska. But when the attempt was made to drive the animals into the interior, it turned out, as any thoughtful person could foresee, that they were unable to find food in the forest, exactly as cattle would have been and for the same reason. The meadow and prairie and not the deep wood is always the logical habitat of grazing animals. Many of the reindeer starved to death; few if any were of value in preventing the starvation of any miner, and, as said, the whole enterprise had no bearing on the establishment of any industry in Alaska.

Through the efforts of Sheldon Jackson, the American Government imported from Siberia 171 reindeer into Alaska in 1892. Between that period and 1902 a total of 1,280 Siberian reindeer were imported. From this small beginning have developed a hundred or more herds scattered over northern and western Alaska that are now estimated to have a total of over 200,000 animals although a 100,000 or more have been butchered for meat and skins.

Seventy-five years ago you could buy a steer in Texas for seventy-five cents, and in a sense it paid to raise them at that price. To speak of cattle-raising in Texas at that time was almost a contradiction in terms, for the animals took care of themselves. The climate and country were such that no barns were needed for shelter, no hay for feed, and half a dozen men could look after a great many thousand head. The work was little beyond branding and rounding-up when the time came to sell. Similar conditions obtain in Alaska now. The reindeer are as well adapted to the north coast of Alaska as cattle ever were to the most favored part of Texas, and if we place the cost of raising reindeer in Alaska to-day at two dollars per head rather than seventy-five cents, it is not because the labor required in raising them now is proportionally greater than with Texas cattle seventy-five years ago, but merely because wages and all other things have gone up. The reindeer needs no barn to shelter it, no hay to feed it, and little care beyond branding and protection from wolves. How simple the wolf problem

is may be seen from the statement to me of Mr. Charles W. Hawkesworth, who on behalf of the United States Government superintended about 20,000 reindeer for five years in northwestern Alaska with a loss by wolf-killing, so far as he knew, of three animals.

The experience of Lomen and Company, who are at present the largest private owners in Alaska, is that it is advisable to keep reindeer in "standard" herds of about 10,000 head. Each herd is satisfactorily looked after by half a dozen or so Eskimos. That a white manager is employed for each herd is partly because the Eskimos, although by nature reliable, have not as yet really evolved from the hunting into the pastoral stage. It is difficult for them to take seriously the continuous care of property although they do the work efficiently under even a casual superintendence.

As mentioned elsewhere in this book, there is no problem nor the semblance of a mystery connected with the adaptability of reindeer to an arctic climate. They are an arctic animal just as the fish is a sea animal and the crocodile a swamp animal, and one mystery is no greater than the others. We have pointed out elsewhere that the summer is adequately long and hot for the growth of a rich vegetation; the winter cold, as such, is not known ever to have interfered with the happiness of reindeer; the snowfall in northern Alaska is much lighter than in such well-known cattle countries as Montana, where cattle forage all winter. Furthermore, were the snowfall five times or even ten times as heavy as it really is, this would of itself be

no problem either to the reindeer or to their owners.

The only condition under which snow could be dangerous to reindeer is that actually found in certain parts of northern Norway where there are narrow grassy valleys separated by barren rocky ridges, and where there is a heavy snowfall with an occasional strong wind. Under such conditions the snow may be swept off the ridges into the deep grassy hollows, accumulating there to a depth of five and ten or twenty feet. Through five feet of snow reindeer will dig their way but not through ten or twenty feet. Because of a topographic peculiarity, northern Norway is, therefore, especially ill-adapted to reindeer. That it is, nevertheless, a great reindeer country indicates that the industry must flourish well in northern Siberia, northern Canada and northern Alaska, all of them better grazing countries than Norway because they are prevailingly vast prairies without the deep narrow valleys where excessive snow can accumulate.

There is only one climatic condition that is seriously detrimental to reindeer. This is what is known as a *föhn* in Norway and as a *chinook* in the Rocky Mountain district of Western Canada—a winter thaw. This may produce a coating of ice over hundreds and even thousands of square miles of grassland, making it difficult or impossible for grazing animals to feed. In northern Norway this occurs rather frequently, causing difficulty and loss. In northern Canada and northern Alaska it is nearly unknown. In western and southwestern Alaska and in Labrador and other parts

of eastern Canada, it may occur although apparently not with the frequency and severity common in Norway.

Fortunately, there is usually in winter a marked difference in temperature between the immediate coast and the country inland and also between the lowlands and the highlands. There are few places, therefore, where herds cannot be driven out of the ice-covered area by heading them inland or towards mountains. Again, should there be a heavy ice coating in the interior or up in the mountains, it will be found that on the lowland and down near the coast the thaw has been so great that all snow has disappeared and most of the water has run off without forming ice. The chinook is, therefore, a menace that can be met successfully by quick and intelligent action on the part of those who control the herds.

The same mobility which makes it easy to drive reindeer away from an ice-covered area is an important quality they have in relation to the marketing problem. In the old days Texas cattle used to be driven five and six hundred miles to market at St. Louis and Kansas City. Driving reindeer equally far would be easier, for they are the most mobile of domestic animals, even more so than horses. In an actual trial several hundred reindeer steers in Alaska were driven in mid-winter 1920 five hundred miles at an average rate of ten miles per day, and arrived at their destination almost as fat as when they started and with ample fat for immediate butchering. Cattle driven the same distance, even through good grazing territory at the

most favorable time of year, could not equal this record, and the reindeer were driven at the least favorable time of year.

In beginning the colonization of any country the ocean and the rivers furnish highways and give location to trading centers. Alaska is one-fifth the size of the United States, but there is no point in it five hundred miles from either the coast or the Yukon River. In some places drives could not be made because of intervening forests, but wherever grasslands are there is usually found a continuation of them down to the coast in some direction.

Railways will doubtless eventually play their part in the development of Alaska but, from the point of view of the reindeer industry, they will be for a long time a convenience rather than a necessity.

Two things led me to undertake in Canada (in 1919) a campaign for the introduction of domestic reindeer —the success of the enterprise in Alaska and my realization that the climate of all northern Canada is not only substantially the same as that of Alaska where the reindeer are developing so bounteously, but also about the same as that of Manitoba where great cities and widespread rural communities now flourish. After spending more than twenty years in the climate of North Dakota and Manitoba and more than ten in the polar regions, I knew that you cannot like the one and dislike the other. The whole problem of colonizing northern Canada resolves itself, then, into finding a means of livelihood for people of the type that are

now willing to live in Manitoba and Dakota. There are mines, there is oil, there are many other resources in the Far North. But local food production is fundamental in every permanently occupied land; it furnishes a basis for a stable population, it makes easy the development of industries which, although based on minerals, cannot well flourish when all the food needed has to be brought from a great distance. The development of food production in the North is, therefore, the logical first step in the development of its mines and oil fields.

In 1919 I laid formally before the Canadian Government, and especially before the Honorable Arthur Meighen, then Minister of the Interior, my ideas with regard to the colonization of the northern mainland of Canada and the islands to the north of Canada. These plans were based mainly on the introduction of domestic reindeer and the domestication of the ovibos. As pointed out in a previous chapter, there resulted the appointment through an order-in-council of a Royal Commission to investigate the resources of northern Canada. In their voluminous and excellent report there is at least one gap. I tried to get the Commission to ask each of the witnesses how he personally liked the climate of the North and whether he believed that the climate through its mere disagreeableness would be a serious deterrent to colonization. The Chairman of the Commission, however, ruled that it was not within our province to investigate the allurements of the North as a winter resort.

My original idea was that the development of the reindeer industry in the Canadian North should be undertaken as a government enterprise. I said to Mr. Meighen that it was a project comparable in its political and commercial significance to the construction of the Panama Canal and should be carried out rapidly with the expenditure of tens of millions of dollars. His feeling and that of his colleagues was that beyond whatever doubts there might be of the feasibility of the undertaking, there was also grave doubt whether a government should "encroach upon the legitimate domain of private enterprise." Furthermore, the people were taxridden and were already clamoring for economy. It was decided, therefore, that rather than ask Parliament for vast sums of money they would give me a long lease of a large tract of arctic land and have me seek out some capitalist sufficiently broad-minded and far-sighted to undertake for the public good as well as his own an enterprise which could not be expected to yield dividends for fifteen or twenty years.

I soon learned that capitalists willing to look twenty years ahead for their dividends are not easy to find. After a year of unsuccessful effort, first in Canada and then in the United States, I finally went to England and to the Hudson's Bay Company. Their Board of Governors said at once that they were willing to undertake the enterprise and for two reasons: They believed in its ultimate business success, and they had for some time been looking around for a constructive enterprise

of magnitude which they might develop in Canada. For two hundred and fifty years in their dealings with the arctic and subarctic lands they had been engaged almost entirely in trading with the natives for furs. This is a non-productive enterprise in the sense that they were merely taking out of the country its indigenous natural wealth. In that sense fur trapping resembles mining as a plundering of Nature's storehouse and is the antithesis of the reindeer industry, in that the reindeer have to be imported into Canada and kept there for years and decades before any profit can be made from their increase.

It is worth saying parenthetically that, while the land lease given us by the Canadian Government is the largest in modern times, it is hedged about with nearly every conceivable restriction. One is that not a single share in the new reindeer company must ever be put on the market and every penny spent must come directly out of the funds of the old Hudson's Bay Company. Of course, shares in the old Company can be purchased but shares in its subsidiary, the Hudson's Bay Reindeer Company, are not for sale. If any were sold, proof of that fact would constitute a valid reason for the cancelation of the Company's charter by the Government.

The Hudson's Bay Reindeer Company with head offices in Winnipeg, has a lease of about 113,000 square miles, which is the southern half of Baffin Island. This is about one and one-third times the area of England and Scotland and Wales or about two and one-

half times the area of New York State, and the lease is for fifty years. The breeding stock will be purchased in Norway. The first consignment of 550 head was landed in October, 1921. It is the plan that if these animals do well, similar shipments from Norway will follow year by year. Naturally, the Company plans to land several thousand animals eventually, because otherwise they would not be making suitable use of the land allotted them; indeed, the charter has a provision for cancelation if the rate of increase of the animals proves to be substantially less than that laid down in the Company's prospectus.

It is certain that long before the success of the enterprise in Baffin Island is actually demonstrated, the more striking demonstration of Alaskan success will induce many companies and private individuals to enter into reindeer breeding in Canada. However, the difficulties there will, in some parts at least, be a little more serious than in Alaska for two reasons: wolves are more numerous, and wild caribou are more numerous.

The greatest danger will be from the unbelievably large herds of caribou. It is said by some authorities that you can incorporate into your reindeer herds about ten per cent. of their number per year of caribou. This will be to the advantage of the domestic herds in increasing the size of the animals, for the caribou are larger. Every caribou incorporated will mean also that much clear numerical gain. It is generally agreed, however, that if a large number of wild animals,

say twenty to fifty per cent., were to get into a herd it would become unmanageable. It follows for an added reason that a herd of a few thousand domestic animals that comes in contact with a herd of many thousand wild animals will be lost.

If you want to know what the great caribou herds are like, read "Thompson's Narrative of His Explorations in Western America—1784-1812," by David Thompson (pp. 100-101); "Across the Sub-Arctic of Canada," by J. W. Tyrrell (p. 77), or my own account in "My Life with the Eskimo" (pp. 224-226). David Thompson estimates a single herd at three and a half million; Tyrrell says the numbers could only be reckoned in acres or square miles, and I have said the numbers are beyond comprehension. A reindeer herd of almost any size that happens to be in the way of such a caribou migration would be swallowed up without leaving a trace.

There are some who say that this is not the time to consider the development of new meat-producing areas, for beef and mutton are down in price. Such a view does not go beyond the next ten or twenty years. Its advocates are men who consider that nothing is worth doing unless it promises dividends "within a reasonable time."

Those who know the inexorable forward march of the population of the world and whose minds are of the type of him who plants an oak to shade a coming

An Eskimo Dog in the Tall Eskimo Grass.

This Caribou got Mixed with one of the Alaska Reindeer Herds and Eventually Became Tamer than the Animals that had been Born Domestic.

generation, are the ones to whom must be addressed the arguments for the development of the North. The experience of a year of continuous activity showed me that I could not find in the United States or Canada any business man who would invest millions in the Canadian reindeer industry, even after he was convinced that twenty years from now he would receive large dividends, and I had to go to the oldest commercial company of the Old World before I found men of sufficiently long vision. If most capitalists can not look twenty years ahead for their profits, neither, it seems to me, need the average farmer worry because the supply of reindeer meat from the North twenty years from now will hold down the price of his southern beef animals. The prices of beef undoubtedly will be higher twenty years hence than they are now though reindeer meat may prevent them from soaring as they otherwise would. Anyway, we hope that the same people who cannot visualize dividends two decades ahead will not worry about a drop in prices that is equally distant.

According to the accepted vital statistics, the world population of the year 1800 was not doubled until about 1915 or 1920. With a lessened infant mortality, with greater longevity, with presumably fewer famines and epidemics, the population of the world should double again within the next hundred years. By that time the average world population will be as dense as it now is in Belgium. It is against that time we must plan in developing and conserving our food and our fuel resources.

There are some who say that long before the year 2000 we shall have released the energy of the atom and shall stop using petroleum, and that long before then we shall learn to make food directly out of the air thus doing away with pig-stys and wheat fields. That may prove so, but it is well to have two strings to our bow and to plan to conserve fuel and produce food so that we shall have something to fall back on in case the dreams of our chemists are not realized fast enough to keep step with the increase of population.

CHAPTER VI

THE DOMESTICATION OF OVIBOS

Every domestic beast and bird is a heritage from our prehistoric ancestors. Not only that, but written history shows no intelligent and persistent effort to domesticate a new animal. Even the ones that came into European civilization as recently as did tobacco and the potato were borrowed by us from the aborigines of America or some other "savage" land. The turkey which is still found wild in some parts of North America is only a cousin of the domestic turkey which we inherited, ready-domesticated, from the Mexicans.

In another book I have made a study of the food prejudices of men and dogs, showing that boys brought up in a primitive way and used to living year after year on half a dozen articles of food, are commonly difficult to induce to eat a new food unless it has been skilfully advertised to them in advance as specially delicious or particularly popular among some class to whom they look up, as, for instance, the rich in our cities. On the other hand, boys brought up in cosmopolitan surroundings who either travel much while they are young and thus become familiar with many foods or who live in homes or hotels where domestic and imported foods are available in large variety, take readily to new foods.

This is another application of the principle well known to all keepers of hotels or boarding schools, that the boarders who come from the poorest homes complain most about the food. That this is not primarily because they are "trying to show off" and pretend they are used to the best, has been shown by strictly analogous experiments with animals which cannot be supposed to have a desire for ostentation, at least in this sense. It has been brought out that dogs reared among the northern Indians or Eskimos, which live their entire lives on only two or three articles of food, such as rabbits, caribou, and fish, will at first refuse to eat any new food, such as mutton, wild goose, or seal; while dogs brought up in a southern household or on a whaling ship and used to all sorts of flavors through foraging in garbage pails or receiving the remnants of the family's dinner will take readily to these or almost any other new foods. If you have an Eskimo dog that never has eaten anything but seal and fish, and a white man's dog that has in its lifetime eaten a hundred different foods, it would be at least a ten to one bet that were both offered a new kind of meat, such as bison or hippopotamus, the civilized dog would fill his belly with it promptly while the Eskimo dog would refuse.

Another application of this general principle is found in our civilized dietary. We have hundreds of varieties of fruits, vegetables and cereals but only a dozen or so varieties of meat. The result is that we seek eagerly for additions to the variety of our vege-

table foods while new meats are difficult to introduce.

It happens, fortunately, that the two most important new meats about to appear on our tables are easy to introduce; one because the name reindeer suggests venison, which is already popular, and the other because the meat of musk oxen, if only the name can be changed into something more attractive, can be differentiated from domestic beef through texture, color or odor only by experts and then only if cooked in the simplest ways, as, for instance, a roast or a broiled chop. Bringing the reindeer to our tables is an accomplished fact with which we have dealt in another chapter. None but epicures are likely to taste musk ox during the next ten or fifteen years although its domestication is about to be taken in hand.

Although musk was a delicate and expensive perfume as recently as the time of our grandmothers, the fashion has so changed since then that the odor is now known by name only and the impression has begun to spread that it is a stink rather than a perfume. This impression, however, is not shared by those who have among their family heirlooms the beautiful silver perfume cases of our ancestors. Our first problem in domesticating the musk ox is, accordingly, choosing for the beast a new name.

Musk melon has become popular as cantaloupe and we expect musk ox beef to become a staple under some name derived from *ovibos*. That name may not be a happy choice and has been settled on only because this is the scientific term which has already been in use

for generations and furnishes us something to start with in the campaign of popularization.

Now that we have introduced the animal under its old name, we shall continue the discussion of it under the new.

Without being accurately descriptive, the Latin "ovibos," or "sheep-cow," does give some idea of the general appearance and other characteristics of this candidate for the first large-scale effort of civilized man to enrich the world with a new domestic animal. Essentially we have a cow with a coat of wool. Our main concern with them is as cattle, for the world stands in even more need of food than of clothing, but the wool will be a valuable by-product.

My idea of ovibos as a domestic animal was developed through intimate association. With a party of sixteen people and about fifty dogs we were spending a year in Melville Island, living entirely by hunting. We killed a few polar bears, a few seals and a few caribou, but in the main we lived on ovibos. Seven hundred miles north of the arctic circle we dwelt in houses made of their hides, used the tallow for candlelight, and the meat and fat for ninety per cent. of our food, the other ten per cent. being the flesh of the other animals mentioned. We estimated that in the island there were about four thousand ovibos, roughly four hundred of which we had to kill to support our party through the year. This left numerous herds still peacefully grazing about our camps. We saw them at

a distance nearly every day and came in close contact with them frequently.

I think it was in January, 1916, that my ideas of how the ovibos could be domesticated and made an important item of the world's food supply had taken clear enough form to be presented to a few people who, I hoped, would become sponsors of the movement. I had with me a typewriter and some carbon paper, so I wrote a letter in quadruplicate, addressing it to Colonel Roosevelt but sending carbons to three other men, Sir Robert Borden, then Prime Minister of Canada, Sir Richard McBride, then High Commissioner for Canada in London, and to Sir Edmund Walker, the President of the Canadian Bank of Commerce at Toronto. The letter was addressed to Roosevelt because above all others he had the imagination and the pioneer type of mind for this sort of enterprise. Duplicates were sent to Canadians rather than Americans or Europeans because it is in Canada (next to Siberia, with the government of which I did not know how to get in touch) that ovibos is destined to have its greatest future as a domestic animal. Another reason why Canadians are most intimately concerned is that, apart from a few in Greenland, the only survivors of the formerly widespread ovibos species are now found in Canadian territories.

Rather than quote my lengthy letter to Colonel Roosevelt, I shall summarize it here. I use a summary of the letter rather than a new statement as I

want the opportunity of presenting Roosevelt's reply because of the pertinence of his comment and the weight of his endorsement.

The size of ovibos is about that of Highland cattle although the proportions of the body are different. A bull, if especially big and especially fat, will weigh over seven hundred pounds, of which perhaps one hundred pounds would be fat. The percentage of waste in butchering is somewhat higher than that with domestic cattle because of the massive head and big horns, the especially large paunch and the generally heavy character of the skeleton. Ovibos is, therefore, several times as large as the domestic sheep. When we remember what animal husbandry has done to increase the weight of cattle within our time, it will be seen that under domestication the size can be further increased by a few generations of careful breeding.

In a newspaper interview given out at the time when my proposal to domesticate the ovibos first attracted newspaper notice, Admiral Peary said that their flesh is better eating than our domestic beef—equal in tenderness, similar in color, and superior in flavor. As to the flavor, I could never agree with the Admiral, for at least a dozen of my American and European companions had given it as their verdict that the meat is indistinguishable from domestic beef through flavor or odor. However, the meat might differ a little from beef and still be a good meat in the opinion of those who prefer beef to all other meats.

Guinea-fowl does not necessarily have to be exactly like chicken to be a good meat any more than turkey has to be exactly like the ordinary European goose to be at least equally popular.

How ovibos got the name or idea of musk associated with it is, so far as I know, an insoluble historical mystery. Should any reader of this chapter know the answer, I should be delighted to embody it in a future edition, if there is one. Two possible explanations have occurred to me.

In the time of early American exploration the motives of its patrons were frequently commercial. At that time spices and perfumes were more important in commerce than they are to-day and many adventurers fared forth in search of either or both. A prized perfume of that time was musk, derived principally from the musk deer of Asia. Conceivably, some navigator returning to Europe reported to his patron that while he had failed to find a short route to the Indies or to discover precious stones or gold by the bucketful, he had seen great herds of musk deer from which perfume in large quantities could be secured. It is even possible, though difficult to understand, that some of the early navigators may really have been ignorant enough to mistake ovibos for musk deer. One might almost as readily confuse turkeys with doves.

It is well known that every animal has its own peculiar odor. In the case of some (notably the skunk) the odor is frequently very strong when associated with the living animal and entirely absent from meat

that has been properly butchered. At certain seasons there is a pungent odor about the elderly ovibos but it is not as strong as in the case of the domestic sheep or the wild caribou. If one is sufficiently endowed with imagination and especially if one is little enough acquainted with real musk, one may speak of this as a musk odor.

To give the statement the additional weight of corroboration by several observers, I quote Sverdrup, who sums up as follows the experience of himself and a ship's company of Europeans through four years of intimate contact with ovibos in Ellesmere Island:[1] "Having shot many of these animals and drunk the milk of the cows, without ever detecting the flavour of musk from which they are supposed to derive their name, I have decided to call them in this book polar oxen."

If there is any musk odor about ovibos it pertains to the living beast and possibly to certain parts of a dead one and not to the meat as it would appear on the market. If there were the odor of musk, it should not be considered unpleasant, for in the opinion of many it is a delicate perfume. Our ancestors who knew the perfume intimately would have been as likely to object to the fragrance of violets as to that of musk. All of which is academic discussion for, as said, the odor of ovibos beef is but that of our domestic beef.

In color and flavor the fat of the ovibos is in gen-

[1] "New Land," by Otto Sverdrup, London, 1904. See footnote to p. 35, Vol. I.

eral similar to that of beef though not identical as is the case with the lean. All of my companions said that they preferred the ovibos fat to beef fat and they further agreed that there is more range of variety in flavors as between fats from different parts of the body. The largest accumulation is on the neck and this is especially delicious.

No wild animal gives a large amount of milk. Domestic cattle when allowed to run wild on the range give only from three to five pints of milk where the same cow would give four times that much under dairying conditions. It is not surprising, therefore, that ovibos gives little milk. They give a good deal more than reindeer, however, and reindeer are used as milk animals in various parts of the world and also for butter and cheese-making. My men agreed that in flavor the milk of ovibos seemed to be about like that of the Jersey cow, but naturally we had to rely on our memories of Jersey milk in making that comparison. In richness it excels the Jersey, for the "whole milk" is of about the consistency of the cream ordinarily for sale in our cities. Probably the percentage of fat in the undiluted ovibos milk is not as high as in our city cream, but the consistency of the milk gives a creamlike impression. It is doubtful whether it will ever be found desirable to develop the milk qualities of ovibos but should that occasion arise, the end can be attained up to a certain limit.

Any one who has herded cattle knows they have an adventurous disposition which is annoying to their

caretakers. They tend to rove in search of pasture and that quality is shared by most grass-eating domestic animals. Here the ovibos differ fundamentally. They fill their paunches with the vegetation nearest to them and when satiated they lie down. After two or three hours of rest they get up again, commence feeding in the immediate vicinity and lie down a second time when their paunches are filled. Melville Island is in the main rocky compared with other arctic lands known to me, and is especially infertile. Even so, the ovibos under our observation did not move on the average more than two or three miles a month. In their march they cropped the grass down fairly close and browsed on the low willows, moving mainly in one direction until they came to a rocky ridge devoid of vegetation. They would then march over the ridge until they came to the nearest meadow. This might be a few hundred yards or even a mile or two. Whenever they found a grassy spot they stopped and resumed their systematic slow progress at the rate of a few rods per day. David Hanbury and others have quoted the northern Indian as saying that ovibos move so slowly that if you find them here one year you will find them here the next. This is overstating the case but it emphasizes the point we are making and which all observers have made: These animals are as little mobile as any grazing animal can be.

There are three main systems of controlling grazing animals under domestication—fencing, herding, and the round-up system. Fencing is suitable for any

of them and is to be used when it is less expensive or more convenient than herding. The round-up system has been used with even the most mobile animals, such as horses and cattle. It is far better suited to ovibos, for where horses and cattle might wander two hundred miles in half a year, ovibos would probably not move more than twenty. With the mobile reindeer, herding is now practised and perhaps it always will be. But with ovibos I am inclined to think the round-up system may prove cheaper and more convenient.

Most grazing animals have many natural enemies but, so far as I know, ovibos has only one—man. In ancient times when they ranged far south, the panthers or other large varieties of the cat family may possibly have preyed upon them. In Alaska brown bears are known to kill reindeer occasionally and it seems not impossible that they may in remote times have killed ovibos. I cannot say that polar bears never kill them but must confine myself to the statement that my personal experience and my inquiries from Eskimos have both failed to reveal a single instance of their being killed or even attacked or pursued by polar bears. On the mainland of North America their range and that of the barren ground grizzly overlap but here also my inquiries have been negative, failing to show any killing of the one animal by the other. The possibility must, however, be acknowledged.

With many northern travelers a theory strongly held has often led to definite statements that seem entirely reasonable and are borne out by the general high

character of the men who made them. Some of these statements have, nevertheless, no real foundation. Who would doubt the general truthfulness of Sir Edward Parry? It is clearly shown in all his narratives. Even so, it does not occur to us to believe what he states for a positive fact—that all the ovibos leave Melville Island in the fall, migrating south and returning to that island in the spring. It is a commonplace of our knowledge now that no such migration occurs.

Basing their statements similarly on what seemed to them reasonable, many northern travelers have said that wolves prey upon ovibos. In this connection it is not commonly noted that there are only two groups of northern explorers who have ever been in really intimate continuous contact with the ovibos—the four-year Norwegian expedition of Otto Sverdrup, 1898-1902, and the five-year Canadian Arctic Expedition under my command, 1913-18. In his extensive residence in the North, Admiral Peary commonly used Eskimo hunters and, although a large amount of ovibos beef was eaten by his expeditions, nearly all the contact with the living animals was either by Eskimos or by sailors sent out by Peary to kill herds and bring home the meat. MacMillan's expedition was in the same general situation. Both Peary and MacMillan were themselves occasionally present at the killing of ovibos and killed some themselves, but they never had the herds before their eyes continually month after month as we did, for instance, in Melville Island.

Instead of describing our experience I shall, however, merely cite and endorse Sverdrup's statement:[2]

"On arriving at the camp we had noticed two polar herds up a little valley. They appeared to consist of four cows, each with a calf. The seven unwounded wolves, having to leave us with stomachs as empty as when they came, now went inland, taking a line northwards towards the plains, and came across these animals. The meeting was evidently quite unexpected on both sides, for the air was so still that they could hardly have got wind of each other, and we could see that the wolves actually started when they caught sight of the oxen. They stopped short, and stood still a while, probably making out their plan of attack. Finally they formed a ring round the nearer of the animals, but not one of them would approach closer than two or three hundred yards. There they took up their stand, and as long as we were about—and that was for several hours—they kept at their music without let or hindrance. Such music, too! A long-drawn weird howling, as if a knife were being driven into them every time they uttered the sound.

"We were most curious to see what would happen. We thought that the four cows with their small calves must be a splendid opportunity for the wolves, but the cows did not seem to be at all impressed by them; and, as a matter of fact, were so indifferent that they did not even take the trouble to get up. When later on the wolves appeared to think of approaching the other herd, which was somewhat scattered, the animals drew nearer together, but did not form a square. It would appear from this scene that the polar ox stands in no great awe of the wolf."

It seems entirely reasonable to suppose that now and then a new-born calf may go to sleep in the tall grass

[2] "New Land," by Otto Sverdrup, London, 1904, Vol. II, p. 390.

and be temporarily forgotten by its mother. At such a moment a wolf could doubtless dash in and kill the calf before the mother could interfere. I have inquired from Eskimos whether they ever knew this to occur and my observation agrees with their statement that, while this seems a reasonable possibility, it has not been observed to happen. It is further said, and I do not doubt it, that when an animal is sick or has become weak with old age it loses the "herd instinct" and wanders off by itself. Such single animals could doubtless be surrounded by wolves and killed. That this happens now and then is not to be doubted although, again, I have neither hearsay nor visual evidence in support. However, the killing of an animal that is about to die is of little significance in the life history of a herd or of a species.

It is commonly said that in defending themselves from wolves ovibos form a hollow square or a circle with the big animals on the outside and the calves in the center. I believe I have said this myself. What I have really meant when I have said it has been that that is the way a herd behaves when dogs are sicked upon them and that I have inferred that would be the manner of their defense if attacked by a band of wolves. The fact remains, however, that I have never heard of a band being attacked by wolves nor have I seen any evidence leading me to think that it could occur even under the most extraordinary circumstances. In my observation the attitude of ovibos towards wolves is that of a cow towards a cat in a

Ovibos on their Native Heath.

Ovibos in Bronx Park, New York.

barnyard. There is no doubt that a cow could defend herself successfully against the attacks of a cat, but it is equally certain that no cow has ever been forced to do it. So far as I know, that is only a slight overstatement of the situation as between the ovibos and the wolf.

But although wolves do not attack ovibos, men do and so do dogs that are in the service of men. When so attacked ovibos form in squares or circles, as they are said to do in a discussion of the hypothetical defense against wolves. According to our usual reasoning based upon the theory of evolution, we are bound to suppose that this method of defense has been developed originally by ovibos as a protection against carnivora of the wolf type. It is a perfect defense against wolves but it is the opposite of a defense against men armed with spears or with bows and arrows. The Eskimos will run up to such a band and shoot them all down with their bows. If they do not happen to have bows with them, they will lash their hunting knives to their walking sticks and stab the animals behind the shoulder until the last one has fallen. It seldom happens that a single animal of any band escapes from hunters, whether white or Eskimo, who know their nature. It does occur, as described by Pike, Whitney and others, that some members of a band and even whole bands sometimes escape from such novices as the Dog-Rib and Yellowknife Indians when they make their fearsome forays out into what is to them the dreadful "Barren Ground."

It has been commonly assumed by zoölogists that ovibos which once inhabited Kentucky and France became extinct there because the warming of the climate after the "ice age" brought bacteria or influences even more directly climatic to which these animals had to succumb. It seems to me a mistake to go so far afield for one's explanation. It is commonly said that men as hunters spread over Europe and America, following the ice northward in its retreat. Our experience shows to-day that ovibos and human hunters will never for many years inhabit the same district. Their ranges are mutually exclusive. It could not have failed to be the case in those prehistoric days as it is the case now that these animals are exterminated from every district that is inhabited by hunters. Not a single animal is likely to escape from any band that is seen by Eskimos or the tracks of which are once discovered. We have no reason to suppose that it would have been otherwise twenty or a hundred thousand years ago, for we think that those early men were armed with spears and bows and weapons pointed with stone and copper just as the Eskimos have been armed who, during the last half century, have killed down to the last animal the ovibos of Banks Island, which were reported as everywhere numerous when McClure was there with the *Investigator*.

In any contest with men the defense of ovibos, perfect against ordinary carnivora, is a method of suicide. But under domestication the one potential enemy becomes their protector and they are themselves capable

of defense against any other. Wolves are a menace to every other domestic animal but not to these, except possibly to the new-born calves. So far as wolves are concerned, the herdsman would not have to worry, unless for a month or two at the calving season. This is an important advantage of ovibos for the immediate future, although later the wolf will become so nearly extinct on the plains of the North that this merit will cease to be important.

For half a century now the Darwinian theory of evolution has stood unshaken and apparently unshakable although there have been additions and modifications about as forecast by its great founder. One of these modifications is that, while Darwin believed acquired characters to be transmissible, it is now commonly believed that they are not transmitted. From the biological point of view nothing can be more foolish than the often quoted remark of one of the leading literary lights of New England that the time to begin educating the child is with its grandfather. Education is transmitted by social rather than by biological inheritance and from the social point of view you may have whatever opinion you please about the wisdom of educating grandfathers so that they may transmit culture by association with their grandchildren after these are born. Similarly, a grandfather ovibos if thoroughly tame will transmit by association his tameness to his remote progeny, but he will transmit none of it biologically.

This explains such facts as are commonly reported

from the reindeer districts of northeastern Asia. On the same prairies there we have wild caribou and herds of domestic reindeer. The domestic herds we can trace back historically only to about 400 A. D., although we have other reasons to believe that their domestic ancestry really extends millenniums beyond. Presumably the wild herds have a wild ancestry dating back hundreds of thousands of years. If domesticity could be transmitted by blood, you would expect the progeny of the domestic animals to be by nature tamer than the progeny of the wild. It is a matter of common knowledge in those countries, however, that if you bring up in the domestic herds caribou calves that have back of them unbroken wild ancestry they will grow up as tame as the reindeer. Similarly, reindeer that escape into the wild herds presently become as wild as the wildest caribou.

In Alaska it happens occasionally that a few caribou join the reindeer herd. When these are males they are preferable as work animals because of their greater size and strength. Mr. Carl Lomen, the president of Lomen and Company, at present the largest owners of Alaskan reindeer, tells me that he has personal knowledge of two caribou that joined a reindeer herd and were taken and trained as sled deer by the Eskimo herders. These caribou became more tractable in handling and easier to catch than any of the sled deer which had domestic ancestry and the opinion has grown up in Alaska that caribou are by their nature tamer and gentler than reindeer. It is probable, how-

ever, that the natural tameness is the same and that the apparently greater tameness of these two was due to the fact that they were the favorites of their owners and were more handled and caressed than the others, from which they got their docility rather than from the blood. It would seem to prove too much and would be inexplicable biologically to say that the calves of animals which have always been wild are tamer than the calves of animals that have been tame for hundreds of generations.

Evidence of similar meaning is furnished by horses. Dr. E. W. Nelson, Chief of the United States Biological Survey, told me the other day that within his own observation the tame horses that escaped and joined wild bands in California took only weeks to become to all appearances equally wild. For a greater reason it is true that the progeny of these tame horses if born among wild bands will be exactly as wild as those horses that have been wild perhaps since the time of the early Spaniards.

Applying this principle to the problem of domesticating the ovibos, we see that the animals should become as tame in one generation as in ten or a hundred. Of course, in the breeding of any animals, a degree of gentleness can be secured by systematically killing off the specially vicious, allowing only the milder ones to breed. In that sense only can the domesticity of ovibos be increased beyond what is attainable in one or two generations.

When a mother ovibos is killed the little calf will

frequently follow the hunters, showing no sign of fear. There are many authorities to share with me the responsibility of this statement. I shall select Admiral Peary, who says: [3]

"Our slumbers were undisturbed except by 'Sambo,' a little coal-black musk-calf. His mother was the last cow killed by Matt, and he the smallest of calves. After we had skinned the cow, the little fellow persisted in placing himself between my legs, and, in this position, accompanied us to the sledge, and after the camp was made, seemed to want to come to bed with us. I curled him up and covered him with a corner of the skin, once or twice, but this did not seem to suit. Though I pitied the little fellow, and was considerably annoyed by his performances, I could not help laughing at them. He persisted in nibbling at my hair, licking my nose, and pawing my face with his hoofs, which, though small, were by no means soft. Though he was undoubtedly hungry, I could not detect either the hunger-note or that of fear in any of his four or five distinct baby-cries."

I have personally always worked under such circumstances that keeping ovibos in captivity even temporarily was not feasible. Several of my Eskimos had, however, kept calves for varying periods. They all agreed on their docility. One of the Eskimos, Illun, captured two which had the following history: He kept them in his camp for about half a year until all the dogs of the neighborhood recognized and became friendly with the two calves. He then sold them to

[3] "Northward Over the 'Great Ice,'" by R. E. Peary, Vol. II, p. 485.

a whaling captain, who had them tethered on shore unprotected while the sailors went aboard ship. While so tied the calves were attacked by strange dogs and one of them was killed. The other was taken to San Francisco and later, I believe, sent to New York where it became one of the animals observed by Dr. W. T. Hornaday.

In Bronx Park, New York, some ovibos have lived as long as seven years. Dr. Hornaday says that certain of them have become extremely vicious. When one remembers that in zoölogical gardens animals are kept in little stockaded enclosures, viciousness does not seem a strange result for almost any animal. It is my opinion that if reared and treated as barnyard cattle ovibos would be as gentle as Jersey cows or as sheep.

It is well known, however, that neither the Jersey bull nor the domestic ram is an animal of a particularly gentle disposition, and we may suppose for argument's sake that ovibos would become equally untractable with age. Texas longhorn bulls and various other varieties of cattle, even including Jersey bulls, are agile animals, armed with sharp horns and, therefore, extremely dangerous when vicious. Ovibos if equally vicious would not be nearly so dangerous. Through their clumsy anatomy they cannot run so fast nor are their horns as well shaped for inflicting deadly injury. When we remember that hundreds of thousands of wild cattle are being handled in various countries every year with few casualties, it is easy to see that even should the adult ovibos prove to have the vilest of tempers,

the problem of handling would not be as serious as the similar problems that are being solved day by day with range cattle.

As stated above, caribou calves born in captivity and brought up with reindeer become as tame as reindeer, which means that they are as tame as sheep. It is, therefore, probable that ovibos born in captivity will be as tame as sheep; it is certain that no matter how vicious they may be they can be handled easily. Ovibos will be domesticated whenever a well-considered attempt to do so is made.

A difficulty that is merely apparent is the question of whether they will breed in captivity. There will be no "captivity" in the ordinary sense of that word. Ovibos have not the intelligence to realize that they are the property of men nor will they themselves know whether they are wild or domestic if they are feeding upon ranges where human beings are rarely seen. To keep them extremely docile it will doubtless be necessary to associate with them every day, but if it were found that such continuous association interfered at all with their breeding habits they could be left alone as our range cattle commonly used to be for months at a time and even half a year. In Melville Island we associated with the wild herds so intimately that they might as well have been our property. Take, for instance, the case of a herd observed in the autumn of 1916 near our winter camp at Liddon Gulf.

My chief assistant, Storkerson, said to me one morning that he thought the supply of meat for winter was

not adequate and suggested that we butcher a herd of about forty ovibos which we could see feeding some seven or eight miles away. I approved of this and he took several of the men with him. They killed the herd and spent that day and the next in skinning the animals and getting the meat ready. On their way home from the kill they ran into a smaller herd which was about half way. Had we seen them sooner they would probably have been the herd killed but now we had no use for them.

The men were passing with several dog teams and the dogs commenced barking and struggling to get at the ovibos, but were restrained. This noise and confusion alarmed the animals enough so they took a defensive formation and remained in that position for a little while or until the men and dogs had disappeared beyond their sight and hearing. They then resumed their feeding on the identical spot. During the following several days the men engaged in freighting home the meat frequently passed this band, which on some occasions was only fifty or a hundred yards away from their sled trail and on others perhaps three or four hundred yards. On the first few occasions they took defensive formations and stood still while the cavalcade of men and dogs was passing. Later the dogs got so used to them that they ceased barking and struggling and pulled quietly on their loads. There was a corresponding quietness in the ovibos herd, due partly to their getting used to us and partly to there being no longer a great row made when we were in

their vicinity. Eventually they ceased entirely to pay attention and I doubt that they even glanced at us as we passed. They kept feeding in that locality for several weeks until their slow progress brought them to a rocky and barren ridge, whereupon they made a march across it one day and the next morning were not in sight.

When animals called wild behave so it is absurd to suppose their being owned on private or government ranges would interfere seriously with their rate of multiplying.

I do not know how fast they breed. It seems likely that the first calf is born when the mother is two or three years old and that she has a calf a year for about the same number of years as do our cattle. This is merely an inference from the fact that it takes them about as long to grow to maturity as it does our domestic cattle.

The strangest thing about the ovibos and one difficult to reconcile with our theories is that the period at which the calves are born does not correspond with the seasons in Melville Island. We cannot speak very definitely but there appear to be six or eight weeks in the spring between the birth of the earliest and the latest calves. The earliest calves are born while the weather is extremely cold. We have observed many cows that obviously have had calves no longer have them by midsummer. It is possible that some of these calves have been killed by wolves but I think it more likely that they have been frozen to death within a few

hours of birth because of being born too early in the season, and that the calves that do survive are those of late birth. There is considerable difference in the sizes of the surviving calves, so that a few of the early ones appear to live through. They are so well furred when born that they are naturally safe from freezing if they live long enough for their hair to become dry. Under domestication this irregularity in the breeding habits of ovibos can be easily controlled and will be a source of no difficulty although it now appears to be the main cause that keeps down their numbers in districts where they are not hunted by man.

In the letter to Colonel Roosevelt I enclosed a sample of ovibos wool with the information then available, which was to this effect: Most of the animal's body is covered with long, straggling hairs which do not appear to be shed any more than a horse sheds its mane or tail. In the roots of this straggling hair grows the wool. This is not conspicuous on commercial skins such as we occasionally find as laprobes or rugs, because the furrier prefers skins that have been killed in early autumn before the wool develops. Any that come on the market with large quantities of wool are curried, and what little remains is hidden in the roots of the hair.

In life the wool is inconspicuous until early autumn. During the winter it gradually develops until towards spring ovibos resembles a sheep and especially when viewed from above. In April and May this wool loosens and is shed and the animals are frequently seen

dragging along so much wool that it appears like a curtain on either side of them, hiding the legs in a side view, and trails behind them for a yard or two as they walk. Under domestication it would appear simple to pluck or curry this wool somewhat as it used to be the custom in Iceland to curry instead of shearing sheep. In the currying process a few of the long hairs will come out with the wool and be mixed with it, which will be a disadvantage for some uses although a possible advantage for others.

Shearing ovibos has two principal difficulties, the seriousness of neither of which can as yet be properly estimated. One is that the hair will all be removed no less than the wool, which may interfere with the quality of the wool and may also, for all we know, be a disadvantage with relation to the next year's crop of wool, for the hair probably does not grow as fast as the wool. Secondly, it appears possible that close shearing may be fatal to the animals if a period of severe weather follows while they are as yet insufficiently protected by the new coat.

It occurs to one to consider whether ovibos would thrive in southern latitudes. This is an interesting problem but the interest is in the main academic. We already have such domestic animals as sheep and cattle that are fairly well suited to our needs and to cultivation in southern lands. The great importance of the ovibos is that they are northerly animals, capable of converting into meat and wool the unbelievable quantities of grass that grow in arctic and subarctic

lands. Cattle and sheep could be raised in the arctic but it would not pay because the season when stabling is necessary would be long. In ovibos we have, however, an animal which (like the reindeer) needs no barn to shelter it, no hay to feed it, and which is as native to the most northerly lands as any animal can be to any climate.

Summing up their characteristics further, ovibos are better than cattle because in addition to meat they supply wool; they are better than sheep because in addition to supplying wool they are several times as large; they have the advantage over any of our grazing domestic animals in that they defend themselves against wolves, are naturally disinclined to roam, are probably docile in disposition and even if vicious are too clumsy to be as dangerous as a bull or a stallion.

On the basis of an outline such as the above, I appealed to Colonel Roosevelt, and to the other eminent men to whom I sent duplicates of the letter, for assistance in a movement which I thought would be of great importance to the world as a whole and of special importance to those countries that have northerly possessions—the United States (Alaska), Canada, Denmark (Greenland), and Russia (Siberia). I received the following characteristic reply:

"New York,
March 23rd, 1918.

"My dear Mr. Stefansson:

"To-day I received your letters of May 17th, 1916, and Feb. 9th, 1917. I haven't the faintest idea of whether this letter

will reach you or not, but I must write to tell you how greatly I appreciate hearing from you and how heartily I admire the wonderful work you have done. . . .

"Now, as regards the muskox. I most emphatically wish your project well, not merely as regards this war but as regards the future of the country. Our domestic animals are merely those of Asia, because it was in Asia that civilization first arose, and in consequence, as it penetrated in other continents, men found it easier to use the animals already tamed, than to tame new ones. The llama of the Andes is almost the only exception. It is a capital misfortune that the African eland has not been tamed. It is a capital misfortune that the muskox has not been tamed. To tame it would mean possibilities of civilization in northernmost America which are now utterly lacking. . . .

"With hearty good wishes,
"Faithfully yours,
(Signed) THEODORE ROOSEVELT."

"Mr. Vilhjalmur Stefansson,
Harvard Club,
New York City."

With regard to bringing the ovibos as a domestic animal to the attention of the Danes, I took advantage in the fall of 1918 of the visit to the United States of Prince Axel of Denmark. I placed the case before him with reference to Greenland on a day's outing when I was his fellow guest on a fishing trip. Not being intimately acquainted with royalty and supposing that they have many distractions, I thought the Prince might possibly forget. I learned from him that he expected to see Colonel Roosevelt on his way to Europe, so I wrote the Colonel asking him to remind

the Prince upon occasion, whereupon he wrote me as follows:

"NEW YORK,
October 28th, 1918.

"MY DEAR MR. STEFANSSON:

"I don't know that I shall see Prince Axel, but I shall certainly do all I can to back up the musk ox project, if I do see him. If I can do anything with the Canadian Government, or with our own, please command me.

"Faithfully yours,
(Signed) THEODORE ROOSEVELT."

I had only one conversation with Colonel Roosevelt on the subject of the domestication of ovibos and that amounted to little beyond his saying that he was anxious to discuss the matter fully and make plans for action as soon as the political campaign was over. Before it was over he died.

Since the proposal to domesticate ovibos was originally made there has come to hand no considerable amount of valuable information with regard to anything except the wool. From ovibos skins which were brought south by our expedition (Canadian Arctic Expedition, 1913-18) and from others belonging to Captain Henry Toke Munn, who has a trading station in northern Baffin Island, we were able to get together fifty or sixty pounds of wool. Some was worked by hand into socks and mittens in the ordinary "old-fashioned" way, but this yielded little definite information from the commercial point of view. Secretaries Lane and Redfield, then members of President Wilson's

Cabinet, became interested and a small sample was submitted through them to the United States Bureau of Standards, but their report was inconclusive. Certain Canadian manufacturers of woolen cloths undertook to have the wool tested and received considerable quantities of it, but apparently were not really interested or else did not have the proper facilities, for so far as I know this has not as yet come to anything.

The wool secured from Captain Munn (about 40 pounds) was handed over to Professor Aldred F. Barker, head of the Textiles Department of Leeds University. Through a period of months he has conducted experiments of all sorts. The full report is not as yet available but we are already able to say that the heat-retaining qualities of ovibos wool seem to be at least as good as the best domestic sheep product. The wool will take dye readily. Its soft, native brown is at present a very fashionable color and seems, therefore, suitable, but it can be bleached a pure white inexpensively by processes already in use. The cloth can be woven by machinery used for ordinary wool; no special machinery or invention is necessary for separating the long hairs from the wool when such separation is desired. For certain purposes it is an advantage to have the hair mixed with the wool. The hair if separated from the wool will be of some value as a by-product. The pure wool fabric will have approximately the softness of cashmere, and, what many will consider important, the cloth will not shrink even when washed in hot water and rubbed. Professor

Barker wants it understood that these statements are for the present tentative and may have to be modified to some slight extent. On the other hand, it may also occur that some of the favorable statements can be made more emphatic when the full information is available.

With regard to the quantity of wool per animal, no information is available beyond the observation of Dr. W. T. Hornaday, who has had several ovibos under his care in the New York Zoological Garden at various times. Apparently the wool was never weighed animal by animal, but it seems safe to say that the quantity per animal is greater than that of the domestic sheep, taken by the weight of the cleaned product.

But although (as said above) we have no important new information about the ovibos since I wrote my letter to Colonel Roosevelt, we have at least accumulated abundant evidence to confirm all the main points there set down. This is chiefly the result of official investigation by the Canadian Government as to the North as a suitable place for herds of domestic ovibos and of them as animals suitable for domestication, as explained elsewhere in this book.

CHAPTER VII

TRANSPOLAR COMMERCE BY AIR

A GLANCE at a map of the northern hemisphere shows that the Arctic Ocean is in effect a huge Mediterranean. It lies between its surrounding continents somewhat as the Mediterranean lies between Europe and Africa. It has in the past been looked upon as an impassable Mediterranean. In the near future it will not only become passable but will become a favorite route, at least at certain times of year, safer, more comfortable, and much shorter than any other air route that lies over the oceans that separate the present-day centers of population.

We shall "soon" be booking our passage from New York to Liverpool by dirigible or plane or some other form of aircraft in as matter of course a way as we now book our passage by steamer. Our estimates differ as to how far in the future that period lies, according to our temperaments. When Tennyson spoke of "aerial navies grappling in the central blue," he was a poet and a prophet, for no inventions were then available the mere development of which could make such dreams a reality. When we now speak of the coming transoceanic commerce, we are no longer prophets, for we are merely considering the daily and yearly increase in efficiency of inventions which we

already have. The thought is, however, in the back of our minds that in addition to such increasing perfection of known instruments we shall eventually have also entirely new devices that are at present as much in the future as were even the crudest approaches to an aerial navy in the time of Tennyson.

Although our estimates of when transoceanic passenger and mail service by air shall be no longer a novelty differ according to our temperaments, they vary only between years in the vision of the optimist and decades in the gloomier view of the pessimist. In five months, say the enthusiastic commentators on the news despatches of the day, the Zeppelin Company will have a regular service between Spain and South America; in five years such things will come, say those who occupy what is not far from the middle road; in fifty years, said Mr. Balfour the other day at Washington. But whenever that time comes there will be in England not only those who desire to book passage by air for New York but also others who have pressing affairs awaiting them in Tokyo. Then will arise the choice of routes, and there is no doubt that in the summer season at least it will be thought an absurdity for those in a hurry to go from England to Japan by way of either New York or Montreal. They will fly over the north polar ocean.

There are few nowadays who do not agree that the world is round, but there are almost equally few who apply the principle of the world's roundness consistently when they think about going from place to place.

The polar ocean has so long been a barrier that when we consider transport from Europe to America, from America to Asia, we think only in terms of east and west; indeed we speak of the Near and the Far East. Since the days of Magellan it has been a commonplace that you can go east by sailing west. It is about to become an equal commonplace that you can go east by flying north.

In Europe the days of Columbus and Magellan were days of intellectual renaissance. People had not generally known even that the world was round, but when that novel view was presented to them they drew from it all its proper conclusions. One of the most fruitful of these was that you could reach China not only by sailing west but also by sailing north, and it was soon realized that the shortest route from Europe to China was a northerly one. In navigation we call this the principle of great circle sailing. But in certain places lands barred the way of the navigator and everywhere the "frozen ocean" was a bar to ships of that day which were not only imperfect from our modern point of view but also manned by sailors who in spite of their courage and resource were products of the south and novices in the strange seas around the Pole. There was failure after failure of great expeditions until finally it was agreed that although a northwest passage was possible (as shown seventy-five years ago by the work of the series of expeditions known as the Franklin Search) it was not a "practical" route and that neither time nor expense could be saved

by using it. Even before the days of the Suez and the Panama canals it was cheaper and safer to sail around the Horn or the Cape of Good Hope than to navigate the northwest passage around America or the northeast passage around Asia. Although the difficulty of making these northerly voyages is in the public mind grossly exaggerated, the fact remains that for surface craft they really are not "practical" routes from the commercial point of view.

The thing that makes either the northwest passage or the northeast passage "impractical" is the ice floating upon an ocean. It is not a continuous layer of ice. There are instead almost infinite numbers of cakes varying as to surface area and thickness and continually drifting about before the wind and current. Even in mid-winter the greatest size of these floes is not over fifty miles in diameter or an average thickness of more than four to six feet. Admiral Peary made the estimate, with which most observers have agreed, that even in the period of the intensest winter cold about twenty-five per cent. of the surface of the polar ocean is either open water or ice so thin that a man could not walk on it. Plowing through such thin ice a powerful ship would lose only from ten to twenty-five per cent. of its speed. As the weather becomes warmer towards spring the percentage of open water in the polar ocean increases and it is probable that in midsummer considerably more than half the surface area is free from ice. At that period also the biggest ice cakes are far smaller than in mid-winter. It may be

considered a certainty that in July no ice field in the Arctic is fifty miles in its least diameter. I doubt that even the greatest diagonal of any cake would be that much.

Although realizing the applicability of both aircraft and submarines to commerce and warfare in our own latitudes, we have not adequately realized their significance in solving after four hundred years the problem of the northwest passage and giving us at last a short route from Europe to the Far East. Whether it be in five years or in fifty years that aerial transoceanic commerce in tropical and temperate latitudes becomes a commonplace, transpolar commerce will then be equally common for at least the summer months. At present, passenger liners crossing the Atlantic have winter routes that differ sometimes by several hundred miles from their summer routes. Aircraft will doubtless be even more free in their variations of route according to season. Indeed, it is probable that the weather bureaus, which will then have multiplied by at least ten their present great importance to commerce, will publish daily or several times a day maps of the air routes, the information of which will be conveyed by wireless messages to the commanders of aircraft, enabling them to vary from hour to hour the courses they steer as to latitude and longitude and altitude. With the sailor on the ocean it is, outside of the trade wind belt, almost a matter of accident whether the winds blow him fair or foul. In the air there may be a fair wind a certain distance up and a head wind

either higher or lower and the airman may change his wind from fair to foul by raising or lowering his craft. It is, therefore, impossible to say now just where the transpolar air routes will lie, and indeed they will probably always vary from day to day. But wherever they lie they are sure to be advantageous commercially and popular with passengers at least during the season corresponding to that in which the tourist of to-day sails to Alaska or Norway or Spitsbergen to see the midnight sun.

For the coming popularity of the transpolar air routes there are at least five main reasons. We shall in the first instance consider these in their relation to the needs of a passenger who wants to go from England to Japan.

Advantage I: The most practical route of the recent past between England and Japan has led by way of ocean steamers to Montreal, the Canadian railways to Vancouver and then by the northerly route along the Aleutian Islands to Japan. The length of this route is given by the Canadian Pacific Railway Company, which covers it all either by steamer or rail, at 9,928.8 miles from Liverpool to Yokohama. But the distance from a railway terminus at the north of Great Britain to the north end of Japan proper where railway travel could be again resumed is by air route only 6,500 miles.

To a man in a hurry, whether for personal transportation or the transportation of urgent despatches, a saving of half the distance, meaning also a saving of half the time, will in some cases be extremely impor-

tant. But the route has other advantages which in some cases may be even more attractive than the saving in distance and time.

Advantage II: It is said that helium is for dirigibles a gas much preferable to hydrogen, not only because it will not explode but also because it does not expand rapidly with heat. However, helium is at present exceedingly rare, so rare indeed that even were the costliness of it no consideration we are at a loss to see how any considerable number of dirigibles could be operated with that gas. Furthermore, there are many countries which are not known to contain any sources of helium, and while the United States and Canada are considered to be fortunate in possessing helium resources, other countries have by that much a greater reason to feel themselves handicapped by certain undesirable qualities of the hydrogen they must perforce use for dirigibles.

Hydrogen expands and contracts not so much under the influence of heat as registered by thermometers at the earth's surface as through the direct production of heat within the gas-bag itself when the rays of the morning sun strike it. Paint the bag silver or any color you will, the amount of heat locally generated by the sun's rays is very great. The hydrogen expands and you can avoid a bursting of the bag only by allowing it to escape. This is the chief factor which limits the length of balloon voyages. A certain amount of gas must be allowed to escape each day and reciprocally a certain amount of ballast has to

be thrown out each night to prevent the balloon or dirigible from settling to earth.

But this alternation of day and night which seems a necessary evil to those habituated to southern latitudes is not a factor in the polar regions, whether in mid-winter or mid-summer. We shall not, for the present, consider winter voyages. With relation to summer journeys, the speed of the dirigible that has already crossed the Atlantic was great enough so that had it started north from Scotland with a full supply of hydrogen just after a spring or summer sunrise, it could have reached the area of perpetual daylight near Iceland in fifteen or twenty hours. This means that such a dirigible would not be overtaken by darkness at all in the beginning of its trip and would meet the darkness only after crossing the polar area and penetrating well into Asia. On the major portion of the voyage from England to Japan there would, accordingly, be no great expansion or contraction of the hydrogen, no considerable loss of buoyancy or necessity for throwing out ballast, giving not only an increased cruising radius to the dirigible but also an increased freight-carrying capacity.

Advantage III: In air voyages no less than sea voyages things will doubtless occasionally go wrong. This brings us to another great advantage of the northern route. If you get into trouble you would rather that it happened in daylight than in darkness, and whatever difficulties you might encounter you could more readily meet through this reason on the northern

route than on any other. In stories of sea tragedies that have overtaken passenger liners at night, the stoppage of the engines, the failure of the light plants and the plunging of the whole ship into inky darkness, is often the most terrifying feature. Just when a crisis brings the need of swift and pertinent action, every effort is thwarted because no man can see what to do or what others are doing. Under the perpetual sun of the polar summer we shall always be free from at least this attribute of southern tragedy.

Advantage IV: If the accident that befalls the dirigible is an explosion of gas the case is well-nigh hopeless whatever the location, as has recently been only too clearly shown by the dreadful wreck of the ZR-2 over a populous city in England. But where the difficulty is a minor one, SOS signals can be sent out while the gas-bag is gradually descending. On the polar route, although the surface of the sea may not be more than half covered by substantial cakes of ice, there would be a reasonable certainty of landing on one of them. Were there a forced landing in open water, it would presumably not be more than a few miles to the nearest ice floe which could be reached by such life rafts or other devices as a dirigible would naturally carry on transoceanic voyages in all latitudes.

It may be said that it would not be any fun to be forced to land on an ice island. But it would be a great deal more fun than having to land among tumbling and breaking seas in the mid-Atlantic. One effect of the presence of ice upon the ocean in the vicinity

is that even in a gale there are no heavy seas. Indeed, if the ice is abundant no swell is noticeable in the heaviest gale, and the waves on the patches of open water are only such as one may find on a pond or a small lake. If SOS calls, containing as they always do position as to latitude and longitude, are sent out while the dirigible is descending to the ice or immediately after the landing, the party would have days or weeks and even months for opportunities of rescue. It is said by some of the enthusiastic advocates of transatlantic air travel that we shall eventually have in mid-Atlantic huge rafts, floating islands in effect, that will be rescue stations for aircraft in distress. While that idea may not be impractical, it will at least be difficult and expensive. On the polar route Nature has already provided a sprinkling of these rafts far greater in number and far more stable than any such artificial rafts can ever be expected to be.

Advantage V: The last to be enumerated of the advantages of the transpolar summer air route may be spoken of as the tourist value of the perpetual daylight. "The Midnight Sun" now draws people every summer to the North in ships. When air travel becomes popular, the Midnight Sun will still have its attraction for that sort of person and will be one of the talking points in selling transportation over the northern route.

The transpolar route will become more important decade by decade. In Siberia, practically speaking,

we have as yet only one great trunk railway. It does, however, tap and make accessible many of the huge rivers that flow north and there are great steamers on these rivers that make the Arctic locally accessible. The Trans-Siberian Railway runs in large part through the wheat belt of Asia and the potential cereal belt extends far north of it. We shall, accordingly, have eventually the development of other great east and west railways and of many spurs running north and south. Tomsk, Yakutsk, Irkutsk and the rest of the cities we have heard of and many of which we have never heard, will be growing into Chicagos and Winnipegs and Calgarys. The centers of civilized population in Siberia and in Canada alike will be continually moving north and there will be more and more occasion for the use of the polar route, a route that will never be directly of great importance to Rome or Buenos Aires or Hong-Kong but of vast consequence to England and Japan, Norway and Russia, Siberia and Canada, and through them of indirect consequence even to the tropical lands.

To people little acquainted with the Arctic as most of us are and misinformed as nearly all of us are, there appear to be many difficulties to the polar route. Most of these do not exist. Indeed where we imagine positive difficulties, there may in reality be positive advantages. Take, for instance, the matter of summer temperature.

We have all of us learned in school the truth that per square mile per hour there is more heat received

from the sun at the earth's equator than anywhere else. But in the minds of most of us this truth is only a half-truth and therefore the most dangerous sort of error, for we have commonly failed to grasp its interpretative corollary that, while each hour brings most heat to the equator, the hours of summer sunshine increase in number as we go away from the equator. This would give a perfect balance if the hours of sunlight per day increased proportionately as the heat per hour decreases. This is not the case. In mid-summer as you go north the length of day increases more rapidly than the amount of heat per hour decreases, so that although the heat per hour received at Winnipeg is less than it is in New Orleans, the amount of heat received per day is greater.[1]

But the difference between New Orleans and Winnipeg is not as great as that between Winnipeg and a place as far north of it as New Orleans is south (and no one will assert that New Orleans or Winnipeg is anywhere near the limit of human habitability.) For something like five weeks every summer there is more heat per day received from the sun on a square mile at the top of the atmosphere at the North Pole than at the equator. There is, however, in many places in the remote North a local refrigeration that tempers what otherwise would be unbearable heat. The winters there are long and under certain conditions a great deal of "cold" may be stored up. In the polar basin we have an ocean thousands of miles

[1] See footnote, p. 255, *post*.

across and thousands of feet deep and all the water during the long winter months is chilled to the vicinity of 30° Fahrenheit above zero. There is also a certain amount of ice floating around on the surface and this ice is approximately the same temperature as the water. This furnishes a huge store of "cold" to neutralize the terrific downpour of the summer sun's heat, and it is probable that the air ten feet above the middle of the polar ocean is seldom warmer even in July than 50° or 55° Fahrenheit above zero. Higher up it would be somewhat warmer, and general flying conditions would be about the same over the polar ocean in July as in France or England in late winter and early spring.

But the conditions in the polar lands differ entirely from those of the polar seas. Furthermore, they may vary extremely from one land to another, whereas the polar seas in general have a uniform condition. Greenland is one extreme among the lands. A large part of it is covered with ice and you have, as in the ocean, a huge quantity of stored-up "cold" to neutralize the great heat of the summer sun. Still, it is the testimony of those who have traveled over the icecap of Greenland in midsummer, as it is the testimony of those who have spent the midsummer among the floating ice of the polar ocean, that the weather seems at times extremely hot. In the case, for instance, of Storkerson's party of my own expedition, who spent the summer of 1918 drifting on the sea ice between two and three hundred miles north of Alaska (and there-

fore five or six hundred miles north of the arctic circle), the men frequently sat around outdoors dressed only in cotton undershirts. The reason for not stripping to the skin was the fear of getting sunburnt, of which there is even more danger on a snow surface than on the shimmering waters of lakes or oceans.

But Greenland is a peculiar island in that its great altitude enables it to store up a large amount of "cold." In a few other northerly islands there are glaciers of moderate size (Franz Josef Island, Spitsbergen, North Devon) and glaciers of intermediate size (as in Ellesmere Island and Heiberg Island) but there are vast areas of polar lowlands where the little snow that falls in winter disappears like magic in the early spring, and where the sun beats down for month after month upon a soil clad with vegetation. The Encyclopedia Britannica says: "Patches of perpetual snow occur in Eastern Siberia only on the mountains of the far north." If there are any patches of permanent snow (glaciers) on the lowlands of arctic Siberia, they have not yet been discovered. It is certain that if any are discovered they will prove exceedingly small. In other words, we can take it for certain that there is far less permanent ice and snow in the lowland of north Siberia than there is in the mountains of Mexico. In arctic Canada we have lowland everywhere except in the Yukon, and on arctic lowlands there are no glaciers. In the mountains of the Yukon there are small glaciers but by no means as large as those of Switzerland or of the state of Washington. In Siberia and Canada there

are, therefore, millions of square miles, indeed an aggregate much larger than the whole United States, where there is no stored-up "cold" to moderate the heat of the arctic daylight except the slight chill of the frozen subsoil, and that is kept from having much effect on the air by the insulation over it of the cloak of vegetation. Accordingly (as explained more fully in Chapter II), we find temperatures of 95° in the shade more frequently on the arctic prairies than in New York, although deaths from heat prostration are in that city not unknown. No thoughtful person will, therefore, suppose that transpolar air journeys will in summer be interfered with by low temperatures.

From the principle that the sun pours down each summer day more heat upon the polar regions than upon the equator, you deduce that summer travel will not be uncomfortable because of extreme cold; neither will it be uncomfortable because of extreme heat, for that can always be regulated by rising into higher and cooler air strata. We further deduce that a downpour of heat upon the northern soil when accompanied by sufficient rain (as it is) will cover the earth with a carpet of vegetation. This is true except where mountains are snow-covered because of their altitude or where the ground is nearly solid rock, both of which conditions are rare. A landing on the polar prairie cannot, therefore, be supposed to be less pleasant than a landing in any other land except for two reasons, one of which is merely temporary but the other of which may prove to be permanent. The temporary

difficulty will be that summer hotels and way stations, although we already find them in such islands as Spitsbergen far north of the arctic circle, will, nevertheless, be more scattered than in other parts of the world.

The permanent difficulty is the swarms of insect life that are bred in the swelter of the polar summer. A striking feature of northern topography is the great number of lakes of all sizes. These are beautiful from a distance and will have their value in airplane travel, for upon them flying-boats can land in summer and on their smooth ice airplanes equipped with skids can land in winter. But in the summer these lakes and their surrounding marshes breed denser swarms of insects (notably mosquitoes) than are found in any other part of the world. This condition is about at the worst on the arctic circle. As you go north from it the fly pests are less and less obnoxious. In the polar islands mosquitoes are not bad except on the larger ones, such as Victoria or Baffin, where the sun can generate extreme heat in districts remote from the immediate influence of the ocean. The smaller islands are so cooled by the sea breezes that in most of them the insect life is a minor annoyance or absent.

It is true that certain parts of the polar regions are given to summer fogs, but fogs lie low over the ocean and presumably the dirigibles and airplanes would navigate in the clear sunlight above them.

In our consideration of transpolar commerce we come naturally to the matter of base stations where petroleum and food and rescue aircraft, corresponding

to the coast guard vessels of to-day, will be kept in constant readiness. Many of these base stations may be supplied and will be supplied by railways, by ocean steamers or by river steamers. A glance at the map of the polar air route from England to Japan shows that it requires no long jumps between places that are now reached with fair regularity by ocean ships or by river steamers.[2]

How accessible are many of the seemingly remote fur-trading outposts of arctic Canada and Siberia many of us fail to realize. The other day I was talking with an exceptionally well-informed man who had himself spent several years in polar regions (in the northwest of Alaska). I was astounded to find that he supposed it would take a year to make a trip from New York to the mouth of the Mackenzie River by way of Winnipeg and Edmonton, using no air vehicles but only railways and river steamers. As a matter of fact, it would take about twenty-five days from New York to the mouth of the Mackenzie, and regular railway and steamboat tickets could be bought if not in New York at least in Winnipeg. Under normal peacetime conditions a similar surprise would await those who desired to reach the north coast of Siberia by journeying from the Trans-Siberian Railway down one or another of the great north-flowing Asiatic rivers.

It goes without saying that where the air route touches the north of Norway or the north Pacific coast of Asia the problem of supply is even simpler.

[2] See map at back of this volume.

The islands that dot the polar ocean will obviously become important relay stations on the various transpolar routes. Of these, Spitsbergen is reachable by steamer at least six months every year and some seasons it is reachable the whole year. Ice conditions can be reported day by day by wireless, and freighting steamers will always know whether they can reach Spitsbergen at any given time. Reaching Franz Josef Land is practicable for a somewhat shorter period each year, and the navigation as far as Novaya Zemlya does not now look nearly as difficult as it used to, for the sailors of the Allied countries learned a great deal about those routes during the latter half of the World War, and its imagined difficulties at least no longer restrain us.

On the American side of the polar ocean Greenland and the Canadian islands are also far more reachable by ordinary steamer than is commonly imagined.

The Gulf Stream makes the coasts of Iceland ice-free at all times and gives the island a winter climate which for all purposes of navigation may be considered to be the same as that of Scotland or New England. In rare seasons the harbors of Portland, Maine, and Boston, Massachusetts, are frozen over and the same thing has occurred in certain harbors in northern Iceland, although both the northern Icelandic harbors and those of Maine are fairly enough considered as ice-free.

But the Gulf Stream that makes Iceland warm has an almost opposite effect upon Greenland, for it is responsible there for a heavy snowfall. Along the east coast

of Greenland there is commonly sweeping a southward current bringing sea ice from the north and icebergs that have been born in the great glaciers of eastern Greenland itself. There is considerable uncertainty, therefore, about ships reaching East Greenland ports even in mid-summer, but these difficulties will eventually be greatly lessened by a chain of wireless stations to give daily information for each harbor. It could seldom happen that all harbors of a long coast would be simultaneously jammed with moving ice. A few decades from now we shall probably have daily wireless bulletins showing that while such and such harbors are temporarily blocked, others are on those days open and accessible. This general removal of the element of chance from ice navigation by the work of the more perfect weather bureaus will be, next to the removal of fear based on ignorance, the greatest single force in opening up the polar regions to more and more extensive navigation by ordinary tramp steamers.

The west coast of Greenland is now considered to be and probably really is more accessible than the east coast, and vessels of the royal Danish trading company go every year from station to station supplying the trading posts and reaching even places such as North Star Bay and Cape York, which were formerly the northerly base stations of polar explorers. Baffin Island has for many decades been visited yearly by the trading ships of the Hudson's Bay Company. Captain Henry Toke Munn has a trading station now near the north end of the island and reaches it whenever he

likes with little difficulty. Ellesmere Island, to the north, will soon be the base of similar trading stations, entirely apart from any aircraft development.

On the map, Melville Island looks exceedingly inaccessible but the fact is that of the many vessels that have tried to reach it nearly every one has succeeded, although they were chiefly sailing vessels of the days antedating steam. In more recent years steamers such as the *Arctic,* of the Canadian Naval Service, have had even less difficulty.

Banks Island can be reached at least nineteen years out of twenty by the ordinary whaling and trading vessels that for the last forty years have been in the habit of going north from Bering Straits and east past the north coast of Alaska to Herschel Island and Cape Bathurst. Another way of reaching Banks Island is by river steamers down the Mackenzie and local ships plying northeastward from the Mackenzie's mouth. Herschel Island itself at the northwestern corner of Canada can always be relied on as a base station for airship supplies, as it has already been relied upon for four decades by the American whalers and the British trading companies.

In Alaska, Point Barrow at the north tip has been reached by supply vessels every year during the last forty. Point Hope, on the northwest corner of Alaska, is even more accessible, while regular oceangoing passenger steamers of the type that cross the Pacific by the more southerly routes have for twenty years been plying between Seattle and Nome on Bering Sea.

In northeastern Siberia the conditions of accessibility are similar. Petropavlovsk is a common rendezvous of traders; Bering Straits are navigable every year, and ships are able except occasionally under extraordinary conditions to pass at will up the north coast as far at least as the mouth of the Kolyma. One hundred years ago Baron Wrangel, in Russian service as a polar explorer, passed down this river and found at its mouth an already ancient trading rendezvous. By spur railways from the Trans-Siberian trunk line, and then down the Kolyma, Lena, Yenisei and Obi, supplies can be sent by river steamer to be trans-shipped to the New Siberia Islands where for a long time the Russians have maintained settlements dealing in the furs of animals now living and the ivory of the extinct elephants (mammoths).

Thus we see that most of the islands that now dot the polar maps can with fair ease be reached by surface-going ships wanting to deposit there petroleum and other supplies needed for the maintenance of way stations for aerial traffic. The newly discovered Emperor Nicholas II Land, north of the north tip of Siberia, and the islands discovered by the Canadian expedition under my command during the years 1913-1918 are more difficult of access by ordinary ships. It appears to me a fair presumption that Nicholas II Land could be reached by ocean freighters only every other year on the average, and I doubt that the islands we discovered can be reached more than one year in ten by surface craft. There will also be exceptional seasons

when such islands as Wrangel cannot be reached at all by tramp steamers and many of the arctic islands are unreachable by surface ships during at least the winter and spring months. It is here that the coming air development will find an important adjunct in the submarine.

It has commonly been said that the submarine will be a commercial carrier only in time of war because the expense of under-water freighting is so much greater than that of freighting on the surface. Under conditions of peace it cannot compete with surface ships in ordinary waters. But it will have its usefulness when and where ice makes surface navigation uncertain, difficult, or impossible.

Those who have considered the submarine only from the point of view of a layman, and even submarine experts who are unfamiliar with ice conditions, commonly assume that ice on the ocean's surface would be a menace and even a bar to submarine navigation. In the opinion of those who understand both ice conditions and the qualities of the submarine this is so far from being the truth that some have gone to the extreme of saying that the presence of ice is to the submarine actually an advantage. This means that had the Germans in the late war had the same motive for sending a commercial submarine to Japan that they had for sending one to the United States, they could have done so easily and by a route recognized to be in length well within the cruising radius of a submarine.

Of the two best-known American submarine inventors, Holland and Lake, Lake has devoted himself especially to the under-ice type. Before the World War the Czar's Government had paid some attention to his activities and extensive trials had been made which are fully recorded in Lake's writings on the commercial submarine.

Those who suppose that the submarine would find great difficulty in polar waters are often led to that belief by direct misinformation as to conditions there. It is commonly supposed, for instance, that icebergs are found in the polar ocean. This is not a fact. In nine winters spent north of the arctic circle traveling much of the time over sea ice, Admiral Peary saw no icebergs; in ten years of similar northern travel, I have seen none; Nansen reports none from his extensive journeys to the north of Spitsbergen and Franz Josef Land.[3] Indeed we are reasonably certain that there are no icebergs anywhere in the ocean between Franz Josef Land and Spitsbergen on the European side and the mainland of Siberia on the opposite side of the great northern Mediterranean. If there are dangers connected with icebergs, such dangers will be met in the north Atlantic during that part of the transpolar voyage when the submarine is steaming along the surface exactly like any ocean-going ship. These would then be only the identical dangers which the Scotch and

[3] Mr. Anthony Fiala tells me he saw some small icebergs immediately north of Franz Josef Land. He feels sure they were locally produced and will not be found far north of the island group.

Norwegian whalers have been meeting successfully and without concern for centuries, and which the tourist ships are now meeting every summer on the Spitsbergen route. In that part of the polar ocean which is supposed to be difficult, the iceberg part of the difficulty is purely imaginary.

Another worry of those who have not looked closely into polar conditions is that even the regular sea ice may project so deep into the water that it will be a menace to submarines. Here again my own experience agrees exactly with that of Admiral Peary, who said that he had never seen a cake of ice aground in more than twenty fathoms. In other words, the most massive piling-up of ice when it is being broken by pressure, will never create a ridge that projects more than a hundred and twenty feet below the surface of the water. It is true from the point of view of physicists that an ice cake of symmetrical shape floats in fresh water something like six-sevenths submerged. From this people have wrongly estimated that an ice pressure ridge which has its highest pinnacles say eighty feet above the water will have its lowest projections four or five hundred feet below the surface. This is not the case, because these ridges are pyramid-shaped, the massive base of the pyramid being under water and the comparatively slender apex above it. Submarines of to-day navigate comfortably between 180 and 200 feet below the surface, which gives a safety zone of 60 to 80 feet between them and the ice above. Half this margin would be ample.

The submarines are not going to collide with ice while submerged. Through my knowledge of polar conditions I have long known that the danger of this is negligible. But it was only in some recent discussions with submarine friends that I learned they did not worry at all about under-water collisions with ice. I was told that the submarines now in actual use by the British Navy do not fear colliding at a speed of say four miles an hour with sunken wrecks of ships. Obviously, there would be no greater danger in colliding with submerged ice. Furthermore, Simon Lake has invented a shock absorber for head-on contact and has also developed a device that makes the submarine almost inevitably strike a glancing blow at any obstruction it meets, and rise or dive rather than come to an abrupt standstill with a shock.

Popularly, the "frozen ocean" is supposed to be more frozen than it really is. The observations of Nansen and others have shown that, by actual freezing, sea ice never becomes more than seven feet thick. This means that the average thickness in winter is much less than seven feet, and in summer less again.

We have already said that ice floes are probably never in summer as much as fifty miles in diameter. Under water a submarine can for a limited time maintain a speed of say ten knots, but at the much more economical speed of five knots a submerged journey of fifty miles is ordinary and one of two hundred miles not impossible even at the present-day stage of construction. This gives ample leeway for diving and

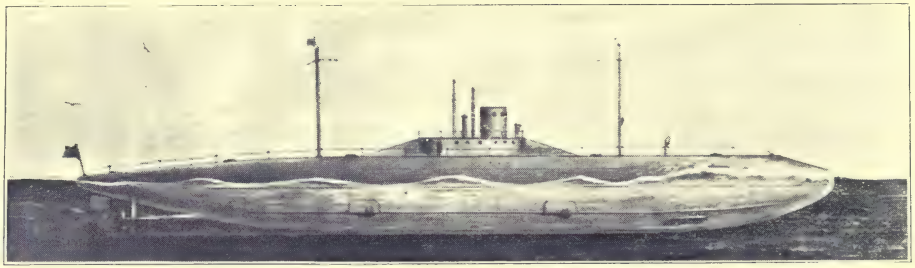
passing entirely under the biggest piece of ice, coming up in free water on the other side. It may be objected that, from below, it is difficult to tell before rising whether you are going to rise in free water or under an ice cake. This is true, but the consequences are not serious. There is no danger of injuring the boat by rising against ice that is above it. The rise can be made very slowly, and naturally under-ice boats will have no conning tower or other upward projection subject to injury. Indeed, certain boats designed by Simon Lake carry a sort of toboggan on their backs so that when they rise against the ice they can steam ahead, sliding along its under surface, somewhat as a fly crawls on a ceiling, until finally the margin of the floe shall be reached when the boat will bob up into the open. Even apart from this the boat can rise and dive, rise and dive, as a whale does, going down each time it fails and trying again a few hundred yards ahead.

Furthermore, there are at least three ways of coming to the surface through ice. One would be to leave behind a depth bomb, go off to a safe distance, explode it, and come back to the place where the ice had been all broken up. A second way, for which there is a patented invention, is to rise against the ice and drill a hole upward for men to step out. This has been actually done through river ice in winter. A third and simpler way is to carry on the deck of the submarine an electric coil. When the boat rests against the ice a current could be passed through the coil heating it as the bread toasters are heated on our breakfast tables,

melting a way upward for the boat. This principle has for decades been in actual use in gold mining in such countries as Alaska, where the miners thaw their way down as here we would thaw our way up. The miners have to deal with frozen mud which is much more difficult to thaw than plain ice, and the problem of the submarine would therefore be comparatively simple. It is to be remembered that by sliding along the under surface for half a mile or so the submarine could almost certainly find a place where the ice would be less than three feet thick, for in summer three feet will be more than its average thickness.[4]

Although I have been considering the possibility of polar exploration by submarines for the last four years (as mentioned by Admiral Peary in his speech when he discussed my work before the National Geographic Society on January 10, 1919. See: National Geographic Magazine, for April, 1920), I was surprised to learn the other day that the submarines of the Allies have actually been using against ice the devices which during the war they had on their bows for cutting through steel nets laid by the Germans. It appears that in effect this is a solid steel bow, corresponding to the steel bows carried by whaling and other ice-fighting ships. With it they have already had experience to

[4] Many persons have read the proofs of this book. Most of the laymen have wanted me to insert here a long account of how all these things are done. They say people will not take much stock in these views otherwise. But since those submarine men I know who have actually operated under ice consider as commonplace everything said here about under-ice work, I have decided not to expand the text on this point.



In Crossing the Polar Area Submarines Will Navigate Most of the Time as Surface Ships.

Drawing Showing One Kind of Submarine Under Ice—the Lake Type.

the north of Archangel in charging at full speed into ice and they have found not only that the vessel can cut the ice and steam through it if it is not more than a foot in thickness, but also that neither the bow nor any part undergoes injury through this buffeting. When we recall that these submarines were not made for dealing with ice and are, nevertheless, adequate for doing so, it becomes evident that others designed for polar voyages would be even more competent if made for that purpose now, and still more competent in the future when experience shall have shown us what modifications to the present type are advantageous.

The most experienced submarine man with whom I have so far talked was one who operated at times among ice to the north of Archangel during the war. He proposed a method of rising up through ice more spectacular than any that I had conceived but which he considered safe. The submarine he commanded had a bow fortified with the regular steel net cutter. His suggestion was that the boat should seek its greatest practical depth, say two hundred feet below the surface. It should then assume an angle of thirty to forty-five degrees and charge upward with a double speed attained by combining the forward thrust of the propeller with the acceleration obtainable by rapidly increasing the buoyancy of the boat so that it should fly upward somewhat as a cork does when released in water. The boat would then reach the surface with a velocity of perhaps fifteen or twenty miles per hour which would give a sufficient blow to break ice

of more than average thickness, especially in summer when it is moderately "rotten."

Many have noted as Shakespeare did the fact that we dread unusual dangers and accept with equanimity those to which we are accustomed. Because each one of us dies but once, it would seem absurd that we could get used to dying. Still that is what it amounts to. Millions are dying around us from tuberculosis, tens of thousands by cancer, and thousands by being run over by motor vehicles. We are so used to having people die from these and other well-known causes that the danger of our also dying in that way doesn't bother us much. It is perhaps an exaggeration to say that the greater the danger of our dying in a certain way the less we worry over that cause of death. An instance in that direction is that we worry more about lightning which kills dozens than we do about tuberculosis which kills millions. We are nowadays getting so used to airmen dashing themselves to pulp against the ground and we are still so strange to death by submarine accident that we can count on almost any one saying that he would a good deal rather cross the polar ocean by air than under water. The facts show that the danger in the air is greater, but still we all accept as a rapidly approaching condition transoceanic air travel, be the ocean the Atlantic, Indian, Pacific, or (now that we understand it) the Arctic.

Our unaccustomed minds shrink from the far safer and easier submarine traverse. So as to understate the case greatly, we shall say that the danger of polar

voyages in ships such as those of Peary or Nansen is greater than that of polar voyages by submarine. Still further understating the case, we can say that the voyages of Columbus and Magellan were made in ships which did not meet the dangers of the ocean's surface nearly so well as the submarine now meets the under-water dangers. If we then think back to the voyages by the Phoenicians north along the coast of Europe and to the voyages by the Norsemen across the Atlantic a thousand years ago, we shall see that the first trans-polar voyage by submarine will be a far safer under-taking than hundreds of thousands of surface voyages across various seas have been during the last three thousand years.

The present point in discussing the adaptability of the submarine to under-ice voyaging is that whenever the air routes become of wide importance the sub-marine will be an auxiliary or, more particularly, a factor of safety in supplying the various polar islands with petroleum and whatever goods are needed from year to year. Suppose, for instance, that in a certain year Wrangel Island could not be reached by ordinary sea-going ships. The distance from Nome to Wrangel Island would be at least half of it a surface journey. It would require only one dive of about 250 miles, or several shorter dives to reach a depot at Rodgers Har-bor. In summer that harbor will naturally be open. In winter it could be kept open artificially exactly as such harbors in northern countries are now kept open for the use of ferry-boats and other craft. Even were

there a continuous layer of ice for 200 miles around Wrangel Island (as there never would be), the submarine could dive at the outer margin of the ice and come up in the harbor thus artificially kept open.

Freighting by submarine is far more expensive than that by surface ships and, as we have said above, it has been assumed therefore, that they would be used as freighters only in time of war. But if any island such as Wrangel is ice-bound and yet has to be reached, there are only two routes open—the air above the ice and the water under it. If the submarine is a more expensive freighter than the surface ship, it is at least far more economical than the swift airplane or dirigible, hence its coming value as an adjunct to them, not only in the actual polar regions but also in districts such as Hudson Bay or the Kara Sea where surface freighters can travel only half the year.

The question of "navigation" as applied to the submarine may seem difficult but really is not. As they are constituted at present, submarines that have to travel under water would rise every fifty or seventy-five miles to charge their batteries afresh. At these risings they could take the ordinary astronomical observations that guide ships at sea. The practical sailor knows that the sounding lead is in the vicinity of land an even more valuable instrument than the sextant. Sailors go not only by the depth but also by the sandy or other character of the bottom sample as brought up by the sounding machine. Right now submarines take soundings as they travel with the same

ease as do surface ships. They carry also gyroscopic and other compasses and their officers have the same training in making dead reckoning that do those of surface craft. For the vicinity of the harbors of their destination they would naturally carry charts showing very carefully the contours of the ocean bottom. In most places there would be channels and ridges by which the submarines could locate themselves to grope into port under water just as surface ships are now every day groping their way into port under blankets of fog.

As said, we may estimate at five years or at fifty years the time when transoceanic commerce shall be an every day matter. There are few who think that time will never come. Accordingly, most of us will get a wider view of the commercial, political and military future of the world when we realize that the airplane, the dirigible, and the submarine are about to turn the polar ocean into a Mediterranean and about to make England and Japan, Norway and Alaska, neighbors across the northern sea.

NOTES ON TRANSPOLAR ROUTES

As already mentioned in this book, the population centers of to-day are not as northerly as they will be within a few decades. The transpolar routes will, therefore, be of continually increasing importance. As the cereal belts of middle Canada and middle Siberia are increasingly cultivated, great cities will grow up.

We have their beginning already. Thirty years ago Edmonton, for instance, was a village; to-day it is a city of 60,000 inhabitants. The oil fields of the lower Mackenzie where the Standard Oil Company already has extensive operations, and the copper district north of Great Bear Lake hold a definite promise of commercial centers. It may be of little beyond academic interest this year that the air route from the northern railway terminus on the Athabasca River north of Edmonton to Archangel, in northern Russia, is only 3300 miles but over 7000 by any route now available. But as the railway continues to push its way northward through Canada this route will rapidly gain in importance.

With the idea in mind that conditions for summer flying are more favorable over the polar regions than in most other parts of the world, the reader will see from the polar map at the back of this volume that the routes indicated thereon are but a few (and perhaps not the most promising) of the airways of the future.

A disadvantage of the shortest possible route from England to Tokyo is that it is not sufficiently northerly to give the maximum amount of daylight, for it is only about half of the journey that lies north of the arctic circle. To get a greater benefit from the perpetual daylight of the arctic summer a route might be laid from Scotland to the east tip of Iceland, thence by way of Jan Mayen Island, next the summer hotel already established in Spitsbergen, then Franz Josef Land, Emperor Nicholas II Land or Cape Chelyuskin,

and thence overland to Japan. This route is only slightly longer than the shortest possible route but is 3500 miles shorter than the route to Japan from England by way of Montreal, and 2000 miles shorter than the route from England to Japan by way of the New Siberian Railway.

The simplicity of the polar air journey from England to Japan appears most strikingly when we compare this route of the future with the routes of the past. It goes without saying that all appliances will be better than they have been and that there will be increasing perfection in technique. It is generally considered that when a long journey is from land to land over various expanses of sea the "length of hop" is the chief difficulty. Then take the flight of Alcock and Brown from Newfoundland to Ireland, a single hop of about 1800 miles, or that of Read from Newfoundland to the Azores. So far as length of journey is concerned, the flight of the Smith brothers from England to Australia far exceeds the London-Tokyo journey.

Those who think a large population is required before a railway can be built into a new country will do well to consider the Australian railway between Brisbane and Perth. From its eastern terminus in thickly settled New South Wales it leaves the populous lands behind at Port Augusta and for a thousand miles thence to Calgoorlie passes through country which nowhere has a population as high as one person in sixteen square miles (according to a graph for the

1911 Australian Census published in the "Official Year Book of the Commonwealth of Australia" for 1920). Its terminus at Perth is a town of 8,000 inhabitants. If you compare the known prospects of development of that Australian semi-arid region with the known prospects of (say) the Mackenzie basin, you will see that men of enterprise similar to the Australians would not balk at building a railway the shorter distance from the present railhead at McMurray to the oil district near Norman. Dawson, almost on the arctic circle, had a population in its heyday that exceeded Perth five to one. Such another city may spring up any day in arctic Canada or Siberia to give new importance to the transpolar air routes.

Whoever has any grasp at all of the great natural resources of the polar regions and of the conditions under which they are about to be developed, will have fascinating dreams about any number of other transpolar routes destined to come into common use whenever air travel itself becomes a commonplace in the more dangerous but already speculatively accepted routes between Liverpool and New York, San Francisco and Hawaii and Japan.

CHAPTER VIII

GENERAL CONSIDERATIONS

In estimating by years or decades how soon the development of the Far North will come we can give weight to two classes of facts, specific and general: the first are instances of railway building, the construction of river steamers, the formation of stock companies, the establishment of trading stations, and other concrete things done in the Far North or with definite relation to it. This book is not a reference manual and we shall ignore this class of facts after merely pointing out that the number of them is great and that information about them is obtainable from railway companies, immigration authorities of such countries as Canada, chambers of commerce of such cities as Seattle, etc. The tourist agencies will give you data about summer hotels and sanatoria that are already located beyond the arctic circle, as, for instance, in Spitsbergen, three hundred miles farther north than the north tip of the mainland of either Canada or Alaska.

We shall here give our attention solely to general considerations.

In this book we have said again and again that the main obstacle to the development of the North is ignorance, or rather positive misknowledge—the belief

in difficulties that do not exist. In that the present situation of the North is analogous to the case of the prairies of the western United States and Canada a century ago.

When North America was colonized from Europe the settlers came from districts of woods and hills and mountains. Most of Europe is that kind of country. These immigrants were familiar with methods of dealing with hills and woods and mountains. They knew how the rapid rivers could be harnessed to industry. Their ancestors had broken their backs for generations clearing forests and tilling rocky fields, and this they were prepared to continue doing. Sea commerce was already well developed in Europe and river commerce to a less extent, and so they understood how to make distant lands tributary to the port of Boston and how to use as highways the St. Lawrence and the Mississippi.

But in addition to understanding the lands of forest and hill and river, they actually supposed a hilly and forested land to be not merely the ideal country but almost the only country that was fit for habitation by men and women of their kind. The treeless plains they did not understand at all and supposed them to be essentially inferior through their mere lack of trees. Accordingly, the westward moving settlements followed the rivers, not merely because they were highways of travel, but also because their valleys were forested, and tentacles of settlements stretched out in every direction, leaving between vast islands of treeless prairie,

as, for instance, in Illinois.[1] Other prairies of a vaster scale the settlers crossed and re-crossed going from one forested area to another, never settling in the open for the simple reason that trees were not found there.

Then of a sudden it dawned on the pioneers that the absence of trees instead of being a disadvantage is an actual advantage. Those who had gone to the forested sections of, say, Michigan, had spent years in hard labor before they could cultivate a ten or twenty-acre field. But on the prairie a farmer could arrive in a covered wagon in the early spring, with his wife beside him on the front seat and back of them a plow and a bag or two of grain. He could stop almost anywhere, pitch a tent if he did not have time to build a more permanent shelter, put the plow in the ground, and in fewer days than it took years in Michigan he could have a ten or twenty-acre plowed field to be seeded that season and to give him a crop in a hundred days. When that realization suddenly came upon the pioneers, the prairies were flooded in a decade by settlers. From this resulted the fact, so well known in all western districts where prairie and forests alternate, that the descendants of the earliest settlers have inherited the

[1] In discussing the colonization of Illinois, Barrows says: "The prairies were generally shunned by the first-comers for several reasons: (1) absence of trees was thought to mean that they were infertile, . . . (5) to the farmer the prairies . . . constituted a new and altogether unknown problem. Men were for a time helpless before this problem, and the prairies were generally regarded as 'uninhabitable.' . . . As late as 1836 the few who thought the prairies capable of occupation were regarded as crazy visionaries." (Harlan H. Barrows, "Geography of the Middle Illinois Valley," 1910.)

comparatively worthless forest lands, while the richest farms have come down to the children of those who came later and were forced to homestead the prairie, either because the woodland was gone, or else because they belonged to a later and more enlightened generation that knew enough to prefer the treeless lands.

With the conservatism of our race, many of us still hold in theory if not in practice the idea that a farmer is unfortunate who is distant from a forest, an attitude defensible upon esthetic rather than economic grounds and commonly amusing to those who have been born and brought up on the prairie.

When I was a boy my father was helping develop a prairie state under land laws made by forest dwellers and promulgated from Washington. Congress, among its other benevolent visions, had the dream of rapidly covering the prairie states with clumps of forest, and the land laws were shaped to that end. A settler received 160 acres from the Government in return for living on the land. This was known as the *homestead.* He had the right to buy 160 acres of land adjoining for (as I remember it) $320. This was known as his *pre-emption.* Then he had the further right of acquiring 160 acres by planting ten acres of trees. This was the *tree claim.* Many of our neighbors made use of both their pre-emption and tree claim rights. It was common knowledge in our neighborhood that cottonwoods could be planted with less trouble than any other tree and so we all planted cottonwoods. Not one farmer in ten paid any attention to how they grew

after being planted, for it seemed that one's right to the claim, if not in law at least in fact, could be maintained through the mere planting without any success necessarily following. In a few places there grew up solid ten-acre clumps of trees, in others there would be straggling trees over a ten-acre patch, and in some you could scarcely speak of trees at all. When the necessary time had elapsed the farmers received full title to their tree claims from the Government, whereupon in more than half the cases they chopped down and burned up whatever trees might be standing and plowed the ten acres back into wheat.

In more recent years trees have been planted to a considerable extent in states like North Dakota but largely because doing so became the fashion; they were looked upon as ornaments, as flowers might be. As a shelter from blizzards they were by no means an unmixed good. I think that most farmers brought up in the woods preferred to have a small clump of trees around their farms, but the men who were the products of the real prairie preferred, at least from the point of view of blizzards, to have their houses standing in the open, for the little advantage of tree shelter was more than canceled by the great nuisance of having huge banks of snow piling up in the lee of the trees, burying the farmer's house, which if built in an open place, would have stood fairly clear of snow.

The idea of the inevitable advantage of trees still persists widely. The first question asked about arctic lands commonly is: "How far north do trees grow?"

The feeling behind the query is that the farther north the trees go the better the chance must be for ultimate development. This might be so if we expected to market the trees themselves, but I have heard of no student of subarctic Siberia or Canada who maintains that the jackpine and black spruce forests of those lands will serve any but auxiliary purposes—they may eventually furnish fuel, shelter from storms, and building materials to people who make their living by some other means than lumbering. It might be conceivable that a forested farm would be better than a prairie farm for certain crops after the forest is cleared—but it would have to be considerably superior in soil (or some other important attribute) to pay for the labor of clearing. But we think of the North as a pasture land, and especially pasture for reindeer and ovibos. A deerman if set down in the subarctic forest would inquire his way out to the northern (not southern!) prairie.

For reasons now well understood, the sons of the pioneers of fertile eastern and middle Ontario have passed through forested western Ontario to settle and almost crowd the treeless flats of Manitoba. For reasons analogous though different, men will pass north through the forests of middle Canada, or will outflank them by one route or another, to settle as ranchmen the arctic prairies.

The uncovering of mineral wealth causes cities to spring up anywhere. Apart from such fortunate accidents (and apart from some new commercial develop-

ment of the future the very nature of which we cannot guess) such forested, rocky hills and sand stretches as make up a considerable part of western Ontario and of central Canada will be for some time to come islands of sparse or no development surrounded by the seas of the colonized southern cereal and northern grazing prairies.

It is in reality the great good fortune of the North, therefore, that most of it is prairie land, although we cannot capitalize that advantage without an educational campaign showing that the northern prairies are more valuable than the northern woods, just as the prairies of Illinois were more easily tamed and have proved on the average more productive than the farmlands of Michigan reclaimed from the forest. Of that campaign this book is a part in that we have indicated how the northern prairies are about to become pastures of vast herds of domestic animals producing meat and wool and hides and the various other by-products of that sort of development. Settlements are now striving northward along the rivers, colonists are appearing here and there along the seaboard, mines are known to exist and oil wells have been bored.

When people discovered that forests were not inevitably associated with fertile land, as they did after they had passed the forest barrier of the eastern part of the United States and Canada, they then sought the prairie lands in a very direct and eager manner. Men from the eastern states or provinces crossed through the forest belt on trains and landed in the midst of

the prairie. Thus men have already learned to cross entire climatic or forest zones in order to get into the more favorable lands beyond. With progress and education and the rapid spread of knowledge we no longer need to wait for a generation of experience to teach us where to go in order to find new economic opportunities. The prairies of the Far North would be entered by an ignorant and unintelligent people by working only from the border lands on the south where settlement was already established. An intelligent and progressive people, aware of the undeveloped opportunities of the northern prairies, should be able to study the situation, arrive from a distance at a conclusion as to their usefulness, and immediately penetrate and occupy in many different places any large land of promise.

It may still be possible to argue that it would have been wiser to develop to the full the cattle and wheat possibilities of Georgia, Vermont, and Ontario before leaping to the distant productiveness of Texas, Nebraska, and Alberta. But the few who could be convinced by such arguments would nevertheless admit that with the history of the nineteenth century open before us we cannot doubt that the pioneers of the twentieth century will cross or outflank the stubborn scrub forests of central Canada on their northward march just as the earlier pioneers crossed or avoided western Ontario on their way to the wheat prairies. They will do so if the northern prairies like the western hold out to them the promise of an easier livelihood.

The sudden development of the North (corresponding to the development of the Mid-west prairies) will come when we at length realize that the very qualities which we had supposed to be its worst drawbacks are really advantages once their true meaning is understood.

It is commonly supposed to be a disadvantage of the North that the subsoil is frozen. The absurdity of this appears as soon as you think about it. Even the city-bred have commonly enough heard that a clayey subsoil underlying surface loam makes the ideal condition for most kinds of cropping. The virtue of the clay is not so much in the nutriment it furnishes to the plants that grow in the soil above but more in that it retains water and brings it back by capillarity near the surface. In temperate and tropic regions much of the land is so porous that a heavy shower dampens it only for a matter of days and the water sinks down beyond the reach of the longest roots, and plants die for lack of moisture in places where the weather bureau reports a rainfall that would be abundant if only there were a clay layer not too far below. But if the clay in southern countries is only in patches, the frozen subsoil of the Far North is universal. In some cases it may be several feet down, in other places and in other circumstances only a few inches. This frozen subsoil prevents loss of water by drainage and acts as a reservoir from which water comes during periods of droughts when the soil warms up to greater depths and makes the frozen water available. This is one of the reasons why no part of the

world is so safe from drought as the Far North, even though the precipitation is light when measured in inches.

How different from a drawback the frozen subsoil may be is indicated by a recent conversation with Dr. Alfred H. Brooks, the head of the United States Geological Survey for Alaska. He was showing me a photograph where Dr. Charles C. Georgeson had secured a fabulous stand of wheat on ground where the frost was only a foot or so down. This picture dated back a good many years. Dr. Brooks said that each year of cultivation has forced this permanently frozen layer farther and farther down until there now are some fifteen or twenty feet of thawed ground where once there were not that many inches.

To explain the retreat of the frost is simple. Formerly the ground was covered in spring with a damp layer of dead vegetation from last year. This had upon the soil somewhat the protective effect that a layer of damp sawdust has upon ice. Furthermore, the color of the surface was whitish and there may have been some bushes or trees to give shade. When the plow turned the soil it exposed a black surface where previously it had been whitish, and it is well known that the sun's rays generate the maximum of heat when they strike anything dark. The shade of bushes or trees was now removed and also the protection of the layer of damp, dead vegetation. As a result the heat penetrated deeper, incidentally drying the soil. It takes less heat to raise the temperature of a cubic foot of dry soil than

that of a cubic foot of damp soil, so here we have another factor to increase the depth of thawing. A combination of these and other conditions has gradually compelled the frost to withdraw deeper into the ground until now the cold of winter is no longer sufficient to freeze the surface down into contact with the original frost. There is thus even at the end of winter an unfrozen layer between the temporary surface frost and the "permanent" ground frost.

If ground frost were a handicap its disappearance would be an occasion for rejoicing. But the interesting and disquieting thought is that (as stated elsewhere in this volume) the subarctic regions generally have very light rainfall. Although this is sufficient for the native vegetation (the dead part of which acts as a wet sawdust covering to preserve the underground frost), it may not be sufficient for cultivated crops. Whether the Yukon valley or portions of it will turn through the thawing of the ground into a region semi-arid in the sense that the rainfall is insufficient for crops, Dr. Georgeson does not yet know but Dr. Brooks thought he was beginning to worry about it.

I have just been reading Conan Doyle's latest book, as I always read his books. I did not expect to find in it anything pertinent to my argument but I did find so striking a passage that I doubt if a search through all our literature, whether "scientific" or descriptive, would serve us better.[2]

[2] "The Wanderings of a Spiritualist," by Sir Arthur Conan Doyle, pp. 64, 65, 66.

"In Adelaide I appreciated, for the first time, the crisis which Australia has been passing through in the shape of a two-years' drought, only recently broken. It seems to have involved all the States and to have caused great losses, amounting to millions of sheep and cattle. The result was that the price of those cattle which survived has risen enormously, and at the time of our visit an absolute record had been established, a bullock having been sold for £41. The normal price would be about £13. Sheep were about £3 each, the normal being fifteen shillings. This had, of course, sent the price of meat soaring with the usual popular unrest and agitation as a result. It was clear, however, that with the heavy rains the prices would fall. These Australian droughts are really terrible things, especially when they come upon newly-opened country and in the hotter regions of Queensland and the North. One lady told us that she had endured a drought in Queensland which lasted so long that children of five had never seen a drop of rain. You could travel a hundred miles and find the brown earth the whole way, with no sign of green anywhere, the sheep eating twigs or gnawing bark until they died. . . .

"But to return for a moment to the droughts; has any writer of fiction invented or described a more long-drawn agony than that of the man, his nerves the more tired and sensitive from the constant unbroken heat, waiting day after day for the cloud that never comes, while under the glaring sun from the unchanging blue above him, his sheep, which represent all his life's work and his hopes, perish before his eyes? A revolver shot has often ended the long vigil and the pioneer has joined his vanished flocks. . . ."

It is only casual thinkers who suppose that cold is on our earth the greatest enemy to vegetation. The greatest enemy is drought. It is not only the sheep lands of Australia and the cattle lands of South Africa

that suffer. From Arizona to Alberta tens of thousands of cattle have died during the last three or four years, if not directly from thirst, at least from hunger brought on by lack of vegetation which in turn was due to lack of water. The losses would have been many times as heavy but for the fact that some owners butchered their herds, selling the meat at a sacrifice, and others shipped them out to districts better supplied with rain, or imported hay half across the continent to keep their beasts alive.

As this book is being prepared for the press famines as terrible as any in history are sweeping over vast areas of Europe and Asia. The leading figure of the Russian relief is Fridtjof Nansen. Presumably few know the causes of the famine there better than he. He is known to be anti-Bolshevik but he does not put the main blame on Bolshevism; he opposed the blockade of Russia and has denounced the fomenting of civil wars in Russia, but he gives these only as secondary causes of the famine. The main cause, he says, was a two years' drought which alone was so serious that help on a vast scale from the outside world would have been necessary even had political and industrial conditions been favorable in Russia.

In only limited areas of other zones can we feel sure that the rain will be neither too scarce or abundant any year. In the Arctic, at least this serious drawback is absent.

In most parts of the United States and southern Canada we have large-scale cattle raising only in dis-

tricts that are used for stock because the rainfall is not adequate for cereal crops and because irrigation is impossible or has not as yet been developed. The greatest danger in this stock raising in the semi-arid districts is that for a year or for a cycle of years you may have desert conditions temporarily prevailing, so that a range which adequately supports ten thousand head one year may prove insufficient for a thousand head two years later. That condition will never prevail in any of the polar lands. Without going tediously into the theory which makes it plain why this is so, we can rest here at merely saying that no one has ever observed in the polar regions that the vegetation varies appreciably from year to year through abundance or lack of rain or snow. The grazing experts of the United States Biological Survey have concluded that in northwestern Alaska a square mile of land will support from twenty-five to thirty reindeer permanently. A similar estimate if made for Arizona would have to embody the qualification that this applies to ordinary years only. In the North every year is an ordinary year, and a range that supports twenty-five head to the square mile one year will support twenty-five head forever, if the soil is not mistreated through trampling by driving vast herds over it or through temporarily being over-grazed by fifty or a hundred head being placed on an area calculated to support only twenty-five.

In this chapter, which considers the factors that for the present tend to hold back the development of the

North, we may admit again what has been implied above, that a good deal of the North is covered with scrub forest. In some quarters, as around Great Bear Lake, vast areas are covered. This will be a drawback there just as a scrub forest in many parts of the United States and southern Canada is a drawback. But when narrow strips of forest are thrust far out into the arctic prairie along river valleys, the disadvantage is counterbalanced by benefits of another sort. People coming from the South and unfamiliar with northern prairie conditions, will eagerly seek these forest strips as location for their ranchhouses. There is also some advantage to gardening from the nearness of trees. Further, it is an undoubted convenience to have firewood available. These advantages of the forest belts along the northern rivers will, in my opinion, about offset the disadvantage of having to subtract their area from the grand total of the available grazing lands.

The lack of transportation facilities in the North is a disadvantage inherent in its newness. Railways and the like will develop as the settlements develop and the problem here is nowise different from the problems that have already been solved by the railway builders of more southerly portions of North America.

From the point of view of boat transportation, it is a disadvantage that in the North the rivers are frozen over for several months each year. The Mackenzie between Great Slave Lake and the polar sea is, for instance, open only from about the middle of May to the middle of November, and a period somewhat

shorter for its delta. Similar conditions prevail in Siberia and in Alaska.

But this difficulty is for the present more than counterbalanced by the ease of overland transportation in winter. In colonizing southern countries it is found that while lakes and rivers are highways for boats they are obstructions to overland travel. In the winter each northern river becomes a highway for sledges and so does every lake. The same country that would be impassable for tractors, for instance, during the summer months, will in the Far North be easily crossable in winter. It is not unlikely that the truck and the caterpillar tractor will in consequence find in the polar regions one of their main fields of usefulness.

On summer journeys the Indians and Eskimos commonly go by boat across a lake to a place that is known to be a narrow neck or portage to another lake. Thus, by carrying canoes and freight over the portages, long journeys are made from lake to lake and river to river. In winter these and similar routes are used for sledge travel. The dog team crosses a lake, goes over a portage and crosses another lake. For heavy freighting the same principle can be applied to tractors. Every lake will be a ready-made road. When you come to the neck of land that separates one lake from another, you may have land which in the summer is a swamp where men would sink to their knees in mud and horses to their bellies. In winter everything will be found solid, and if only trees that happen to be on the portage

are chopped away flush with the ground, you have without any further building a fairly level and exceedingly hard tractor road.

In considering the possibility of this mode of freighting in winter, it is to be emphasized again that snowfall in polar and subpolar lands is nearly everywhere exceedingly light, a fact that simplifies greatly the winter freighting problem. In the fish industry on Lake Winnipeg, for instance, tractors and trucks are now in extensive winter use. They will be even more valuable for lakes farther north both because of the slightly increasing length of winter and because of the continually decreasing snowfall.

It is thought by some that the absence of the sun during a part of the year will be a serious handicap to northern development. True, for outdoor work it is highly desirable that the sun should be shining. But even as it is, mines in every latitude use artificial light at all times of day and night and the same is true of many of the factories and most of the business offices in our great cities. Certain kinds of work are, therefore, now carried on by artificial light at all times in every latitude.

For travel daylight is generally advantageous. It is, however, well known that automobile travel can be satisfactorily conducted at night. I have found that drivers on such fairly dangerous roads as the Navajo Trail, for instance, or indeed anywhere in mountains, commonly prefer to drive at night, for the light of a

vehicle coming around a curve gives you an earlier warning than the actual appearance of it would in daylight.

The people who now live in the North commonly look forward eagerly to the period of darkness, not because they like the darkness itself, but because the mid-winter is the vacation time. This is especially true of the Eskimos but is to a less degree true of the whites as well. In southerly latitudes we look forward to August, not because we like the heat as such, but rather because the extreme heat lessens our ability to work and so makes it the accepted vacation time. For an analogous reason mid-winter is the accepted vacation time of the North.

It will always be possible to argue, even after the North has been colonized, that the distribution of daylight and darkness is more advantageous in the tropics or in the temperate zones. I think it likely that a vote taken in any place will always show a heavy majority in favor of that distribution of day and night which is found in that place. Dwellers in the tropics will feel it more convenient that the day and night should be of approximately equal length throughout the year; dwellers in the polar regions will probably think it more desirable that there shall be perpetual daylight during the seasons of greatest productive activity. They will say that they would like to have daylight the year round, but, if half the year has to be daylight and half dark, they prefer the distribution found around the arctic circle to that found farther south.

Tractor Drawing a Train of Sledges in Alaska.

The Mackenzie just South of the Arctic Circle.
The northern rivers are highways for boats in summer and highways for tractors and sledges in winter.

Such at least has been my feeling and that of many of our men. Since the northern winter is the time of idleness anyway, you might as well have the darkness concentrated there. When the North becomes really civilized, with movie houses on every corner, we shall find modern ways of passing the winter that are as satisfactory to us as the singing and dancing and visiting are to the Eskimos.

We now come to more serious handicaps to rapid development: our fashionable houses and our fashionable clothes.

The great disadvantage of the ordinary European or American house when employed as a northern dwelling is the character of the door. It is well known that warm air is light and cold air is heavy. When at low winter temperatures you use doors that are seven or eight feet high and three or four feet across, you are opening a communication of that size between the outdoor air and that of the house, which differ in temperature by say one hundred degrees (perhaps from 30° below zero outdoors to 70° above indoors). The gravitational difference in the heavy outer and the light inner air results in an inrush of cold along the floor and an outrush of heat through the upper half of the door. You can scarcely open and close a door so quickly that you do not appreciably lower the temperature of the interior of the house.

The solution of this problem is exceedingly simple. In cold countries you should live in houses that have the ground floor devoted to a store room. You could

enter this ground floor through a door of the ordinary type, then proceed upstairs by means of steps. In many of our cities there are flights of from six to a dozen steps leading up to the doors of fashionable houses, and one would think that it would be easy to get people living in a cold climate to consent to walk up a flight of steps inside a house similar to the one which they so cheerfully mount outside. The fact remains that neither in Dawson nor Nome nor Winnipeg nor any cold city known to me has this sensible method as yet been employed and I am not at all sanguine that it will soon be employed. Fashions do not seem to be developed through any process of conscious reasoning. They are accordingly difficult to alter through motives of mere convenience or common sense.

The problem of shutting out the cold by having double or triple windows has already been satisfactorily solved. Apart from a few such modifications, in the countries now inhabited that have minimum winter temperatures similar to those of the polar regions (the Dakotas, Manitoba, Russia, etc.), we mitigate the worst effects of the thoughtless designing of our buildings by a heavy consumption of fuel. This for the time being may be considered a practical solution and will tide us over until common sense shall become more powerful than fashion in the designing of our dwellings.

We do not have to invent, but can borrow from the Eskimos, a system of winter clothing that comes nearer perfection than most human devices. There

are many styles adapted to modifying conditions. Of these I shall describe but one.

First you have a complete suit of light reindeer underwear, the fur in from mittens to socks. You may think this would be ticklish or would have other undesirable features, but on trial it would soon become your favorite underwear for midwinter. If you know how good a sealskin collar feels against your cheek, you know how such underwear feels all over. It would be uncomfortable indoors at typical American house temperatures, but would be about right in Scotland or France. Over this you would wear boots, outer coat and mittens all of fur and all to be removed or exchanged for lighter ones on coming into a house. You would wear cloth outer trousers which need not necessarily be changed for lighter ones on coming indoors. This is about what we are used to in removing at the door rubbers, overcoat, mittens and cap. If you did not expect to go out again you could change to lighter house garments—which would not be any more trouble than you now have dressing for dinner.

The sort of complete suit just described need not weigh more than ten pounds—no more than the average man's winter business suit. It is as soft as chamois leather and so nearly cold-proof that you would be much more comfortable in it at fifty below zero than you now are in woolen underwear, tweed suit and light overcoat at twenty above zero.

If, then, we dress in a common sense way, we can be as comfortable outdoors in an arctic winter as we

now are in the winter climates of almost any of the "temperate" lands.

But it is a far look ahead to the time when common sense shall supersede fashion in the designing of our clothes. No matter how poor we are and no matter how silly the fashions are, we discard our clothes or make them over year by year to correspond to the mode in Paris or in London. How wasteful this practice is and what a millstone it is about our economic necks we all realize. However, we get along somehow here in the South. Even in cities like Minneapolis and Winnipeg we worry through the winters, the women in diaphanous dresses and the men in oxfords and stiff hats. But the handicap becomes greater as you go north, for the winter does become longer though it be not appreciably colder. Enthusiast that I am about the North and delighting as I do in the brisk and stimulating air of winter, I always have to admit that I abominate spending the mid-winter in a city. I have to dress according to fashion, with a result that I suffer more from cold in the two or three cold months of New York than I do in the six or seven cold months of Banks or Melville Island.

The increasing popularity of winter sports in Switzerland and such American winter resorts as Lake Placid or Algonquin Park shows a clear trend towards the fashionableness of winter. Advertising and skilful propaganda will swing the tourist currents now south and now north, but there will probably in the long run be a division, the old and lethargic going prevailingly

south, the young in years and the young in spirit going prevailingly north. I cannot see the North as a loafing place nor as a place for resting, if by rest you mean inactivity or languid movement. But if by rest you mean a refreshening through strenuous play that will enable you to return with stored-up energy to the hard work of the city after a week or a month of vacation, then there is already ample testimony to show that Lake Placid and Switzerland have much in their favor as against Florida or the Riviera.

But it must be noticed that northern sports everywhere pre-suppose a new way of dressing. These cold weather fashions may be intrinsically as attractive as you please but they maintain themselves with difficulty sporadically and locally, for they do not fall into the general currents of fashion as predetermined in France and England.

In Montreal and Ottawa boys and girls dressed for skating and skiing are happy as the day is long, while their parents in European fashions complain much of the discomforts they suffer in their hasty excursions to their offices and their afternoon teas. Sensible dress in such cities merely palliates the rigors of winter, for it is so seldom worn, but it at least points the way. Until people of all ages and all occupations begin to dress as sensibly for the cold as do the skaters and skiiers of cold countries, there will be much discomfort connected with living in the North.

Having considered the handicaps to northern development that relate to the winter cold, we come now to

those that relate to the excessive summer heat and to its corollaries.

Heat as heat will not keep back the development of the North any more than it has kept back the development of the tropics or the temperate lands. Plainly there will be some suffering during the period when the temperature ranges between 85° and 100° in the shade, for prevailingly the North is humid and the heat will therefore have its fullest disagreeableness. Also we lack in the North the brief respite of the night's darkness. It has seemed to me in Arizona that the 110° in the shade was, even at noon, palliated by the approaching coolness of the night. You do not feel really hot if you know that you will soon be cool. At places such as the Coppermine River in Canada you would have to have a vivid imagination to be able to get much comfort in the swelter of 95° in the shade by remembering that inside of six weeks the sun would begin to set and the nights begin to be cool.

But in certain ways we can deal with the heat better in the North than we can in the South. The summer of 1918 when it got so hot in the hospital at Fort Yukon that many of us moved down into the cellar, we had a cool cellar to move into because the ground underneath was frozen. Almost anywhere in the North you could have a sort of cyclone cellar where you could descend into the frozen ground for temporary relief, somewhat as they burrow into the ground to flee the tornadoes in Iowa and Nebraska.

In most southern places you can get relief from the

heat by dressing lightly. At present this is not an available avenue of escape in most northern lands because of the plague of mosquitoes. No matter how hot you are, you will have to wear thick enough clothing so they cannot sting through, with unpierceable gloves on your hands and a veil over your face. There was a time when many southern places now comfortable in summer were intolerable through the number of mosquitoes. Settlements will in general mitigate the insect pests of any land. However, we look upon the immediate development of the North as consisting mainly in great stock ranches where a few people will be all that are needed to look after thousands of animals and tens or hundreds of square miles of grazing land. This type of colonization, requiring no cultivation of the land and little drainage, will not handicap the mosquitoes appreciably. We shall, therefore, have to discover some new means of dealing with the insect pests before we can seek relief from the heat up there by light clothing.

Although the mosquito is the worst single insect of the North, the sandflies and horseflies are also to be reckoned with. Some say the sandflies are worse than the mosquitoes because they will get inside of your clothes and crawl all over you. This can be dealt with by wearing knitted cotton or woolen underwear that grips the body so tightly that flies cannot crawl under. That is a simple enough way theoretically but one does not like to be clothed that way when the temperature is around 90°. I always feel that the sandflies

are second to the mosquito for they come late in the summer when the nights are beginning to be cool and, whatever annoyance they give in daylight, they at least let you alone during the cool and dark hours.

The horseflies, or as they are usually called, moose flies or bull dogs, are not any worse in the Far North than they are in many settled countries.

The difficulty with the perpetual daylight of summer has always been no less imaginary than the difficulty with the darkness of winter. Being imaginary, this difficulty will have to be dealt with only by the early colonists of the North who come into the region believing in its existence. The belief, with its attendant ill effects, will die out in a year or two. Eventually a tourist who fears the perpetual daylight will get on his nerves will become in the North as much of a joke as the Englishman used to be a few years ago in Montreal who stepped ashore armed to the teeth against desperadoes and Indians.

With all the people who find difficulty in getting up in the morning in time to catch the suburban train to their offices and with all the fashionables who sleep till noon, it ought to be a matter of common knowledge that daylight does not interfere with sleep. Still, I have heard of people in Alaska and the Yukon who have worried themselves into a state of nerves by their fear of inability to sleep in daylight. This fear has created the real inability to sleep, which in turn has had its effect upon the disposition and even the health of the person concerned. This is a psychological con-

dition from which many people have suffered during the last two or three decades in connection with the Alaska and Yukon gold rushes, but which has already passed its crest. When first I went North (1906) I heard a great deal of talk about this difficulty in sleeping. In spite of careful inquiry, I have heard very little of it the last few years.

We who are trying to abolish the Arctic are well aware of the difficulty of the task. No one can be familiar with similar enterprises of the past without realizing that in its class this is the most difficult. Take, for instance, the slow decline and fall of the Great American Desert. That was an idea which ran its full course within a single century and, therefore, never had the vitality of the polar myth which has come down to us through milleniums of unshaken belief. For the purposes of the illuminating analogy, I had commenced a study of the Great American Desert when there came to my attention an admirable summary, written by Floyd C. Shoemaker, "Traditions Concerning the Missouri Question," an address delivered at the general session of the American Historical Association in St. Louis, December 29, 1921.[3] His account in part is as follows:

"For forty years 'The Great American Desert' included what is to-day one-half of the world's greatest granary—the

[3] "The Missouri Historical Review," January, 1922.

Mississippi Valley. Considering the relatively accurate knowledge of the trade routes of this region possessed by traders, trappers and explorers, and considering even the relatively accurate knowledge of this region possessed by scientists and observing travelers, it is surprising that 'The Great American Desert' persisted decade after decade, a barrier to settlements, a refuge for savages, and an all too handy term of derision by foreign writers and statesmen to discourage emigration to western United States. In reading the literature of that day descriptive of this section, it seems that the Government reports educated the adult population and the school text-books educated the growing generation to recognize the fact that America could rival Africa in possessing a Sahara."

". . . To Zebulon M. Pike, a native of New Jersey, the West is largely indebted for . . . the mirage-barrier of 'The Great American Desert.' This New Jersey-Pennsylvanian did more through his report of 1810 to the War Office to retard settlement of the trans-Mississippi country than all the Indian tribes of the plains. His report contains such descriptions and comments as this: 'From these immense prairies may be derived great advantage to the United States, viz.: the restriction of our population to some certain limits and thereby a continuation of the Union. Our citizens being so prone to rambling and extending themselves on the frontier, will, by necessity, be constrained to limit their extent to the West to the borders of the Missouri and the Mississippi, while they leave the prairies, incapable of cultivation, to the wandering and uncivilized Aborigines of the country.' Here was an official report, based on two explorations, on the country north and west of Missouri. Pike had done more than explore the sources of the Mississippi and discover the peak which bears his name. He had discovered a desert that equalled the Sahara. In geographies and literature both in America and in foreign countries, 'The Great American Desert' was now to receive unstinted publicity.

"The next nation-wide advertisement of this district was again gratuitously written by a government official. To Major Stephen H. Long, a native of New Hampshire, a graduate of Dartmouth, and an officer in the United States Army, is the West indebted for the vivid colorings of 'The Great American Desert.' His great exploration of 1819-20, set forth in his report to the Secretary of War, is important . . . in picturing the West beyond Missouri as uninhabitable. He described the country between the Mississippi and the Missouri in these words: 'Large tracts are often to be met with, exhibiting scarcely a trace of vegetation.' Of the mountain region he wrote: 'It is a region destined by the barrenness of its soil, the inhospitable character of its climate and by other physical disadvantages to be the abode of perpetual desolation.' In conclusion he says: 'From the minute account given in the narrative of the expedition of the bad features of the region, it will be perceived to bear a manifest resemblance to the deserts of Siberia.'

"As government documents Pike's and Long's reports were widely circulated and generally accepted. They furnished the data for statesmen, historians and geographers. The school geography of Woodbridge and Willard of 1824 thus describes the present Nebraska district: 'The predominant soil of this region is sterile sand.' Later geographies used in the schools contained similar descriptions. Iowa and Minnesota were eliminated only as they were settled. The most graphic and damaging picture of the 'American Desert' came from the pen of America's novelist, Washington Irving, when his *Astoria* appeared in 1836."

About the middle of the 19th century the power of the Great American Desert began perceptibly to wane and by 1867 only western Kansas remained of the fictitious desert—and of course the small patches of

real desert that remain to this day and are only gradually and partially being conquered by irrigation. It is a commonplace now that much of the Great American Desert is the best natural farming land in the world, and parts of it have been selling for agricultural purposes during the last few years for as high as five hundred dollars an acre.

If one disregards the greater antiquity of the "Frozen Wilderness of the Far North," Dr. Shoemaker's account furnishes in other respects a striking parallel. The Great American Desert rested upon the accounts of travelers, admired in their time and so charitably treated by posterity that their names will not disappear from our histories for centuries, if ever. We reluctantly admit that their judgment as to the habitability of the country they explored was not sound, but somehow that does not seem to detract very much from our general admiration for them nor to lower their historical position. From this analogy we may take comfort, for history will doubtless manage similarly still to rank high the explorers of our Frozen North even after we realize that it is not half so frozen as they reported it to be and even after cities are built in the regions which they thought would be forever desert.

It is striking to note in Dr. Shoemaker's summary the parallel between the Government reports that furnished the chief bulwark of the Great American Desert, and the Government reports which still sustain the Frozen Wilderness of the North. Then, as now, the

school books followed the reports of Government and private explorers, and the knowledge of the fertility of the Middle West existed for decades side by side with the text-books and encyclopedias which denied it. So it is now, and the slow battle has to be fought over again. No one realizes that better than the author of this book and the friends who have encouraged him to publish it. We have no thought of abolishing the Great Arctic Desert with one book or in one short campaign. The best we hope is to focus public attention upon the case and to provoke discussion and investigation that shall not end until this myth goes the way of the many similar myths of early days that have retarded progress each in its own time.

Most of the Great American Desert has vanished because most of it never existed. What did exist we are conquering, in part at least, by irrigation and dry farming. Where minerals have been found great cities now stand in patches of otherwise unconquered desert. A similar destiny awaits the Frozen Desert of the Far North. Much of it will disappear through the mere advance of knowledge. The rest the ingenuity of man will conquer, here partially and there completely. In some sections now most forbidding we shall find undreamt values. The creative minds and guiding hands of the future will turn many of the forces we now dread to precious use.

When looked at with the perspective of a century to our advantage, it seems a curious thing that Pike could consider the Great American Desert a blessing

in that it prevented people from going west of the Mississippi, thus indirectly (he thought) favoring the development of the eastern half of the United States. It is hard for us to see how people of that time could have been so short-sighted. But it is somewhat easier (because we have the advocates now with us) to understand why many of the colonists of southern Alaska resent the development of the reindeer prairies that form the northern third of that territory, and why many in Ontario think that the prairies that make up the northern third of Canada should await for their development the time when the scrub-covered and rock-infested hills farther south have been laboriously brought under the plow. The interest in such views, however, must always remain academic, for in the history of the development of the western hemisphere their advocates have never yet prevailed. Neither will similar views, should they be held in Russia or Siberia, keep back more than temporarily the development of that great country, even though sterner measures may possibly there be taken than any that are congenial to North American political institutions.

There is a fundamental difference between colonization from east to west and colonization from south to north. East resembles west more closely than north resembles south and the psychological difficulties of northern colonization are, therefore, greater.

A part of Illinois was colonized from Louisiana and

Mississippi. With southern minds, the colonists were naturally inclined to southern ways and southern crops. So they tried to cultivate cotton in Illinois. The results were difficulties that might have fallen little short of disaster had not other colonists been there from the east with eastern ideas and eastern crops, the success of which won over the southerners from cotton to corn. These eastern colonists were the great good fortune of Illinois, for, although their minds were intrinsically no better than the minds of the southerners, they did not have to undergo a fundamental change before they became useful in Illinois.

In certain parts of Dakota we had difficulties analogous to those of Illinois. Just as the southerners tried to plant cotton north of the Ohio so did the immigrants from Illinois and Iowa try to plant corn in North Dakota. Broken in fortune and broken-hearted, many of these colonists returned to the corn lands with tales of the inhospitality of the Dakota prairie, and cattle ranches spread over the abortive corn fields. When my family moved out to establish a cattle ranch on the public domain, we camped near an abandoned plowed field. Judging by the condition of the ground, I imagine the original homesteader had left it six or eight years before. Although it was fifteen or twenty miles to our nearest neighbor at that time, the country had been dotted with homesteads a few years earlier.

But North Dakota had colonists from Ontario as well as from Illinois; just as Illinois had colonists from Pennsylvania as well as Mississippi. In the main, it

was these northerners that revived the fortunes of Dakota and brought the tide of immigration back again, so that after a decade or two of abandonment the prairie farms were re-homesteaded, this time by a successful people because they were not trying to gather grapes from thorns. They were not cultivating cotton or corn, but wheat.

As we go north the problem of colonization becomes steadily more difficult. Fully half of Europe can give us colonists that are fitted through their bringing up for the development of Illinois. North-Europeans can adapt themselves without violent mental wrenches to southern Manitoba and Saskatchewan. But none of the European countries which have so far given any appreciable number of colonists to North America is fitted by climate to send us immigrants who in northern Canada can commence without apprenticeship the development of the land. The southern cotton growers in Illinois had neighbors from whom to learn better. The colonists of the Yukon or of Great Bear Lake must either be of such a high level of intelligence as to think out their problems before they actually meet them, or else they have to go through the painful experience of learning by failure. But history shows that the colonist will not ordinarily learn by failure; instead he returns disheartened to the cotton lands and the corn fields.

We are frequently asked to-day why it is that Alaska has a smaller population now than it had twenty years

ago or even ten years ago. There are various narrow answers, such as the effect of "hard times" in the United States, and the drop in the purchasing power of gold. But the broad answer is: southerners have gone there and have tried to live as southerners. They have in general failed. A few have learned wisdom, have become northerners and have stayed; but the majority have returned to lands where they could live as their fathers had lived before them.

To those who suppose that similar latitudes in the old and new worlds necessarily have similar climates and similar resources, it seems reasonable to suppose also that Norwegians, for instance, would take to the North as ducks do to water. The fact is that Norwegians are not through their experience any better adapted to real polar countries than the natives of Ontario or Michigan. The climate of North Dakota gives a much closer parallel. The immigrant from Dakota would find near the arctic circle in Canada or Siberia many conditions to which he is used—the hot summers, the cold winters, and the treeless plains. He might, therefore, approve the scenery and find the climate tolerable. But he would try to cultivate cereals, build barns and milk cows. Thus he would be as unfit for the North as the cotton planters were for Illinois. It is true that the northern summer and winter resemble in heat and cold the same seasons in many of the ordinary lands, but the difference in length of season is enough so that nothing but failure can

result from any colonizing scheme where the plan is to develop the animals and the crops to which the colonists are used.

Here, then, we have a profoundly serious difficulty to overcome in the colonization of the North. But the difficulty is psychological and can be dealt with by education. It is hard to educate large masses of people, but fairly easy to convince a few individuals, especially when these are men of pioneer minds. Now it happens that many of the large industries of the world and much of the world's capital is in the hands of just such men. If rapid development of the North is desired, the logical way is to convince a few "captains of industry" and to induce the governments concerned to give these leaders a fair opportunity. If a thousand small landholders go north, a thousand men have to be educated to meet the new conditions. But if a thousand go there as employees of a corporation, they will work under the direction of foremen who do much of their thinking for them. This will remove the "psychological" factor from the case (or at least lessen its effect). An ordinary colony may fail through the conservatism of its members, but a commercial enterprise on a large scale will succeed unless the resources of the land have been over-estimated, or unless the plan deliberately intended to meet the new conditions in reality fails to meet them.

Before closing, we have to consider a fundamental weakness in all the arguments of this book. We have

A Burning Coal Mine, near Parry Peninsula, 200 Miles North of Arctic Circle.

Flowing Oil Well on the Mackenzie River Between Fort Norman and the Arctic Circle.

assumed in general that the northern frontier will be crossed and the northern lands colonized because the same factors will still take men North as once took them West. The weakness of the argument may be that our people are no longer the same and will not be led far afield by the motives that lured their ancestors. All over our "civilized" world is seen a tendency of the land folk to crowd into the cities. Tenement houses not remote from theatres are increasingly becoming the general ideal. This is a condition which has aroused alarm in many quarters. It is said that we are becoming a weakened and softened nation, not only because the frontier is not here any longer to struggle with, but also because we shrink increasingly from any sort of active struggle with Nature that takes us beyond the reach of our various new and elaborate appliances for coddling ourselves.

This argument would have seemed a little stronger before the War than it does now. It was found then that both in the camps before the soldiers went to the front and later in active service, the milksops from the cities not only turned into surprisingly sturdy men but proved to be surprisingly fond of the active life when once they had been forcibly thrust into it. However, it unquestionably took force to thrust them into it and, as no force can conceivably be applied in sending men to the new frontier, it may well be that those who actually would like the North if they ever tried it can never be induced to go and try.

We have argued elsewhere that the development of

a northern frontier will be more rapid than was the development of the western, because everything nowadays moves more rapidly. When the need is once realized, railways are more quickly built than they were fifty years ago. Air navigation is an easy way of opening new places, for no matter what the inequalities of the surface, no matter what of swamps or rocks, the air above is substantially the same and the topography is of importance from the point of view of air development only in so far as it allows or prevents safe landings. It happens that in the Far North we have lakes scattered everywhere. There is no part of the world which has so many small lakes. These will always form good landing places for flying boats in summer and for airplanes equipped with skids in winter. The natural limitations of aircraft as freight carriers will lessen but not cancel their value in northern development.

It is probable that Daniel Boone in the Kentucky forest reconciled himself easily to the thought that he might not hear more than once a year what Congress was doing at Washington. Our different generation may worry if they go far beyond the frontier lest they miss their newspapers for several days. From the point of view of these the radio and the airplane will be consoling thoughts.

While we recognize that the general modern tendency towards city life and the lessened percentage among us of those who enjoy activity in the open air will inhibit somewhat the development of the northern

frontier, we still feel that the other compensating factors will operate to such an extent that the North will soon come into its own and will be developed as rapidly at least as the West was by our perhaps hardier and more adventurous progenitors.

Whatever the general effeminacy of our time may be, we do still have among us a considerable number of men of the Roosevelt type. There are growing up here and there boys of the Daniel Boone and David Crockett type with an inborn passion for the frontier. Each giant task that develops along the trail of such pioneers will find at the appropriate time its Cecil Rhodes, its Jim Hill or Strathcona.

It is great good fortune that we still have our frontier land in which pioneers may struggle and build, where they may dream their dreams of empire, and eventually write upon pages now blank the story of those realized dreams.

POSTSCRIPT

It took forty years of residence in the northern hemisphere, twenty years of the study of history, anthropology and geography, and ten years of residence in the polar regions to open my eyes to the considerations which this book has attempted to present. I hand it over to the public disheartened by a realization of the faults of the book and aware of the ease with which hackneyed tricks of controversy will be employed against it.

It is a commonplace with sociologists that nothing is so utterly unpleasant as that which is wholly new. The ideas of this book are new enough to be unpleasant to the "conservative." From this source alone there is sure to be a good deal of opposition. It is easy to foresee that further opposition will come from many sources. But, foreseeing opposition, we are not attempting to meet all of it. That could not be done without making the book voluminous and tedious.

In a talk recently given at the Naval War College, Dr. Isaiah Bowman said:

"Until a new idea succeeds, it can always be logically demonstrated that the idea is either wrong or unsound; for back of the old ideas and the old ways lie experiences which are interwoven with the judgments of men; and this advantage is denied the new idea. A classic

example is the case of Agassiz when he saw the moranic drift about Boston. He said: 'If this were in Switzerland I should think the ice had been here.' Everybody laughed! How absurd (at *that* time) to suppose that the ice *could* be there when there were no mountains!" [1]

When a novel view is not dismissed offhand as being absurd, the usual method of controverting it is to misquote it sufficiently to make it seem even newer (or more absurd), and then to ridicule or disprove it as misquoted. This in its nature is impossible to guard against.

With a book against which there are many prepossessions, the method of confutation by misquotation need not be used. It is almost as effective to take single arguments apart from their context. A structure built to lean against another structure is not necessarily able to stand alone.

In some cases the critic can appeal with confidence to public misinformation. In days when the earth was believed to be flat, a reference to its roundness sounded as ridiculous as a reference to its flatness would sound to-day.

A priori, one would think that ability to change one's opinion was a sign of mental power. It is instead a gift, or a grace. There are minds at once powerful and stationary—they can always see a new point, but they always find a method of explaining it away so

[1] Is there any deeper damnation of an opinion than a clear demonstration that it is new? Cf. the New England expression: "Who ever *heard* of such a thing?"

as to avoid changing their previous opinions. Such men have already said about some of the essays that have gone to make up this book that they are examples of very clever special pleading. These men do me too much honor. It takes great ability to present a bad case well, and only a little to present the truth convincingly. But when you know a thing you cannot easily avoid seeming a special pleader to those who either cannot or will not see. In his day the arguments of Copernicus were looked upon as exceedingly clever (in fact, devilishly clever) examples of special pleading. But the world was and is round, and his special pleading is now called clear exposition.

Many say that I am prejudiced in favor of the North because I have lived there too long. Here again we have a rather fundamental difficulty. Had I lived in the North little enough to retain my prejudice against it, I should never have had the ideas which this book tries to express. Knowledge is so apt to prejudice one. That is why we have so much trouble finding in an era of general education men ignorant enough to serve on our important jury trials. To-day it would be almost impossible to find a jury ignorant enough to give the prosecution a fair chance to burn Bruno. Certainly you could never have picked from Magellan's shipmates an impartial jury to try Copernicus for heresy.

But out of forebodings such as these there has come a cheering thought. If it took half a century to depose a pretender like the Great American Desert, we cannot expect to compel with one book, or with a dozen,

the abdication of the Frozen Wilderness of the Far North, legitimately descended as it is from centuries of myth and marvel. What we do reasonably hope (not I alone but the many who consider the subject of first importance) is that we may start debates and discussions and investigations that shall not end till men's ideas of the North correspond as nearly with the facts as our present ideas of the Great American Desert correspond with our mental pictures of Utah and of Kansas.

Since our motive is not to prove the case now, but rather to start a discussion that shall prove it eventually, some at least of the apparent defects of this book may prove to be among its real merits. If our statement of a point falls short of being convincing, some one may challenge it loudly. Thereupon another who sees the truth even through our faulty exposition (or who knew the truth before) will arise to the defense of the controverted statement. Thus, he may start the very controversies and create the public interest we desire. The first consideration is to keep the public from forgetting that there is an issue. In this age of an overcrowded world, no one who knows there is an issue here can remain careless of its settlement, for upon it hangs the great value or utter worthlessness of lands equal in area to the whole continent of North America.

There is thus a special reason why this book is not heavily buttressed with the footnotes that are considered the signs and the strength of scholarship. We are not

exactly setting traps; but there is no motive to forestall with references to learned works the possibility of some critic rushing into print with a denial of a statement, or an ill-considered rebuttal of a theory. The more of such the merrier.

APPENDIX

WHY THE ERRONEOUS IDEAS PERSIST[1]

Traditional Ideas of the Polar Regions

"The Polar Regions" is in one sense a term in geography; in another sense it is even now a term in folklore, and once upon a time that aspect was far more important than it is to-day. We cannot study the origin of the ideas about the polar regions, for this doubtless lies in prehistoric times. Our earliest histories show us the ideas definite in form although almost wholly erroneous in content. It is probable that few people to-day have a clearer idea of the polar regions than did, for instance, the Romans and the Greeks. What those ideas were we shall not consider in detail, merely summing them up as a group of mental pictures of an area lying beyond the sheltering mountains of southern Europe filled with definite terrors more or less directly allied with cold and darkness. To people of subtropical lands the very idea of water in a solid state, as ice or snow, was gruesome. To those accustomed to a succession of days and nights that varied only slightly in length from season to season, the thought of short days and long nights in winter was dreadful, and that of weeks or months without sunlight the depth of horror.

As civilization advanced northward the northern regions of darkness and desolation were gradually shifted farther and

[1] This more technical discussion, originally published in the Geographical Review of the American Geographical Society for April, 1922, will be found to overlap in small part the discussion of the earlier chapters of this book. We put it here as an appendix rather than to destroy its unity by dismembering the original argument and scattering its fragments among the earlier chapters where (in a sense) they belong.

farther north. But the process was slow: the generally accepted idea lagged behind the acquisition of scientific facts. The "farthest north" of Pytheas was discredited by Strabo, who placed the boundary of the habitable world just north of Britain. And of the Roman conception of the possible northward extension of civilization we have a well-known presentation in the gloomy picture of Germany drawn by Tacitus. When the heritage of classical learning passed to the Arab scholars of the Middle Ages, they readily adopted the idea of the dark and frozen north. It was still the general belief of the Mediterranean peoples. In the thirteenth century we find Robertus Anglicus protesting in Montpellier against the geographers who ascribe to England "an unin habitable climate." [2]

Even to-day parts of Norway that are in reality no colder at Christmas time than Massachusetts or Switzerland, are likely to be pictured by even university men as the very outposts of desolation. This is not directly through a misunderstanding of the facts of geography and meteorology but is rather a survival, in spite of correctly apprehended scientific principles, of ancient inherited opinions about the terrors of the Frozen North.

Present-Day Misconceptions of the Arctic

To-day the average intelligent person who is not a geographer or a meteorologist is likely to have the following ideas about the Arctic:

1. In general, it is dreadfully cold there at all times of the year; in particular, the minimum temperatures of winter are everywhere lower than they are anywhere in lands occupied by an agricultural population. In summer the greatest heat is not sufficient to make the days comfortably warm.

[2] Pierre Duhem: "Le système du monde," 5 vols., Paris, 1913-17; reference in Vol. III, p. 292.

2. The arctic lands are nearly everywhere devoid of vegetation. If there is any vegetation, it is mosses and lichens. A few people who are not geographers have heard that there are flowers in the polar regions, some even know that there are carpets of flowers; but this idea is prevented from becoming very enlightening by the assumption that these are all "lowly," "hardy," or "stunted" plants.

3. The Arctic is, generally speaking, devoid of animal life. In some places there are polar bears and seals, but neither of these animals nor any other is found in the water or on the ice when you get into "the remote polar regions" at great distances from land.

4. A certain mystical idea about the polar regions is responsible for a group of notions as follows: (*a*) that there is a peculiar deathlike stillness at most or all times; (*b*) that the polar night has a dreadfully depressing effect on the human spirit, but that (*c*) there is a certain fascination about the North which either in spite of its terrors or even because of them entices men of a peculiarly heroic mold into these dreadful regions, there to suffer and if need be to die in the cause of science.

We have perhaps not made this picture complete, but, so far as we have drawn it, it will be found substantially correct.

Noises of the So-Called "Silent North"

A curious instance of how an inherited idea can fail to be corrected through repeated observation is found in "the eternal silence" of the North. It seems likely to me that had Sir Clements Markham lived to see the publication of his last book, it would not have appeared as it did under the title, "The Lands of Silence." Still, it is significant that a book under that title should have been published in 1921 after centuries of polar exploration and as a summary of what is known about the Far North and Far South.

We know from the fact that Sir Clements Markham had himself been in the North and also from his own writings that he was familiar with the great variety of summer animal life. A hundred species and more of birds nest largely or almost entirely north of the arctic circle. There are millions of cackling geese and squawking ducks and tens of thousands of cranes and swans and loons. Except for the noise made by our machinery rather than by ourselves, and except for possibly one or two beasts of the tropics, there is nothing in all creation more noisy than the loon; and no one who has ever heard their ghoulish shrieks and their maniacal laughter can think of any place infested with them as being noiseless. But in the North we have, in addition to them and in addition to the birds mentioned, more than a hundred varieties of other birds, each making its own peculiar noise. And then there are the insects. The buzz of the mosquito cannot be said to be particularly loud, but it certainly is a noise that attracts the attention of any one who happens to be about.

These are the noises of the summer, and there are also the whistle of the spermophile, the sharp bark of the fox, and the long howl of the wolf. In the winter the birds are gone with their noise except for the unobtrusive cackle of the ptarmigan and the occasional croak of a raven. Some owls also are there, but they are never noisy. The foxes bark occasionally, as they do in summer, and through the starlit night there resounds afar the howl of the wolf (wolves are found in most of the arctic lands), either singly or in chorus. But even were they and all other animals absent, the winter would be by no means silent. If you are inland, about the only loud noises are the whistle of the wind and the resonant cracking of the ground when it splits and splits again under the influence of expansion and contraction with changing temperature. But few explorers have spent their winters inland; rather have they been on the coast lines or in some cases out at sea.

The book dealing with polar regions that was published in England immediately preceding Markham's "Lands of Silence" was Shackleton's "South," from which we quote:[3]

July 25. Very heavy pressure about the ship. During the early hours a large field on the port quarter came charging up, and on meeting our floe tossed up a ridge from ten to fifteen feet high. The blocks of ice as they broke off crumbled and piled over each other to the accompaniment of a thunderous roar. . . .

August 4. For nine days we have had southerly winds, and the last four we have experienced howling blizzards. I am sick of the sound of the infernal wind. Din! Din! Din! and darkness. . . .

Of similar import is a quotation from my own book, "The Friendly Arctic":

Two characteristic noises of southern lands are absent. There is not the rustle of leaves nor the roar of traffic. Nor is there the beating of waves upon a shore except in summer. But none of these sounds are heard upon the more southerly prairies. The treeless plains of Dakota when I was a boy were far more silent than ever the Arctic has been in my experience . . . near the sea at least there is, not always but on occasion, a continuous and to those in exposed situations a terrifying noise. When the ice is being piled against a polar coast there is a high-pitched screeching as one cake slides over the other, like the thousand-times magnified creaking of a rusty hinge. There is the crashing when cakes as big as a church wall, after being tilted on edge, finally pass beyond their equilibrium and topple down upon the ice; and when extensive floes, perhaps six or more feet in thickness, gradually bend under the resistless pressure of the pack until they buckle up and snap, there is a groaning as of supergiants in torment and a booming which at a distance of a mile or two sounds like a cannonade.[4]

[3] Sir Ernest Shackleton: "South." New York, 1920, p. 325.
[4] Vilhjalmur Stefansson: "The Friendly Arctic: The Story of Five Years in Polar Regions," New York, 1921, p. 19.

Summer Heat in the "Frigid" Zone

That the persistence of the idea that the arctic regions are everywhere extremely cold at all times of year is not due to any misapprehension of geographic or meteorological laws, is clear, for every textbook on geography lays down the principles from which we could deduce the fact that many parts of the polar regions cannot be as cold as certain other inhabited and "civilized" parts of the northern hemisphere and that the arctic summer in certain places must be extremely hot. The weather bureaus of all northerly countries furnish facts to bear out these geographic principles. Yet most persons remain oblivious to them.

Psychologically there is another aspect to this case. The mind has a passion for simplicity. From the economic point of view there is still another angle. We are in need of every labor-saving device. To say that the tropics are always hot, the "temperate" regions neither hot nor cold, and the polar regions always cold, satisfies the mind's craving for simplicity and saves the time of the teacher, who gets an idea into the minds of his pupils with very little effort. The only trouble is that the idea is not correct—for any of the zones. The error of this simplified idea regarding the two former zones has been well put by Mark Jefferson, "What a suggestion of burning heat has the phrase 'torrid zone' and how unwarranted! And how pleasing is the name 'temperate' applied to our own zone! . . . so intemperate in fact that the only sound description of it that applies at all times is that every season is exceptional."[5]

The textbooks tell us that the amount of solar heat received at any point on the earth's surface depends on the angle at which the sun's rays fall and the length of day and, further-

[5] Mark Jefferson: The Real Temperatures Throughout North and South America, *Geogr. Rev.*, Vol. VI, 1918, pp. 240-267; reference on p. 240.

more, that the rapid increase of length of day toward the pole during summer more than compensates for the decreased angle at which the sun's rays strike the earth. Hence at midsummer more heat per square mile is received within the polar regions than at the equator.[6]

This comes into flat conflict with all our inherited views as to the nature of the polar regions, although it explains satisfactorily such figures as those given by the United States Weather Bureau for the summer temperature of Fort Yukon, Alaska, four miles north of the arctic circle, where, according to the Bureau, a temperature of 100° F. in the shade was recorded in June, 1915. Nor are high temperatures unusual. Dr. Cleveland Abbe gives 90° as the summer maximum in the Yukon valley, and, while he questions certain extremely high temperatures (112° or over) that have been reported, he says, "That it grows very hot in this province [Alaskan interior] no one may deny."[7] The average temperature of the warmest month at Fort Macpherson, 65 miles within the arctic circle in Canada, is 58° F., only 1° less than that of San Francisco (59°). The mean maximum is 80°.

Great Variety of Temperature Conditions in the Arctic

But it is not conservatism alone and the volume of inherited misinformation that have enabled the idea to prevail that the North is always cold. Different parts of the Arctic have very different temperatures. There are certain parts which never become very warm in summer, and, as it happens, some of the most widely known regions are included in them because

[6] This refers to values at the upper limit of the earth's atmosphere; but, even allowing for the loss of heat in transmission through the atmosphere, the ratio is high—according to Angot, 494 for the North Pole to 517 for the equator at the summer solstice.

[7] Cleveland Abbe, Jr.: Climate, in "The Geography and Geology of Alaska," by A. H. Brooks, *U. S. Geol. Survey Professional Paper No. 45*, 1906, pp. 133-200; reference on p. 155.

they have been convenient to traders and travelers and have been, largely through what might be called accidental reasons, the base stations of many well-known polar expeditions.

Take, for instance, Greenland with its historical connections with Europe and its present-day interest as a Danish colony. The island is a mass of high mountains which store up "cold" in the form of the well-known ice cap and locally refrigerate the air so that there are only a few places in Greenland where it ever gets uncomfortably warm in summer.[8]

Another storehouse of cold is the polar ocean which saves up enough chill from the long months of winter to neutralize locally a good deal of the summer heat. North of the arctic circle, it is only where you get far away from ice-covered mountains and far away from the ocean, in such places as the northern plains of North America or Asia, that you get the intense summer heat which no one expects who holds the historic view about the Arctic but which every one expects who understands the principles of climatology.

An Instance of the Retarding Influence of Tradition in the Development of Our Prairies

The lands that are the seat of our recent high civilization are mainly forest-covered except where the forests have been cleared away. Our people are accustomed to the idea that in order to be desirable a land must be forested. This erroneous view kept back the development of the frontiers of the United States, even as far south as Illinois, until the comparatively infertile lands around had been colonized. Only about half the history of the United States as a nation has passed since people came to realize that a land may be desirable though it be treeless. It was even more recently that our mid-western farmers saw that the absence of trees is an advantage, enabling

[8] According to Hann, Angmagsalik (65° 37′ N.) has a mean July temperature of 43° and an extreme temperature of 66°.

them to cultivate at little expense lands more productive on the average than the fields reclaimed by decades of labor from originally forest clad areas, such as those of Massachusetts or Wisconsin.

In going west from the Atlantic seaboard, the colonists did not expect to find undesirable land and were surprised and grieved when the prairie lay before them. Those who have gone north from either Europe or America, prepared to arrive at a region of desolation, found only the desolation they expected when the northern prairies lay before them, and wherever they went they filled their narratives with such adjectives as "barren" and "desolate." But, although they perhaps intended to indicate by those adjectives little beyond the mere absence of trees, they have conveyed a gloomier meaning to the stay-at-homes who read the books.

Illustrations of Tradition in Current Descriptions of Alaska

An added reason why we find it so difficult to get correct ideas about the North is that even the writers who are trying to explain to us the friendliness and fruitfulness of the Arctic are handicapped in doing so by the molds in which their childhood thought has been cast. A good example of that is a recent article in the *Review of Reviews*. This is a magazine of the higher type. Furthermore, the author of the article evidently intends to be specifically truthful. The whole tenor of what he writes contradicts his opening sentence, which is as follows: "A new chapter in the story of the international search for oil is now being unfolded in the *frozen wilderness of the far North*."[9] By the words "the frozen wilderness of the far North," he obviously does not mean to convey the idea that the country is particularly frozen. To him this is merely a formula to describe the North and does not mean that the

[9] J. W. Smallwood: Oil in the Frozen North, *Amer. Rev. of Reviews*, Vol LXIII, 1921, pp. 639-644; reference on p. 639.

North is frozen any more than calling Michigan the "Wolverine State" implies that the most outstanding feature of that state is the omnipresence of wolverines. We see this clearly when we follow the article on towards its end, where we find the following: "The Imperial Oil drillers were furnished with vegetable seeds when they went north and requested to observe closely the results of their planting. They found that peas planted early in June were ripe on July 23. By the end of July potatoes were ready to eat and the grass was three feet high. The soil is a rich black loam. Some day this country may serve as a great agricultural district." [10] This, then, is the very district to which he refers as the "frozen wilderness of the far North."

Another good example is "A Cheechako in Alaska and Yukon," by Charlotte Cameron. Mrs. Cameron also intends to be truthful, and scattered throughout her book are rapturous exclamations over the marvelous flowers and fruits and vegetables which she found growing nearly everywhere she went in Alaska. I have checked up the route by which she traveled and have found that it must have been seldom that she came near enough to any of the high mountains of Alaska to see a snow-capped peak. She then means nothing beyond the use of what to her is a formula or a name for the North when she says in the "Afterthoughts" to her book:

> Was this journey of 20,000 miles really worth while? The hardships, the inconveniences, the rebuffs, were they worth it all?
>
> Of a surety! This long, long jaunt *to the Arctic snows* has brought me face to face with a race of men and women whom one is proud to own as kin—the pioneers, the men who blaze the trail, the men who, God willing, will point the way to that coming race of pioneers who will set out to conquer *these ice-locked vastnesses.*[11]

[10] *Ibid.*, p. 643.

[11] Charlotte Cameron: "A Cheechako in Alaska and Yukon," London, 1920, p. 292.

Of course, she or any one can defend the description of Alaska as "ice-locked" by pointing out that there are some glaciers, especially near the southeastern corner of the territory, and that several mountains have snow caps. Still, no one will seriously maintain that the presence of glaciers around Sitka or Juneau is reason for calling Alaska a land of ice-locked vastnesses. The reason is historical. We are merely making fair acknowledgment by our vocabulary to the ancient southern civilizations from which our ideas have descended to us.

The experience of others confirms this. F. A. McDiarmid, describing the Yukon, finds it necessary to combat the old conceptions.[12] He says:

> For countless ages all peoples have looked upon the north as a wild and barren land, the home of the iceberg and the storm. In the past few years it has been given to a favored few to learn that the Yukon is a land of beauty, of sunny days and clear skies. . . .
>
> The enchanting beauty of the wide-spreading Yukon valley —its glorious sunshine and its wealth of vegetation and fruit and flowers—comes as a great surprise to one who beholds it for the first time; and often causes the exclamation, "This cannot be the north." Indeed, it is not the north land of which we have read and thought perhaps to see.

Other Factors Helping to Preserve the Tradition of the North

A set of reasons for the persistence of erroneous opinions about the North centers around the fact that many northern travelers have found it advantageous, for one reason or another, to perpetuate the idea of a land of desolation. Take, for instance, missionaries and explorers.

[12] F. A. McDiarmid: Determination of the 141st Meridian, The Journ. *Royal Astronomical Soc. of Canada*, Vol. II, 1908, pp. 84-95; reference on pp. 84 and 86.

Many travelers are hostile in their attitude towards missionaries, saying that they do far more harm than good in such places as China and Turkey, the interior of Africa, and the northern coast of Canada. I am not one of these. My opinion is that it would be a good thing for the Eskimos if they could be protected from our "civilization" as a whole. But if our civilization goes to them, as it is bound to do, I would be the last to say that the missionaries should not go wherever the trader and whaler and prospector go. I think the missionaries help more than any other class of persons to temper to the shorn lamb the bitter wind of our civilization.

The missionaries are doing important work, or at least a work which they think is important. To carry on that work with full efficiency they must have a great deal of money. They have found out by experience, and the missionary organizations here have found out, that there is nothing that opens our purses so readily as the belief that these devoted people have been undergoing great hardships in the Far North for the glory of the Kingdom. Accordingly, it is only exceptional missionaries who take pains to explain what easy and pleasant times they have in their remote fields of work.

When lecturing recently in Indianapolis I was presented to the audience by a man who had written on certain aspects of Canadian and Arctic exploration. In his introduction he assured me that whatever I might say in my lecture about the pleasant aspects of polar regions and the ease with which one could live there, he for one would never believe me and my audience would not. That is the beauty of being a polar explorer. You can go far away and do things that are easy to do, come back and say the country is friendly and the work pleasant, and still get credit for being a hero who must necessarily have gone through terrifying adventures in a region of utter desolation! Furthermore, southerners do have real hardships in the North—real to them, at least—and when graphically related the hardships are admirably suited to keeping

firm in our minds our inherited views of the dreaded polar regions.

Stages in the Development of Arctic Exploration

We get a different idea, however, when we read the history of Arctic exploration during the last three hundred years and trace the gradual emancipation from its terrors. At first the travelers were in such dread of the northern winter that they made only summer forays in ships, returning home in the autumn. In the second stage of arctic exploration they did pass the winter in the North, but practically in hibernation. It was a sort of trench warfare against the cold. They dug themselves in at the beginning of fall and managed to endure the tedium of winter through various devices, such as publishing a newspaper or the teaching of school where the officers were the masters and the sailors the pupils or various other occupations designed to kill time. In the spring they came out of their trenches in more or less trepidation and did what exploring was possible by their primitive methods during the spring and summer. As late as 1876 Sir George Nares declared that any polar explorer should be censured for cruelty who required his men to begin the work of exploration before April.

But long before the time of Nares, such pioneers as McClintock had begun to emancipate themselves from the imagined terrors of the arctic winter. It was considered a great achievement, and was so in a certain sense, when they began to carry on sledge exploration under temperatures about the same as those at which children ordinarily go to school in winter in Manitoba and Dakota.

Explorer after explorer made advances, and one by one the imagined difficulties of the North were conquered until finally, in the time of Peary, only one or two obstacles remained serious. He had emancipated himself so completely from the

fear of the winter that he laid it down as a principle that all important exploratory sledge work should be done in winter and that the journeys ought to be over before the snow began to thaw appreciably in spring. He had devised a transportation system which we still consider the best for those parts. The two ideas that remained unconquered were that the polar sea is unnavigable (it really still is except that it is everywhere sailable by submarines) and that the polar ocean is devoid of food or fuel resources, making it necessary to carry large quantities of both. Peary, himself, in his journey of four hundred miles from Cape Columbia to the North Pole, used about ten tons of food and fuel, all of which was exhausted before the journey was over.

The idea that the polar regions are devoid of animal life has been the most stubborn of the misconceptions and now remains the only one of our inherited views that is held by many explorers and many geographers. The pristine polar regions survive only in the minds of the laity.

Erroneous Beliefs Regarding Animal Life in the Arctic

When the pioneers came to the northern prairies, they were repelled by what was to them a great desolation. Sailors of southern seas were equally repelled by the ice-covered northern ocean. It was the theory of the landsman that whatever birds or animals might be in the North in summer would certainly move south in winter. Equally, the sailors believed that the whales and seals and fishes found on the margin of the ice would go south in the fall (which is really the case with the whale and the walrus) or would remain at the edge of the ice. It was thought that at no time of year would there be any considerable amount of animal life found in the sea beneath the fairly permanent ice covering of especially that part of the polar ocean which lies around the Pole of Inaccessibility—the center of the icy area, a point lying about four hun-

dred miles from the North Pole, a few degrees east of the meridian of Bering Strait.[13]

It is astounding how firm a hold these theories had on the early explorers. His whole record shows that Sir Edward Parry was about as truthful a man as ever lived. Honest as he was, he was unable to distinguish between theories which he held as unassailable and facts which he had actually observed, and so he tells us explicitly that the caribou and ovibos (musk oxen) of Melville Island leave that island in the fall and go south, returning to it in the spring.[14] We now know that neither the caribou nor the ovibos leave the island and go south. The ovibos stay in the island at all times, while the caribou do travel east and west at various times of year (not particularly in spring or autumn), going from Melville west to Prince Patrick and east to Bathurst Island. There are some also that go north and south between Melville Island and the islands to the north of that. This may happen at any time of year when the ice is sufficiently stable. There is no southward migration from Borden Island to Melville Island in the fall nor any northward migration in the spring, but merely an erratic movement between. Furthermore, this fact has no bearing on Parry's statement, which was to the effect that the animals moved south from Melville Island and came north to it in the spring, a thing that has never been observed and has doubtless never occurred in the case of ovibos and seldom or never in the case of caribou.

When so reliable a man as Parry could make a definite but entirely unfounded statement about the absence of land animals from Melville Island in winter, it does not seem particu-

[13] Vilhjalmur Stefansson: The Region of Maximum Inaccessibility in the Arctic, *Geogr. Rev.* Vol. X, 1920, pp. 167-172, and "The Friendly Arctic," pp. 8-11.

[14] "They arrived in Melville Island in the middle of May, crossing the ice from the southward, and quitted it on their return towards the end of September" (A Supplement to The Appendix of Captain Parry's Voyage for the Discovery of a North-West Passage, In The Years 1819-20, London, 1824, p. clxxxix).

larly strange that other equally honest explorers, confusing accepted theory with observed fact, make definite statements to the effect that animal life is absent from the ocean to the north of Siberia or Alaska or Greenland.

To begin with, the explorers who traveled over the ice on the polar ocean had inherited from their ancestors the view that these were regions devoid of animal life. Quite as important is the fact that they came to the shores of the polar sea with the idea, which is held nearly universally, that primitive people, such as the Eskimos, are well-nigh infallible in their knowledge of the habits of the animals they hunt. They therefore took as fact what the Eskimos told them about seals being found only near land, assuming that these seal-hunting aborigines must know. Such an assumption should not be made. The Irish have been cultivating potatoes now for centuries, and still an Irish farmer will tell you things about the nature of the potato which you classify as simple superstition. Hundreds of generations of sailors have spent their lives on the sea and have discovered that the moon controls the weather, which it does not, and have failed to discover that the moon controls the tides, which it does. These things being so, need we suppose the Eskimos are infallible when they tell us about the habits of seals?

Native Knowledge Not Infallible

As has been said, the explorers appear to have come to the North with the idea that in this field the Eskimos were infallible. The Eskimos told the explorers that seals are found only near land, and this was taken not as the expression of a view but as the statement of a fact. When, at latitude 86° N., Peary eventually saw a seal in an open lead,[15] this struck him and his Eskimo companions as remarkable (as he told me in conversation) and requiring special explanation.

[15] R. E. Peary, "The North Pole," New York, 1910, p. 250.

The explorers, then, knew the absence of seals from the polar ocean far from land (*a*) through their inherited views, (*b*) through information from the Eskimos, (*c*) because they never saw them, and (*d*) because of the absence of polar bears which live on seals. It seems at first a reasonable assumption that if one animal's food is known to consist practically exclusively of another animal, then you would inevitably find the predatory animal wherever the food animal is abundant. This logic has the flaw that a beast of prey may succeed remarkably well under one condition and fail entirely under another. A well-known example is the snowy owl which lives on mice. In summer the owls prosper everywhere in the polar regions because at that time the mice can be seen running around on top of the ground. In winter the mice are still in the northern lands just where they were in summer but they are in their frozen holes or going around, mole-fashion and invisible to the owls, under the snow. It seems clear that owls do not suffer from the cold of the northern winter and that the only thing which drives them south in the fall is the coming of the snow, a condition that protects the mice (or lemmings).

I am one of those who admire the cunning and prowess of the polar bear and believe that this animal has not as yet been given full credit by the animal psychologists for its comparative rank in intelligence. However, I do not consider it a piece of extreme vanity to suppose that I have more brains than a polar bear, that I might be able to get seals in a place where bears fail utterly, and might prosper by hunting in a place where no bear could live.

In this article I cannot go into the details of seal hunting as practiced by us out on that ocean which once was supposed to be devoid of seals. There is no novelty in the method we used. The only novelty is that we applied it in a region in which neither Eskimos nor explorers had considered applying it because of their inherited views to the effect that the seals

were absent, and because they had inferred the absence of the seal from the absence of bears and bear tracks. With a party from my expedition I traveled for two years in a region where we never saw a polar bear track, and still while traveling we lived mainly on seals which we were able to get from under the ice, where they would have been safe from the utmost ingenuity of polar bears, even had the bears been there to look for them.[16]

Conservatism Again a Hindrance to Discovery

The man in the street has ideas of the North that are his because the recent advances of science have not been able to change the current of popular thought as it applies to the north polar regions. The scientists themselves, being victims of their daily association with the average man and of the very vocabularies that have been built up under the influence of our old ideas about the North, have found it difficult to apply consistently to the deduction of correct views about the remote North their scientific principles evolved in southern latitudes. Had there never been a Mosaic cosmogony, with its six thousand years spanning all of human development, those might have been considered the most conservative geologists and anthropologists who made the longest estimates of the period that man as man has existed upon the earth, for archeology shows that the bodily changes in man during the last seven thousand years have been slight, some say negligible. But it has been a fact in our day that those have been called conservative who have assumed or deduced the shortest possible period of man's history on the earth. They have esteemed

[16] For methods of seal hunting, see Vilhjalmur Stefansson: "My Life With the Eskimo," pp. 108-111; and "The Friendly Arctic," pp. 171-172 and 301-310; *idem*, "Living Off the Country" as a Method of Arctic Exploration, *Geogr. Rev.*, Vol. VII, 1919, pp. 291-310.

it a sort of merit to make their conclusions conform to a cosmogony which, as scientists, they had entirely discarded.

There seems to be at present a similar tendency among authorities on the polar regions. Although the various sciences predispose us to make favorable conclusions about animal life in the North, we are still considered conservative in so far as we make our judgments conform, not to the principles of the sciences that apply, but to the views inherited from a superstitious ancestry. It has always been considered probable that great aggregations of animals might be found in the tropics or in the temperate zone. No serious doubts have, therefore, been cast upon estimates made in Africa or in the middle of North America about vast herds of grazing animals, whether eland or bison. I do not recall that I have ever heard questioned even the most extravagant estimates of the size of buffalo herds. These estimates, however, do not rest upon any other sort of evidence than that which goes to show that caribou move in the arctic and subarctic regions in herds equally large—say a million animals. But so strong in the public mind is the presumption for the barrenness of the North that the very men who have seen the herds which they think contain a million, will admit their real estimates to you only in conversation and will print instead of their real views statements more "conservative."

Similarly the oceanographers who have found out that animal life abounds at the margin of the ice make very guarded statements as to the probability of its extending under the ice. One by one we have already discarded nearly all of our former beliefs about the North. If in the case of any man we find nine statements of his to be lies, we incline to assume that the tenth is a lie also. In the case of the North, however, when we find our ideas one after another to be wrong, we still continue to act on the principle that the remaining ideas are probably true and that they must not be canceled except through overwhelming evidence.

Animal Life Proved Abundant in Parts of the Polar Ocean

In my reasoning about the polar regions and in my work based on that reasoning I have treated the still-accepted views about the North as I would the still-undisproved statements of a man whom I have found uniformly unreliable. I have traveled in the particular regions which Sir Clements Markham selected to point out as devoid of animal life,[17] and there I found animal life particularly abundant. Sir Clements was himself a distinguished geographer and arctic explorer and the intimate of most of the well-known explorers of the nineteenth century, and yet he died believing the Beaufort Sea "lifeless." That was because every one up to that time had accepted the inherited view of arctic "barrenness" and no one had tried systematically to find animal life in the regions previously supposed to contain little or none. But we who since have tried have so far succeeded wherever we have tried. Should we then be intimidated into "conservative" adherence to old beliefs and assume that we have happened upon one favorable region after another and that somewhere else in the polar ocean there must exist at least a little remnant of the desolate polar regions that were once so extensive? Or should we say that since the applicable sciences know no principle according to which the rest of the polar ocean should be any more "devoid of animal life" than the parts already shown to be abundantly supplied, the time has come at last to follow science and observation and to place the burden of proof upon any one who desires to maintain that there is somewhere a large part of the polar area that conforms to ancient views?

As shown in my recent book "The Friendly Arctic [18] and as previously brought out in my article "The Region of Maximum Inaccessibility in the Arctic," the area in the Arctic covered

[17] Sir Clements Markham, "Life of Admiral Sir Leopold McClintock," London, 1909, p. 172.
[18] Pp. 8-11.

with so much ice that it has till now remained unnavigated is not symmetrical, with the North Pole for a center, as seems to have been commonly assumed by those who supposed that the geographic North Pole was one of the places devoid of animal life. The real center of the icy area lies in the direction towards Alaska, at about latitude 83° 50′ N., or 400 statute miles from the North Pole. If the iciness of the ocean is the reason why animal life is assumed to be absent, then the assumed area of desolation should lie roughly in a circle which has the "Pole of Inaccessibility" rather than the North Pole for a center. If we reckon from that center, we have already found seals so near the Pole of Inaccessibility that the North Pole is no farther from it. There is, therefore, the same presumption for finding seals at the North Pole that there is for finding them where we have actually found them.

Arctic "Deserts" Not Large

As pointed out in the article to which we have just referred, we have found that certain areas of the polar ocean are better supplied with animal life than certain other areas. This merely corresponds to our general knowledge of the continents and of the oceans. In any new land, in the sense in which North America was new four hundred years ago, the traveler who makes a long journey will find himself at one time in a region of more game and at another in a region of less. Similarly, the fishermen know that certain parts of the Atlantic are well supplied with cod and that in others the prospect of finding even one codfish is remote. From the point of view of animal life there are deserts on the continents and in the warmer oceans, so why should there not be similar deserts in the polar ocean? Thus far we have never found these seal-less areas large. As we travel north we come into a district where there are less and less seals but, as we continue farther north, we come into another district where

there are more and more seals. There appears, accordingly, no definite relation between the abundance of seals and latitude.

Conclusion

It cannot be considered proved that seal life is as abundant at the North Pole as at certain places where we have traveled depending for our food month after month on seals; but it appears to me we have carried our investigations and reasoning on this subject so far that the burden of proof now rests on any one who assumes that there is a part of the polar ocean, whether the North Pole or any other part, that is devoid of animal life or where animal life is so scarce that a skilful hunter would find it difficult to secure food and fuel for a small party of men and dogs.

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