

A thermometrical table on the scales of Fahrenheit, centigrade and Reamur : comprising the most remarkable phenomena connected with temperature, in relation to climatology, physical geography, chemistry, and physiology / by Alfred S. Taylor.

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Taylor, Alfred Swaine, 1806-1880.
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Publication/Creation

London : T. & R. Willats, 1845.

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THERMOMETRICAL TABLE

ON THE SCALES OF

Fahrenheit, Centigrade, & Reaumur;

COMPRISING THE MOST REMARKABLE PHENOMENA CONNECTED WITH
TEMPERATURE, IN RELATION TO

CLIMATOLOGY, PHYSICAL GEOGRAPHY,
CHEMISTRY, AND PHYSIOLOGY.

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LONDON:

THOMAS & RICHARD WILLATS,
PHILOSOPHICAL INSTRUMENT MAKERS, 98, CHEAPSIDE.

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THERMOMETRICAL TABLE, &c.



THE accompanying Thermometrical Table has been copied from a thermometer in my possession, graduated on the scales of Fahrenheit and Celsius. It has been designed to obviate the necessity for those perplexing calculations, so often rendered necessary by the use of different methods of graduation in England and on the Continent. In most chemical works, we find, besides the rules given for the conversion of the degrees of one scale into those of another, comparative tables, which, however, convey no information beyond the bare fact of the correspondence of certain degrees. In this table, the attempt has been made to make it convey information on numerous interesting points, connected with temperature in relation to Climatology, Physical Geography, Chemistry and Physiology.

There is another advantage which a table of this kind must possess over those hitherto published in works on Chemistry. In the latter, the degrees on one scale only, run in arithmetical progression,

while the corresponding degrees on the other scale, are necessarily given in fractional or decimal parts, and at unequal intervals. Thus, in some of the best works on Chemistry, a comparative table is printed, which is only fitted for the conversion of the Centigrade into Fahrenheit degrees, so that a person wishing to convert the Fahrenheit into Centigrade degrees, would have to revert to one of the old formulæ of conversion. This process must also be adopted whenever the Centigrade degrees are given in decimal parts, for all the tables yet published in English works, wrongly assume that the Centigrade degrees are always given in whole numbers. The present table renders such calculations unnecessary, since the value of any degree, or of any part of a degree on one scale, is immediately found on the other, by looking at the degree in a parallel line with it. The main divisions will, I believe, be found perfectly accurate:—in single degrees a little inequality may be occasionally detected; but I have not found the error to be such as to affect the calculated temperatures. When it is considered that the table has been drawn on stone, and that those artists who are best qualified for the execution of such an arduous work are not always aware of the exact principles intended to be developed, it may be regarded, perhaps, as a matter of surprise, that so great a degree of accuracy has been attained.

Although the Fahrenheit and Centigrade scales are the two which are chiefly used in Europe, it has been thought advisable to carry out the parallel degrees of Réaumur's scale, by dots on the drawing of the tube. This table, therefore, comprises in itself, six distinct tables, assuming the necessity for each scale to be represented in whole degrees,—with the additional advantages: 1st, that the space occupied is smaller, and 2nd, the value of any fractional part of a degree on one, may be at once determined on the other two scales.

It is extraordinary, considering the great advances which have been recently made in physical science, and in the manufacture of philosophical instruments, that the makers of thermometers should still adhere to the old and absurd practice of marking on the Fahrenheit scale, the unmeaning words *Temperate*, *Summer-heat*, *Blood-heat*, *Fever-heat*, *Spirits boil*, &c., when the instrument might be easily made to convey a large amount of information, in respect to climate, as it is dependent on temperature. Thus the mean temperatures of England, Ireland, and Scotland, with the maxima and minima, as well as the mean range of the thermometer throughout the year, might easily find a place on all the common scales. When the length of the scale would admit of such an arrangement, the mean temperatures of the principal cities and towns of Great Britain as

well as of foreign climates, might be attached, with many interesting points in animal and vegetable physiology. The extensive tables on temperature, collected and arranged by Sir James Clark, in his excellent treatise on Climate, would here serve as a useful guide.

It will be seen that the table now for the first time published, ranges from 12° to 374° Fahrenheit, from -11° to $+190^{\circ}$ Centigrade, and from -9° to $+152^{\circ}$ Réaumur. It might have been extended, but this, it was considered, would have rendered it of very inconvenient size: and besides, the range here selected comprises all the most remarkable phenomena connected with heat. The more important facts relating to temperature above and below this range, will be found inserted in distinct paragraphs, on the table, with formulæ for the conversion of the degrees of Centigrade into those of Fahrenheit and *vice versâ*.

It will be only necessary to state generally those facts which the table is intended to illustrate. They will be found arranged opposite to their respective degrees, either on the Centigrade or Fahrenheit side, according to the space afforded. Some points have been necessarily omitted, in order not to render the table confused.

Thus it has been impossible to introduce all the maxima and minima of temperature in respect to

climate, owing to the spaces being already occupied, but a selection has been made of some of the most important of these. The facts connected with temperature, placed on the scale, may be arranged under the heads of Climatology, Physical Geography, Chemistry and Physiology.

CLIMATOLOGY.

1. The *mean temperatures* of the principal countries, towns, and cities in the world, with the maxima and minima, as well as the mean summer and winter temperature of some of the most important localities.
2. The *maximum* degrees of *heat*, and the *minimum* degrees of *cold*, observed on the surface of the globe, including the accumulated temperatures of air, at Edinburgh and Geneva.

PHYSICAL GEOGRAPHY.

1. The *temperature of the atmosphere*, as observed on the summits of the principal mountains of the Old and New World, with the respective elevations attached—at the sea level in various latitudes, from the Arctic to the Antarctic seas, as well as in deep mines and other excavations in Europe and America.
2. The *temperature of the ocean* at the surface, and at various depths to 12,420 feet, including the

temperature of the Polar Seas, of the Mediterranean, Atlantic and Pacific, with the temperature of the Gulf stream.

3. The *temperature* of the waters of *lakes* and *rivers* at various depths, with the respective fathomings attached.
4. The *temperature of the strata of the Earth* at various depths, observed in some of the deepest mines in the Old and New World.
5. The *temperature* of water raised in *Artesian wells* in Europe, from depths varying from 250 to 1794 feet.
6. The *temperature* of the principal *Thermal springs and baths* observed in Europe, Africa, the West Indies and South America.
7. The *temperature* at which *water boils* at all the elevated and inhabited spots in the world, including the summits of the mountains of Switzerland, South America, and Central Asia; the boiling point for all elevations up to 5415 feet, and for 1054 feet depression below the level of the sea.

CHEMISTRY.

1. The evaporating, boiling, fusing, melting, subliming and congealing points of all solids and liquids in chemistry, from 12° to 374° F., from -11° to $+190^{\circ}$ C. and from -9 to $+152^{\circ}$ R., including the boiling points of the saturated

solutions of numerous salts, and the melting points of a large number of alloys.

2. The temperature for fermentation of various kinds, malting, putrefaction, etherification, and other chemical processes.
3. The boiling points of alcohol and acids of various specific gravities, with the respective densities of the vapours.
4. The pressure or elastic force of the vapour of water, alcohol, oil of turpentine, and ether, at various temperatures.
5. The temperatures, with the corresponding pressures required for the liquefaction of the gases.
6. The temperature for the explosion and ignition of fulminating and combustible substances.

PHYSIOLOGY.

1. The maximum degrees of natural and artificial heat, and minimum degrees of cold, borne by man and animals.
2. The temperature of the body in Man, Mammalia, Birds, Reptiles, Fishes, and Insects.
3. The temperature at which hybernation takes place in certain animals.
4. The temperature for the germination of seeds, incubation, the artificial hatching of the ova of birds, fishes and insects.
5. The temperature for the growth of the Sugar

Cane, Date, Indigo, Cotton-tree, and for the cultivation of the Vine.

6. The temperature for warm, tepid and vapour baths; the vapour baths of Russia and Finland.

As the value of a table of this kind, depends less on the compiler than on the observers on whom he relies, I feel bound to state that I am chiefly indebted to the following authorities :—for Climatology and Physical Geography; to Humboldt, Bonpland, Saussure, Boussingault, Rose, Ermann, Baer, Von Wrangell, Breislak, Phipps, Scoresby, Franklin, Parry, Back, Ross, Pachtusoff, Zivolka, Cordier, Gay Lussac, Pouillet, Biot, Arago, Bertrand, Desfontaines, Gerard, Lhotsky, Schomburgk, Davidson, Forbes, Brewster, D'Abbadie, Moore and Beke;—for Chemistry and Physiology; to Berzelius, Dumas, Mitscherlich, Gaultier de Claubry, Peligot, Davy, Faraday, Ure, Brande, Graham, Turner, Dr. Davy and Liebig. In respect to the department of Physical Geography, I am much indebted to the Foreign Correspondence of the Athenæum.

Many of the facts I was enabled to collect or verify by personal observation during a journey through France, Italy, and Switzerland. Some of the chemical phenomena have also been derived from direct experiment. It is very probable that a few of the temperatures, in each department, will be found to differ from those given in some works on

Chemistry; and, on this point, I have one remark to make, namely, that the greatest discrepancies will often be found among respectable authorities in regard to temperature. It is impossible here to enter into the causes of these discrepancies. I have invariably acted on the principle of selecting the best authorities; and where these differed, I have endeavoured to arrive at an approximation to the truth by experiment, or where this was impossible, by seeking for corroborative circumstances. A large number of observations, made by travellers, I have been obliged to reject,—in some instances, owing to the omission or confusion of the + and — signs; and in others, owing to the observers having omitted to state what thermometers they employed. During the researches into which the compilation of this table has led me—occupying as it has done the occasional leisure of four years—my mind has been strongly impressed with the benefits which would accrue to science, if the philosophers of Europe would agree to employ only one scale, with small degrees and so adjusted as to render entirely unnecessary, the use of the + and — signs.

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January 6, 1845.





