

THE THERAPEUTIC MERITS OF THE ARCTIC CLIMATE. METEOROLOGIC DATA OF A SUMMER CRUISE.

FREDERICK SOHON, M.D.
WASHINGTON, D. C.

Having already reported that the climate of the fjords of Greenland has claims to recognition as holding distinctive advantages for the treatment of certain classes of tuberculosis, I present the following account of summer conditions in these regions.

This article is not written with the thought that a summer's sojourn in these regions is, or can be, infallible as a curative measure or that it can be beneficial in all varieties of cases, but, as some localities are unhealthy while others hold elements which favor health,

fall directly on the near segment of the polar area and likewise pass over and beyond the pole even to the distal arc of the arctic circle. The rotation of the earth brings each point on the circle only to the edge of the shadow, and so no spot included within the circle passes out of the direct sunshine. In December, when the earth is on the opposite side of its orbit, the north pole leans away from the sun, and its rotation does not bring any spot in the polar area to face the sun, so these regions are then constantly in the shadow, or night. In passing the intervening quarters of the orbit the axis is inclined sideways from the sun, so that the borderline between light and shadow passes over the poles. Consequently, at the pole the sun rises but once and sets but once in each year; six months have sunshine and six months have none. Southward

the months of continuous sunshine became shortened until, at the Arctic circle, the longest period through which it lasts is twenty-four hours.

In the transitions from season to season the course of events is as follows, the exact time of these changes at any one place depending on the latitude: About the first of September the sun begins to dip daily below the northern horizon at our usual midnight hour. There is no darkness, but the twilight of the sunset and the dawn merge one into the other. The sun's rising and setting occur each day more around to the eastward and westward; as it remains longer below the horizon the night begins to encroach on the day until on September 22 the two are of equal length. The sun continues its southern swing so that in December it comes above the horizon just east of south and drops out of sight again just west of south. The next day it does not show at all, and for a period the night is only relieved by a twilight at noon in the south.

At last, even this does not show and there is the continuous cold and cruel Arctic night of winter. In February the southern twilight shows again; later the sun appears for a few hours daily. The daylight lasts longer and longer as the sun in rising and setting works around the compass until in June it both rises and sets again to the northward. Then, after one short final dip below the horizon, it sets no more, but completes its circling each day in the heavens overhead.

In these months the darkness and cold of the night disappear in the warmth and life of daylight, extending without cessation through several months of time.

In the forepart of this long day the snow melts and the ice is broken up and carried away by the winds and tide. In July naught distinctive remains to impress on one that he is in Arctic regions, except the midnight sun and the glaciers which, pushed forward by the weight of ice in the perpetually frozen interior, throw off bergs of ice into the sea. All else is indicative of pleasant summer as the frozen life leaps into flowering vegetation under the stimulating sunshine.

The accompanying chart exhibits the meteorologic

Date	Sunshine and Atmospheric Condit.			Barometer at noon	Temperature			Relative Humidity		Classification of Day
	4 A.M. to Noon	Midnight to 4 P.M.	Darkness		Daily Range in the Shade	Minimum and Maximum Fahr.	in the Sun	Daily Range in hundreds		
Sydney, July, 17				31.00						2
18				29.90						2
St. Peter's Bay 19				.70						3
IN HARBOR 20				.60						4 light NE wind
21				.70						3
Off Labrador 22				30.00						2
23				.15						2 Light NW wind
Davis Strait 24				.05						2 light W wind
ARCTIC CIRCLE 25				29.95		50°				3 ice here p.m.
Off Greenland 26				.68						2 light wind a.m.
" 27				.90						1
" 28				.89						3
Melville Bay 29				.80						3 brisk wind 1st 4 p.m.
" 30				.75						2 brisk wind night
Smith's Sound 31				.90						1 calm all day
AUG 1				30.00						1 wind from land
2				.28						1 calm all day
3				.00						1 "
North Star Bay 4				29.15		83°				1 "
76° 45' N.L. 5				30.25		76°				1 "
6										1 "
7										1 "
8										1 "
9				29.85		67°				1 "
10										2 some winds W.
11				.90		61°				1 calm all day
12				.93						2 "
13				.95						1 "
14				30.00						4 cold winds
15				29.80						1 brisk wind night
16				.88		59°				1 calm
17				30.00		58°				1 brisk N wind
18				29.90		58°				1 light wind a.m.
19				.99		62°				1 calm all day
20				30.00						1 brisk wind night
21				.80						1 light wind a.m.
22				29.85						1 calm all day
23				.60						1 wind at night
24				.90						2 no wind
Melville Bay 25				.80						3 brisk wind a.m.
Off Greenland 26				.95						3 fresh wind noon
" 27				.93						4 no wind
IN HARBOR 28				30.10						1 no wind
29				29.72						2 light wind
ARCTIC CIRCLE 30				.10						2 Aurora Borealis
31				30.00						1 "
Sept 1				.64						2 "
2				.18						1 "
Off Labrador 3				.18						1 "
Off Newfoundland 4				.18						1 "
St. John's 5				.18						1 "

Meteorologic data of a cruise from Sydney, Cape Breton, Nova Scotia, to 78 degrees N. Lat. in Greenland.

so also are certain conditions recognized as favoring improvement in pulmonary tuberculosis. These conditions may be utilized better by a sojourn at places where there is a full combination of health-inviting conditions.

This data does not deal with the days and nights to which we are accustomed. Most of it should be regarded as showing the conditions during a succession of twenty-four-hour periods making up one single day several months long, for such is the arctic summer. This happens because the earth's axis is never perpendicular to the plane of its orbit. Thus, on June 21 the north pole is tilted about one-fourth toward the sun, whose beams

conditions during such an Arctic summer. It is compiled from my records on the *S. S. Erik*, the auxiliary vessel of Commander Peary's present polar expedition, on which I went north for the third time to obtain certain information which perhaps may aid in making these lands accessible to the tuberculous. The vessel cruised according to her special purposes and there was no selection of places with regard to climatic conditions. The arctic waters were entered a month past the summer solstice, and so the chart but depicts conditions toward the close of the summer day.

The weather of the first week, in passing Newfoundland and Labrador, was worse than that usually met at this time of year in more southern waters. In contrast to it is the latter part of the return trip over the same route. This is in accordance with the well-known changes of fog in these regions.

It will be seen from the chart how a few days suffice to bring one into the regions of ceaseless sunshine, where for months a clear atmosphere is the rule and

life-giving stimulus of two days' sunshine thus forced into one, but the value of the light is enhanced, as is shown by the accompanying photographs. Figure 1 was taken at 12 p. m., a snapshot from the moving vessel, the diaphragm used being one proper for exposures in our latitudes during the afternoon, when the altitude of the sun is much greater. The nearest land and glaciers were 10 miles off.

Figure 2 is an example of the deceptive perspective created by the clear atmosphere under certain conditions of light. It is an instantaneous exposure with a one-fourth inch diaphragm taken at 9 a. m. The iceberg is about $1\frac{1}{2}$ miles off, the glacier front about a half mile farther on and the receding gorge is over a mile in length, though to the eye, as well as in the photograph, all objects appeared to be about the same distance off.

Being previously aware of the peculiar actinic power of the arctic sunlight, a pin-hole camera, without a lens, was prepared as a test. In Washington this required a three-minute exposure. In northern Greenland, under

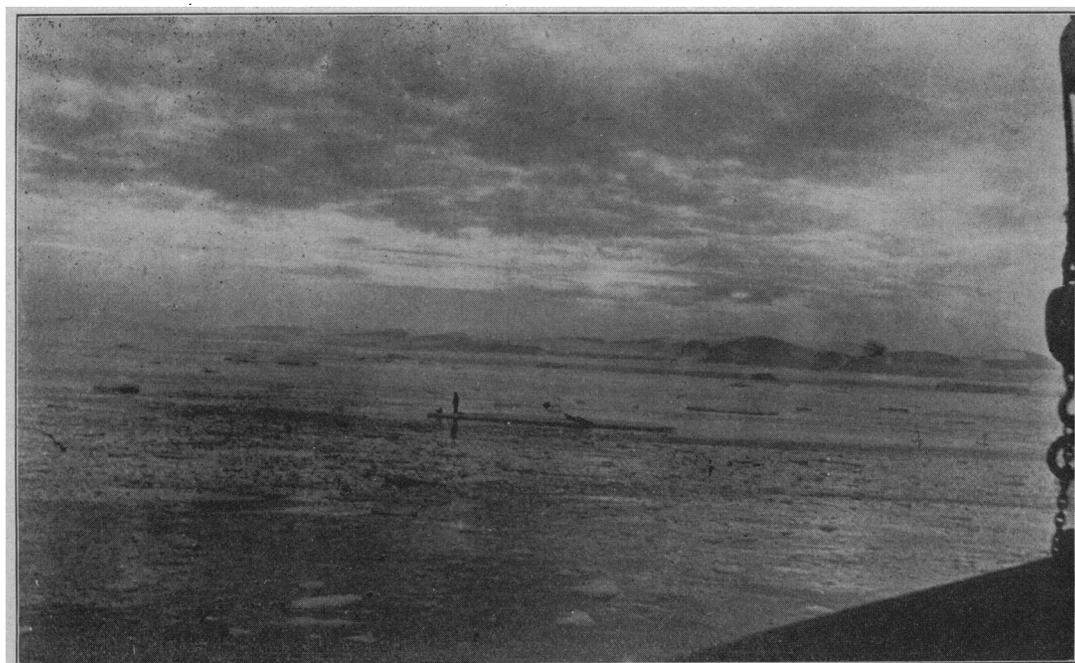


Fig. 1.—Snapshot of land ten miles distant, taken in Arctic regions at 12:00 p. m.

poor weather the exception. Starting earlier, one would have not one month, but two or even three months of this summer day.

The lines in the marginal brackets, during which days the vessel remained at anchor in the same place, are blank for the simple reason that hour after hour there was nothing to record—no haze, no fog, no clouds, no wind, no darkness, nothing but a succession of hours of brilliant sunshine. The first series was at 76.5 degrees north latitude in North Star Bay, a small basin bending in from Worstenholm Sound, eight miles from where the latter debouches into the open sea. The second series was at 78.5 degrees north, just within the entrance of Etah Fjord, which is protected by high hills of warm rock on either side. The blank spaces of these days show the difference between the atmospheric conditions on the sea and when but a few miles distant from the coast line.

The chart shows that away from the open sea there was nothing to obtund the sunshine. Not only is the

what seemed to the eye to be equivalent conditions of light, one minute sufficed, and an exposure of two minutes blackened the film. Though the quantity of the light appeared to be the same, its quality was altered; there was an increase of the actinic rays, and it should be borne in mind that these rays are allied to those which influence metabolism. Much of this increase of actinic effect may be attributable to the clearness of the atmosphere; indeed, one may at times see plainly objects seventy-five or a hundred miles away, but other facts indicate that a further explanation must be sought.

The hypothesis is advanced that there is a different proportion of the component rays in the sunbeams as they approach the poles or approach the equator. In laboratory experimentation it is known that magnetic fields deflect some rays having the more rapid vibration periods, and the earth, acting as a magnetic field, may so influence the stream of approaching sun's rays that some will be deflected from their straight course and crowded together toward the Poles.

The prolonged absence of light and the recurring scarcity of food each winter would lead to the extinction of life in the far north were there not compensations given in this protracted light of extra potency. As it is, the vegetation does wonderfully well in its struggle for existence, the native animals are the largest of their kind, and countless fowl from the south select these places to hatch and rear their young. The Eskimo lose flesh and strength during the scarcities of the winter season, yet with the returning light they recuperate quickly, become again plethoric and, as do the animals, accumulate a surplus of fat to carry over into the next depressing winter.

In these lands there occurs naturally on a grand scale all that we may try to accomplish by artificial aids in treating slow diseases in which periods of retrogression are liable to occur. The management of the favorable stages in such diseases is directed toward regaining the vitality already consumed by the disease and also, when possible, providing a reserve of strength to safeguard against the next period of depression. In many parts of the Arctic such a stimulation is exhibited for the fourth part of each year in every event of life, and it may be made serviceable in increasing chances of regaining health.

Concerning the temperature records, it may be said that readings were taken at 8 a. m., noon, 4, 8 and 12 p. m., and the thermometers were shaded and sheltered twelve feet above the side of the vessel to eliminate, as far as possible, errors which might be caused by heat from the vessel. Check observations showed but minor alterations from this cause.

Air itself, that is, the mixture of oxygen and nitrogen, can not be heated; the sunlight in passing through warms only the admixture of other gases, watery vapor, dust, etc., and this determines the temperature of the atmosphere. As the Arctic air carries no dust and the percentage, i. e., the actual amount of contained moisture is small, it remains cool, even under the ceaseless sunshine. This gives it a bracing quality that is not felt as cold, for when out of doors one always experiences the temperatures given in the next column of the chart. These were taken at odd times when the sun could beat through the open door of the observatory directly on the instruments. These figures show why one wears neither overcoat nor gloves in the arctic summer and how one may sleep comfortably out of doors if so disposed. The Arctic summer is pleasant; it is not warm enough to enervate; it is just cool enough to freshen one and to invite an invigorating life.

The limited range of the daily fluctuations in temperature is accounted for by the heat which is radiated from the rocks being taken up by the miles of glacier ice. This thermostatic action insures uniformity of temperature; there are no decided barometric "lows" and storms are rare in summer.

In the bracketed series of days, the relative humidity,

instead of remaining above the seventies, went as low as 28.08. The prevailing light winds are from the icy interior, and the atmosphere loses its surcharge of moisture as haze or fog along the coast. Had it been possible to take the observations a half-mile inland or even in some of the deeper penetrating fjords, the maxima of humidity would have been much less than those shown in the chart.

A comparison of the relative humidity at each of the places where the steamer remained for some days, with observations of the U. S. Weather Bureau during the same month of August at cities in different sections of our country, stands as shown in table.

The atmosphere of these places in Greenland during the stay of the vessel was never as moist as during the night and morning hours in each of these cities; it was never as dry as it became in three of them during the heat of the day; the range of variation was decidedly less, and the actual amount of contained moisture was smaller.

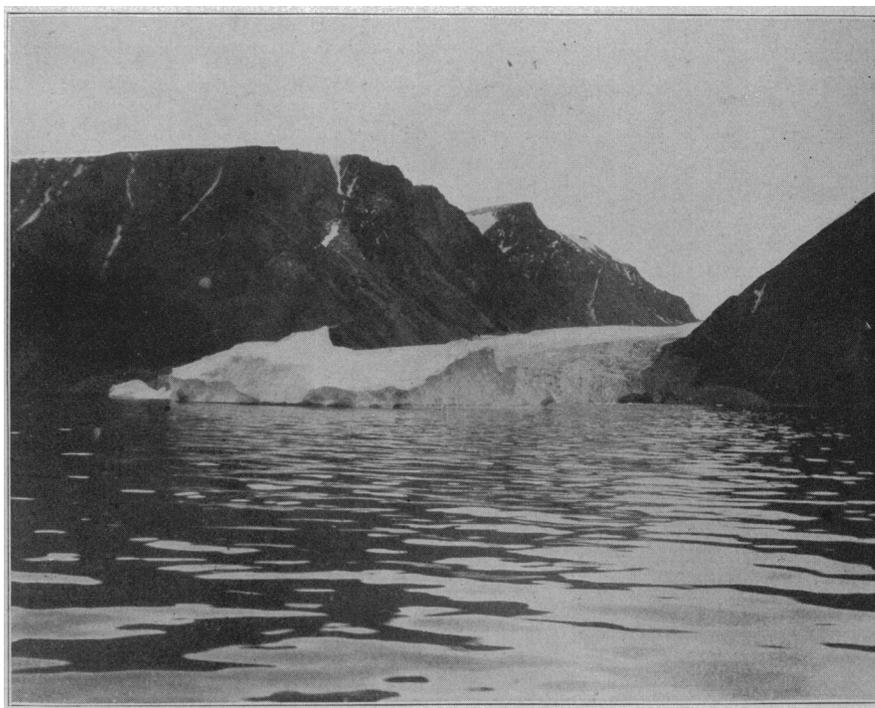


Fig. 2.—Snapshot of iceberg one-half mile distant, glacier one mile distant and gorge of a mile in length, showing deceptive perspective caused by clear atmosphere in Arctic regions.

In this connection it may not be improper to consider the influence which sea air, which is the air of accessible parts of the Arctic, may have on the tuberculous. A comparison of the tuberculosis ratio of the army with that of the navy may be useful, as in both services the

	Maximum Humidity.		Minimum Humidity.		Average Humidity.	
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	8 a. m.	8 p. m.
New York.....	100	95	62	50	81.3	74.4
Washington.....	100	93	65	56	84.8	79.1
Los Angeles.....	100	80	52	23	88.1	62.1
Denver.....	90	90	41	18	66.1	37.1
Phoenix.....	88	50	43	15	59.0	25.2
North Star Bay.....	72	71	56	39	63.1	54.0
Etah.....	81	70	40	35	57.6	52.4

men are equally hearty on taking up the special life. The sailor sleeps in ship's quarters, does not get fresh food when at sea, his exposure is more severe, his sleep, duty and relaxation are set by watches instead of being naturally regulated by night and day, and when ashore

he is exposed to the infection even while breathing dusty air, to which he is unaccustomed. Considering the chances of the two, the sailor should succumb more often than the soldier, yet there is about an equal tuberculosis rate in both services. It seems, therefore, that a life near or on the sea has some influence in at least holding off tuberculosis infection, and so after infection sea air should be preferable if it can be had where there are no decided fluctuations of temperature or a high humidity to produce dampness, catarrhal conditions, etc. Such is the air of these lands. In all respects as to comfort it is preferable to the air of excessively dry regions.

On this short trip the crew, though engaged at habitual work and having the same food as on other cruises elsewhere, and probably not so good as at home, made an average gain of ten pounds in weight.

Concerning the classification of each day as to its suitability for semi-invalids, I consulted Prof. N. Senn, who also undertook the journey to complete his investigations of disease among primitive races by a study of the Eskimo of northern Greenland. As the vessel was covering some 200 miles each day, sometimes near land and sometimes at sea, we had to consider the general characteristics of the whole twenty-four hours, paying particular attention to the usual waking hours. When the weather was such that a delicate person would feel uncomfortable, or the day one which we could not consider beneficial, it was classed as unsuitable or No. 4. When most of the day was good, but with some hours of dampness or wind, generally in the night hours, it was classed as indifferent or No. 3. Days which had the full sunlight obtunded by clouds or were slightly overcast were called favorable or No. 2. These days were in reality fine days and only classed as No. 2 in order to reserve a class for the superexcellent days, in Group 1, whose perfection could not be equaled elsewhere. At each of the two harbors in the north there was a succession of these "excellent" days; this series, it may be said from past experience, had been repeating itself for two months and continued for some weeks after we left.

In the arctic there is a significant absence of affections of the respiratory tract. The following statements from leaders of experience may be interesting: General Greely, in referring to previously published statements of my own,¹ writes: "My experience regarding the contracting of colds, is practically the same as that mentioned in your article." Also, Mr. W. S. Champ says: "From my experience in the arctic I thoroughly agree with you in regard to the climatic advantages to be met with in the far north." When one is chilled in wet clothing the physiologic reaction may sometimes be manifested by relaxed tonicity and engorged nasal membranes, but this is fleeting; there are no pathologic conditions of catarrh and no fever; in short, one can not "take cold."

The arctic atmosphere holds no dust and is sterile so far as noxious germ life is concerned. Sparse molds and a few harmless bacteria exist, but the low temperature does not favor the development of pathogenic organisms, and the constant sunlight will forever keep these lands free of contamination by imported diseases.

The merits of this climate for the relief of chronic affections, particularly tuberculosis, are threefold:

First.—It holds absolutely nothing to add fuel to the existing flame. There is no dust to irritate tissues al-

ready struggling against a present mastery of the disease, no superadding of pus or other infections, no contracting of colds to invite a setback, nothing to depress vitality.

Second.—It holds every incentive to an increase of bodily vigor. Each and every chance and opportunity for a cure which is here sought for and obtained only singly or indifferently is there grouped together in full intensity without the necessary presence of any disadvantageous element.

Third.—As a result of this dual combination, a beginning tuberculous process may be checked in the shortest space of time, and not so much local damage will be done while waiting for the tide to turn and recovery to begin. This will lessen the chances of a new infection occurring after a cure.

Since I have broached this subject I have heard from no one acquainted with these lands who does not corroborate these views. Dr. F. S. Nash, surgeon, U. S. N., who has contributed a monograph on the arctic, in a personal letter, writes: "My position as one of the surgeons of the Greely Relief Expedition under Admiral Schley and afterward as surgeon of the Northern Alaska Exploring Company gave me excellent opportunities for observing the conditions of which you write. . . . most heartily indorse your statements." Mr. H. L. Bridgeman, a traveler of wide experience who has been to the places where the foregoing records were taken, considers them eminently suitable for a summer sojourn by consumptives.

Prof. N. Senn, the latest and most deeply observant of medical writers on the Arctic,² tritely summarizes the whole situation when he says that Nature there bends such efforts toward prophylaxis as to leave no need for therapeutics.

These lands can be reached without difficulty or danger; the pioneer work has been done and the way is open. Concerning this Commander Peary, who knows every detail of the Arctic in its pitiless moods of winter and its smiles of summer, wrote last August at Etah: "Answering your inquiry in regard to bringing a ship to this region for a summer voyage, I beg to state that the experience of nearly fourteen consecutive summers enables me to say that there is nothing more arduous in a voyage to this region than in the voyages which are now undertaken each year by tourists to the North Cape and Spitzbergen."

In conclusion, these northern lands hold distinctive conditions which are precious. Here is a field for a benevolent enterprise, with more surety of practical results than are to be had elsewhere. This field, reported on and indorsed by professional men and others who know whereof they speak, is worthy the attention of those who could begin such an undertaking.

INFANTILE PSEUDOLEUKEMIC ANEMIA.

J. GARNET HUNT, M.D.

Interne New York Postgraduate Hospital.
NEW YORK CITY.

This disease of infancy is one about which there has been a great deal of discussion among writers on diseases of the blood since von Jaksch, in 1889, first described the disease which now bears his name. Italian writers recognized and described peculiar forms of grave

1. American Medicine, vol. vii, No. xvii, April 23, 1904. Washington Medical Annals, vol. iii, No. v, Nov., 1904.

2. "Medical Affairs in the Heart of the Arctic." The Journal A. M. A., 1905, vol. xlv, pp. 1564, 1647.