From these widely diverse sources of information, it appears that the optimum temperature for the human being is in the neighborhood of 18° C.

NOTE ON DR. GRIFFITH TAYLOR'S CLIMOGRAPH CHARTS.

A note from Dr. Griffith Taylor, of Melbourne, Australia, calls attention to an unintended implication in a sentence in an abstract of a note by Sir Napier Shaw on "Climograph Charts," (MO. WEATHER REV., July, 1919, p. 494), calling attention to use of the essential principle of the climograph by Dr. John Ball before Dr. Taylor's use of it. The sentence referred to which states that this "is a fact that should be noted," was not intended to discredit Dr. Taylor's independent invention of the climograph. In fact, there is no copy of Dr. Ball's article in the Royal Society's or any of the other large libraries in Victoria. Moreover, Dr. Taylor's climograph has wet-bulb temperatures plotted against humidity, which seems to give a better climograph than Dr. Ball's dry-bulb temperatures plotted against humidity.

EFFECT OF HIGH TEMPERATURE, HUMIDITY, AND WIND ON THE HUMAN BODY.[1]

By C. W. B. NORMAND.

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Under climatic conditions such that air temperature is above blood heat the gain of heat to the human body through convection may exceed the maximum cooling power derived from perspiration. As the rate of gain of heat through convection increases with wind velocity, while the rate of perspiring has a definite limit, it follows that, under given conditions of relative humidity, to each air temperature above blood heat there must, theoretically at least, correspond a certain critical value of wind velocity which, if exceeded, will produce a net gain of heat to the body. Under these conditions it is assumed that continued existence becomes impossible. The greater the air temperature the lower this critical wind velocity becomes.

The human body may be regarded as somewhat similar in action to a wet-bulb thermometer, which maintains its temperature by a balance between convection and evaporation. In the paper a curve is worked out by means of the wet-bulb formula, showing the conditions of air temperature and relative humidity under which a wet-bulb thermometer at blood temperature neither gains nor loses heat in a given wind velocity. Under all conditions of temperature and humidity which represent points on the diagram on one side of the curve there will be a net gain of heat, and under conditions representing points on the other side a net loss. The human body can not supply perspiration at more than a certain rate, which is analogous to a wet-bulb thermometer having a definite fixed maximum rate of supply of water. The modification in the above curve introduced by this condition is investigated. By this means the conditions of temperature, relative humidity and wind under which human life is possible are indicated with such accuracy as our present knowledge of the different conditions involved allows. As an example, with temperature at 122° F. and humidity at 8 per cent, life becomes impossible with a wind velocity above 15 meter-seconds. The fatal simoon may be explained by this means.—*J. S. Dines.*

[1] *Roy. Met'l Soc. Quart. Jour.*, Jan., 1920, 46: 1–11; discussion, 12–14.

THE EXTENSION OF KATA-THERMOMETER OBSERVATIONS.

[Reprinted from Meteorological Office Circular, Mar. 1, 1919, pp. 3–4.]

Dr. Leonard Hill, F. R. S., Central Staff Medical Research Committee, the inventor of the kata-thermometer, is anxious for its use to become general. The advantage of this instrument is that the readings show the combined effect of wind, temperature, sunshine, and humidity in a way comparable to the experience of the human body. The kata-thermometer is simply an ordinary thermometer of known dimensions which has to be warmed to 100°, so that the time of cooling from 100° to 95° may be observed. It is suggested that the merits of, say, Skegness and Torquay as health resorts for people of different types could be compared more satisfactorily by kata-thermometer readings than by any other observations. From the official point of view the observations are subject to the defect that the records depend so largely on exposure; in fact, they provide a measure of exposure, formulæ for estimating the speed of the wind in the immediate neighborhood from the comparison of kata-thermometer readings with the air temperature and humidity having been developed. Accordingly in publishing results it would not suffice to indicate Skegness and Torquay as the meteorological stations; the localities, sea front, inclosed garden, or what not would have to be specified. Two or three stations would really be desirable in a single health resort. It may be possible, however, to make suitable arrangements for publication if the observations become general. * * *

It should be mentioned that Dr. Hill is also asking for measurements of the temperature reached by black bodies exposed to the wind as well as to the sun or sky shine. For this purpose he uses a piece of black fur, the temperature of which is ascertained by stroking it with a small-bulbed thermometer until steady readings are obtained.

THE IMPORTANCE OF AIR CONTROL IN HOSPITALS.

The Modern Hospital, for April and May, 1920 (vol. 14, pp. 271–275; 348–353), contains two articles of timely interest by Prof. Ellsworth Huntington, of Yale, dealing with the control of air in hospitals and other public buildings. The first installment treats especially of the purpose of controlling the air, and the second chiefly of the methods employed to control the air and the results that have been attained. One of the outstanding points mentioned by Prof. Huntington is the importance of small variations in the temperature, humidity, and movement of the air, in their effect upon human life.

The most important atmospheric factors are temperature, humidity, purity, movement, and variability. In most ventilating systems, however, the most attention is paid to the question of temperature and that usually to the end of producing constant temperature. The importance of humidity is recognized, also, but it is only a perfunctory recognition and, as a rule, the steps taken to control the humidity are entirely inadequate. Purity is easily controlled, partly because nature is constantly striving to produce pure air, and partly because artificial contamination by dust is easily prevented. Movement and variability are often neglected because they are frequently construed to mean drafts and hence colds. But experiment has proved that, with all other conditions the same, the patient who spends his time where the air can move over him in variable gusts with consequent short-period variations of temperature stands better chance of

recovery than one who is shielded by glass from these irregularities.

The most satisfactory conditions are those in which the mean daily temperature is about 64° F. Night temperatures in hospitals do not, ordinarily, go low enough to give this mean. But were the air properly humidified temperatures as low as 58° would not feel cold. Differences, as mentioned above, as small as 5° F. in the mean temperature may mean a difference of 5 per cent in the hospital death rate, while differences of only 10 per cent in humidity at low temperatures may influence the death rate by from 3 to 5 per cent. The question of variability of temperature has been studied in schools, and it was found that in rooms with the supposedly ideal conditions of constant temperature and ventilation the absences attributable to respiratory diseases is 30 per cent more than those where the windows were occasionally opened. In summing up the first article, Prof. Huntington says that if attention to the correct temperature will reduce the death rate by 5 per cent, humidity by another 5 per cent, purity by 2 per cent, movement and variability 3 per cent (these figures are thought to be conservative) it would be possible to decrease the deaths by 200,000 in the United States each year. But if only one-tenth of this number could be saved, namely, 20,000 lives, it is obvious that the effort expended at air control is well worth while.

How can these ideal conditions be produced artificially? Nearly all the devices for heating and ventilating in use at present are unsatisfactory from the standpoint of one or more of the features mentioned above. In a few public buildings attempts have been made to control temperature and humidity scientifically. An example is the Boston Art Museum, in which these conditions are carefully maintained for the preservation of the art objects. Attention has been given to the question in factories because of the value to materials, but all too little attention has been paid the question in hospitals, even those which are most elaborately equipped.

These facts are a terrible reflection on our civilization. We have found out just what sort of air is needed not only for works of art, but for movie films, silk dresses, woolen coats, and cotton sheets. We make humidifying machines that enable our cigars to be rolled without cracking and our candies smoothly coated with chocolate. Our materialistic civilization spends millions of dollars in perfecting things, mere *things*, many of which are sheer luxuries. Yet when it comes to people, we have had no success as we have had with things. We have tried to produce the right conditions in schools, hospitals, and other buildings, but we have never carried on any such prolonged and patient experiments as have been tried by the makers of cigars and candy. If we should succeed with people as well as we have succeeded with things, the world's health and happiness would be improved incredibly. We can succeed if only we will try. Shall we not, then, enter upon this supremely worth-while effort?

These articles present another of the almost unlimited phases of the application of meteorology to the affairs of life, and from the great influence of small variations of the atmospheric conditions upon health, this field must be recognized at once as being one which can be no longer neglected.—*C. L. M.*