# IMAGE EVALUATION TEST TARGET (MT-3)

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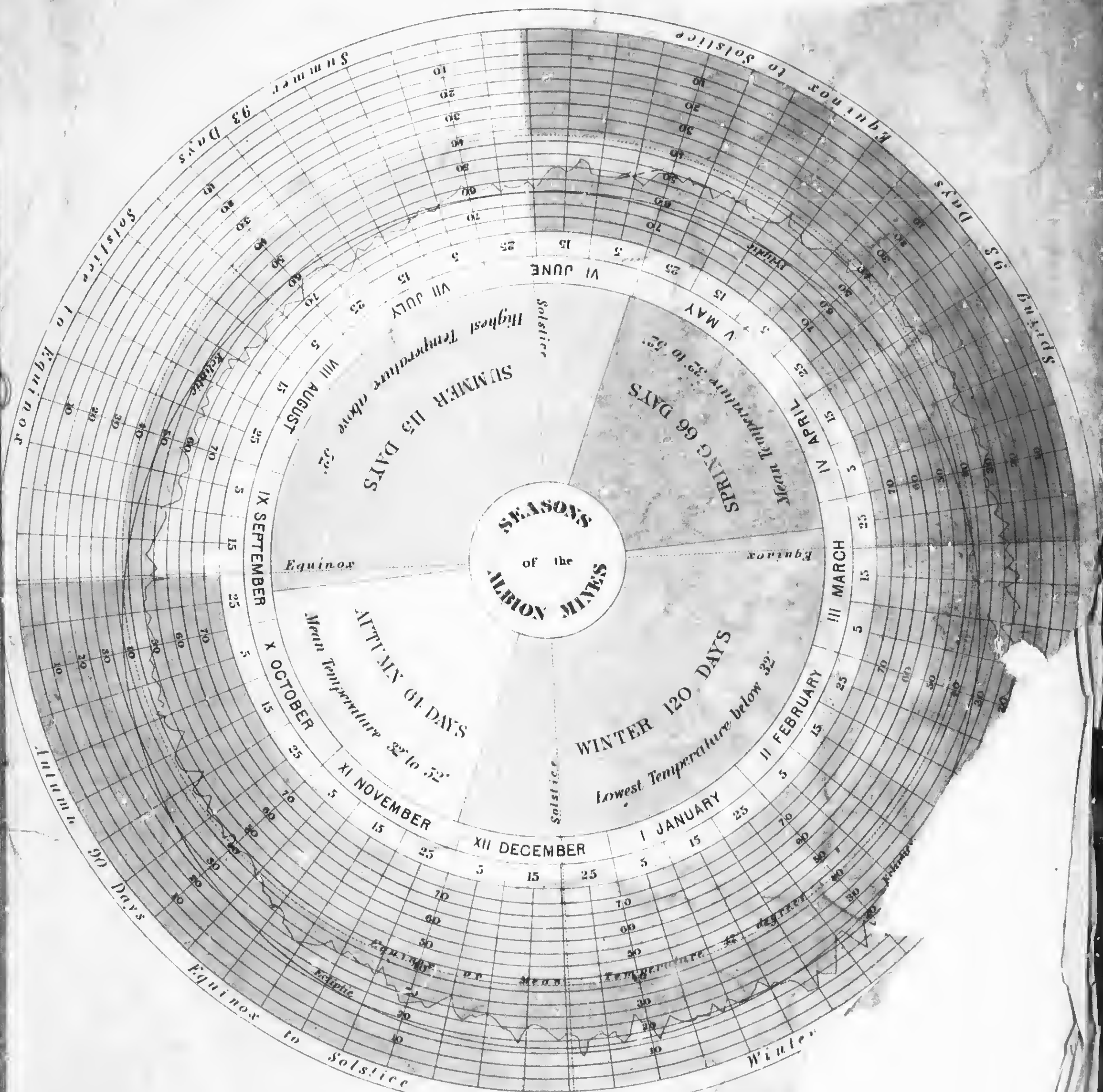
# ALBION MINES,

*PICTOU, NOVA SCOTIA, NORTH AMERICA.*

Latitude 45° 34' 30" North; Longitude 62° 42' West.




## DIAGRAM

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# OBSERVATIONS

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THE

# DIAGRAM

OF

## MEAN TEMPERATURE,

**FOR TEN YEARS,**

AT THE ALBION MINES, NOVA SCOTIA.

LATITUDE, 45° 34' 30" NORTH; LONGITUDE, 62° 42' WEST.

**BY HENRY POOLE.**

J. D. McDONALD, PRINTER . . . . PICTOU, 1860.

# CLIMATE AT THE ALBION MINES.

Being curious to compare the very considerable variations in the mean heat of the same day in different years, I determined on constructing a set of Tables applicable for that purpose, on a plan similar to that adopted by Howard for the "Climate of London."

I possessed observations on the thermometer for 10 years; and though the temperature of the year might not reach both extremes of its variation in so short a period, yet I thought they might give a close enough approximation to enable me to elucidate many interesting phenomena.

The method employed in forming these tables, was to set down the higher and lower observations of each day under the day, through the month; then to repeat the operation for the same month in the next year, and so on for ten years. The average of the sums in each *column* then gave the mean heat of the *day* for ten years, and that of each *line* in the table, the higher and lower mean alternately, for the month. The monthly means for ten years being then deduced, both from the first column and from the line of averages at bottom, the agreement of these within certain limits was considered as proving sufficiently the correctness of the calculation.

The Diagram, as the reader has perceived at once, presents a circular scale for the year, divided into intervals of five days; the daily undulations (where the termination of the months required them) being sometimes marked for six observations in the space allotted for five days

Each of the lines forming these divisions forms, likewise, a scale of temperature, being cut at equal intervals by the concentric circles, which are distant from each other five degrees fahrenheit; the *highest* part of the scale being *within* or towards the centre; the *lowest, without*, or towards the circumference.

Just within the circle representing 40 degrees is another formed by a strong dotted line; this is placed on the *mean of the climate*, and with reference to the declinations, it represents also the Equinoctial or Equator. The circle representing the sun's declination through the year, would be readily found by its being so greatly eccentric; it is however further marked by the word "Ecliptic." The north declination is made to proceed towards the inner or upper part of the scale of Temperature; the south, towards the outer or bottom; the extreme distance from the equinoctial each way being equal to 23 deg. 28 min.

Having thus far explained the figure, I would now call the reader's attention to the circle formed by a flexuous line, which traverses the scale through the year, and presents the same eccentric appearance as the circle of declination. This is the curve of the daily mean temperature prolonged through points marked for each day on the scale.

On a general view, the reader will perceive that like the circle of declination, it is highest in summer and lowest in winter, and that it crosses the mean line twice; in spring and again in autumn; but not at the same time, being about a month later. If we trace the correspondence of the two circles, we shall find this difference in time to obtain throughout the year, though with some slight difference in favor of the hot days, as from the time of its crossing on the first of May above the line of mean temperature, until it repasses on the 4th of November, is 187 days, while the number of days shown below the mean is 178 days, or an excess of 9 hot, over the cold days.

At the autumnal Equinox on the 22d September, we have the diurnal mean temperature 53·75 or 11¼ degrees above the mean of the year, to which it does not attain in its gradual descent until the 5th of November, or a period of 44 days. Proceeding on the Winter Solstice, the declination arrives at its south extreme on the 21st December, but the temperature does not reach its lowest point (19·30 deg.) until the 20th of the following month. Here, there are three considerable fluctuations; and there is not much actual increase in the temperature during the whole of the month of February. As the season proceeds, the sun again passes the equinoctial line on the 20th March, when the temperature is only 28·50 degrees; the diurnal mean temperature not reaching the equinoctial line until the 1st of May, or 46 days afterwards. The ascending temperature now follows the declination, keeping at the same distance as before unto the Summer solstice or the 21st June; but the temperature at this time is at 62, or 11·50 degrees short of its higher extreme, which does not take place until the 22d July, or 32 days afterwards. From this time the declination falls in the scale, keeping in advance of the temperature, and the divergence of the two from each other increasing (as before in spring) down to the Autumnal Equinox, from which point it will be recollected we set out in the comparison.

Thus the average of each day upon the observations of ten years, has furnished a practical proof of the theory, that the diurnal temperature is determined by the sun's altitude at noon throughout the year.

The curve of mean temperature we may observe, scarcely ever rises or falls uniformly for a week together, but is continually interrupted by deviations. Yet the general effect so nearly agrees with the progress of the Sun, that were the circle of declination shifted, and its centre made to coincide with that of the curve of temperature, the latter would cross the former in more than sixty places, besides a great many in which they would be in contact. We may therefore suppose that a very long average, or one taken from a real natural period of years, and in which local influence on the thermometer should be avoided or allowed for, would bring out a curve much more nearly resembling the circle of declination.

The fact of the mean and extreme temperatures occurring with so regular a relation to the Equinoxes and Solstices, yet at so considerable a distance after them, has suggested a more natural demarkation of the limits of the seasons of our climate, which I have now with the help of the *colored* parts of the plate, to lay before the reader.

It is clear that in these latitudes we have four seasons, variable in their length, and distinguishable by the rest and and progress of nature in the vegetable world. Now, the difference of these from each other, depending chiefly on the temperature as to its elevation, and the direction in which it is proceeding in those parts of the year in which they severally take place; if we can divide the yearly circle of temperature in such a way as shall at once make its four parts symmetrical, and bring them more nearly to accord in time with the natural appearance of a Germinating, Leafing Spring, a Flowering Summer, a Fruit-bearing Autumn, and a Dormant, naked Winter; we may be pardoned for departing from the customary "quarters" of the year in our calendars, and which lead to deceive, rather than to elucidate the periods of active and of quiescent vegetation.

The concentric circles through which the flexuous line of diurnal mean temperature passes, have therefore been divided and colored according to the usually received divisions, viz., from Solstice to Equinox, 89 days, for Winter; Equinox to Solstice, 93 days for Spring; Solstice to Equinox, 93 days, for Summer; and Equinox to Solstice, 90 days, for Autumn. To make the symmetry and proportions of the seasons as thus distributed, more obvious to the sense, the plate has been colored thus:—the space between the line of the annual mean (42 degrees) and that part of the variable curve of daily temperature which lies *above* it in the scale, is made *red*; this space may be considered as representing the heat of the year. The space betwixt the mean line and the curve of the daily temperature lying *below* it, is colored *blue*, and may be considered as representing the cold of the year. The remainder of the ground of the scale being filled up with four colors appropriate to the seasons; they are thus marked out from each other, like the countries in a map.

To represent the seasons at the Albion Mines, and to distinguish them the more readily from the above divisions, or normal quarters of the year, I have marked the interior of the diagram into four other sections, and their divisions have been made according to the following scales:—the extremes of heat and cold, are each about 30 degrees apart from the mean temperature of 42 deg., or an extreme range of 60 degrees; this, divided into three parts gives 20 degrees of extreme heat for summer 20 degrees of extreme cold for winter, and the intermediate 20 degrees between these extremes for the temperature of spring and autumn. Winter will then begin when the diurnal mean temperature falls below 32 degrees, which takes place on the 27th November, and continues for 120 days, or until it rises again up to the same temperature, which is on the 27th March; Spring will occupy 66 days, or the time that the mean temperature is increasing up to 52 degrees, which takes place on the 1st June; Summer will last for 116 days, or while the temperature keeps above 52 degrees of heat, which is until the 26th September; Autumn will be only 63 days long, or until the 27th November, when the temperature again sinks to 32 degrees, and thus completes the circle.

It remains to be shewn why the temperature, both in its increase and decrease, is always a month behind the Sun. The heat existing from day to day in the portion of our atmosphere next the earth, is at no time the simple product of the direct action of the sun's rays on that portion. It has been found by experiments carefully conducted, and continued for a great length of time, that the direct action of the sun's rays in a calm air, will raise the thermometer an equal number of degrees, whether the time be the Summer or the winter Solstice, whether the temperature be at summer heat or near the freezing point. It is therefore probable that the mass of the air is similarly affected, and that the proportion of heat which it derives from the direct passage of the rays is alike in all seasons. The accumulation of heat near the surface of the earth, which we always experience from continued sunshine, is evidently due to the stoppings of the rays at that surface, to their multiplied reflections and refractions, in consequence of which they are as it were, absorbed and fixed for a time in the soil and in the incumbent atmosphere. By this process the earth, when in a cold state at the end of winter, *becomes gradually heated to a certain depth* as the season advances. On the other hand, when the sun declines in Autumn, the soil thus heated acts as a warm body on the atmosphere, and *gives out again the heat it has received.* Thus, from the mean temperature to the extreme of cold takes 78 days, and the absorption of heat from the extreme of cold to the mean temperature requires 100 days; again, from the mean temperature to the hottest day of summer takes 83 days, and it requires 104 days before the soil gives out again the heat it has absorbed, and cools it down again to the mean temperature.

The thermometer is therefore placed betwixt the sun and a reflector, the earth, and the heat which it indicates is at all times the product of the compound action of the two bodies. Now, if we place a flat screen suddenly before a clear fire, we shall not need a thermometer to learn that at the first moment the screen reflects no heat into the space between them: it requires first to be heated itself—that is to say, the rays which first fall on it are for the most part absorbed, but as soon as heated, it reflects copiously. It is thus with the earth's surface; it is a screen behind the thermometer which absorbs heat during the spring, and gives it out again in autumn. Were it not for this effect on the part of the earth, the heat indicated by the thermometer would probably on a long average (to obviate the remaining irregularities caused by clouds, rain, wind and evaporation) be precisely at its maximum and minimum, at the Solstices, and at the mean at the Equinoxes. For the power of the Sun is proportional to the quantity of parall rays falling on a given area of the earth's surface. This quantity is greatest when they are vertical, and diminishes as they become more oblique, till in a perfectly horizontal position of the rays it is null.

On this principle depends the superiority in heat of noon over morning and evening, of our summer over our winter, and of the tropical over the polar regions. As the Sun advances in north declination, therefore the heat we derive from him increases, actually in proportion to his altitude, but not sensibly, because a part is required to heat the earth, and is lost there by absorption. As he declines southward in the Autumn, the heat we receive actually grows less in proportion, but not sensibly, because we now receive back a certain quantity from the warm earth. And it would appear, that were the earth's surface at a mean temperature, and were the sun rays suddenly and totally interrupted for the time, it would require 44 days to be cooled down about 12 degrees, or the difference between the temperature by the sun and that by the thermometer; and about the same time to be heated to the former temperature on their return.