the neck, trunk and extremities: constant vigilance and occasional twitchings of face and legs. Death on the fourteenth day. Autopsy: Much edema of the pia. When the calvarium was removed the brain looked as if covered with a thick layer of wine jelly.

CASE V. Temperature 110°. Temperature fell quickly to 102° under ice-cold packs and sponging. He was then wrapped in blankets and rubbed vigorously. The temperature fell further to 99°, but rose again to 103° in the evening. There were several severe convulsions. There was moderate fever for several days, but no further untoward symptoms.

CASE VI. 110°. Death in four hours. Convulsions.

CASE VII. 111°. Moribund.

CASE VIII. 102°. Ice bath at the station. Convulsions, otherwise quick and uninterrupted recovery.

CASE IX. Temperature 109°. Was left in cold bath until the temperature reached normal. On removal the temperature continued to fall, reaching 98.6°. During the next two weeks the man was very weak, delirious at times, and the temperature normal or subnormal. On August 26th he was unable to walk alone, and the gait was ataxic; the muscles were flabby, knee-jerks present. Through September he was confined to the bed, but gradually recovered his strength and on October 8th he could walk alone.

CASE X. Temperature 109.5°. Was placed in an ice bath and kept there until the temperature reached 102.5°. After removal the temperature fell lower, to 98.6°. During the evening there were convulsions and a secondary rise of temperature to 107°. He was conscious the next morning; and except for a moderate fever for four days no other symptoms developed.

All of the cases were treated by external application of ice-water, some by full baths and others by pouring cold water over the body as they lay on rubber sheets in bed. In all cases the importance of stopping the application of cold by the time the temperature reached in the rectum 102° was fully emphasized. In those cases that I watched personally I felt that the cold baths were much more efficacious when the superficial circulation was stimulated by the alternate use of vigorous friction and wrapping the patients in woolen blankets for short periods. In addition to the application of cold, the patients were stimulated by the subcutaneous use of brandy and sulphate of strychnia. Sulphate of morphia apparently had a beneficial effect in controlling the convulsions.

The clinical phenomena of severe cases of sunstroke all point to a direct and profound disturbance of the nervous system—coma, contracted pupils, convulsions—all symptoms suggesting some direct effect upon the brain as a whole, rather than discrete focal lesions. In Case IV, the boy, the clinical symptoms strongly suggested some pathological process in the meninges, and the autopsy confirmed the clinical diagnosis, showing that the disturbing factor was an extensive edema of the pia.

Two main theories may be advanced in explanation of the nervous phenomena which follow severe sunstroke; they may be the direct result of pathological changes produced in the brain and meninges, or they may be dependent upon the poisonous action of some toxine set free in the body as the result of the disturbance of the heat equilibrium. I have been unable to find many reports of the post-mortem appearances found after sunstroke, but such as I have found suggest that we may find sufficient cause for the clinical symptoms in the lesions of the brain and meninges.

ONE CASE OF CONTINUED FEVER.

Woman, age twenty-four. Entered my wards August 26th. No items of importance in her family or previous history. On one of the hottest days of the hot period she went in bathing at South Boston Point and stayed four hours in the water. Her head was not protected, and she says she did not wet her hair. Severe headache followed. Five days later a doctor was called who found her temperature 103.8°. She became delirious; had severe headache and backache; pupils regular and small. The pulse was occasionally irregular. The temperature continued, but gradually fell, reaching almost the normal point when she entered the hospital. She entered the hospital, as she was much annoyed by any noise. Typhoid fever was considered, also meningitis, which was suggested by the intense headache and the focal signs in the pupils.

I found the following condition: Herpetic eruption on the lips (rarely if ever seen in typhoid). No enlargement of the spleen. Abdomen negative. Urine negative. She had much headache and seemed weak. After entrance to the hospital there was no fever, and she gradually improved without the occurrence of unfavorable symptoms.

Before she entered the hospital she had symptoms evidently pointing to meningitis, according to the account given me by the doctor who saw her in consultation. I believe that those symptoms were the result of lesions produced by sunstroke.

THE TEACHING OF CLIMATOLOGY IN MEDICAL SCHOOLS.

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THE time has come when climatology should be generally taught in our medical schools. It is a subject of great importance to medical men, and one about which they should all have some rational information. In the hope of arousing the interest of the medical profession and perhaps also of provoking further discussion of the subject, the present paper is herewith presented.

The intimate relations existing between atmospheric conditions and health have been the theme of comment and investigation from the days of the earliest writings on medicine and on meteorology down to the present time. From the statement made by Hippocrates over two thousand years ago, that "Whoever wishes to study the healing art properly must do this—first, he must attentively consider the seasons of the year," down to the most recent articles in the last numbers of our medical journals, there will be found abundant proof that medical men have been and are fully alive to the important influences which climatic conditions have on disease. The last few years, especially, have witnessed a remarkable increase of interest in this meteorologic or climatic side of medicine, both on the part of medical men themselves and on the part of meteorologists also. The present activity along these lines seems to be largely, if not wholly, due to the fact that meteorology is itself so young a science that it has not been able, until recently, to offer as its contribution to medical or sanitary climatology anything like systematic and reliable

climatic data from different parts of the world. Medicine, on the other hand, has been so busy with its own new discoveries, that it has not had the time to collect these data for its own use.

The remarkable development during the past few years of our knowledge of the bacterial origin of many diseases, has emphasized more than ever before these close relations between medicine and atmospheric conditions. We now know that the development and preservation of pathogenic bacteria depends to a considerable degree on weather conditions, and we know also that the status of our own bodies, which makes us liable to, or immune from, the attacks of these micro-organisms, depends likewise largely on these same conditions. We know that it is not altogether chance which determines the prevalence of one disease in winter and another in summer; which limits some diseases to one zone and some to another; which induces more or less severe outbreaks according to the character of the season.

It has been too much the custom among physicians—and no one seems more willing to acknowledge this than themselves—to send patients away from home to a different climate in the hope that the change might prove beneficial, when they themselves knew but little concerning the new climate except perhaps that, as a whole, it was drier or warmer than the old one. It certainly cannot be said with justice that such physicians have been to blame in the past when, acting on the best information obtainable, they have conscientiously recommended a new climate to a patient, when it may afterwards have proved that this change was the most disastrous thing that could have been suggested. Such mistakes have been inevitable in the past, for physicians had no means of securing the necessary information, and, furthermore, in many cases they really did not know how many meteorological data are necessary in order that a complete understanding of any climate may be had. The knowledge which not a few physicians have regarding the effect of climate on disease does not go much beyond a realization of the influence of a dry or a moist climate on various stages of phthisis. It cannot be too strongly emphasized that climate has important relations to many other diseases, such as cholera, influenza, yellow fever, paludal and nervous diseases, etc. In the case of convalescence from sickness it often becomes necessary to recommend a change of climate, and every climate is not equally beneficial in every case.

There would be no occasion for writing the present paper were there not some suggestions to offer that point to a way out of the present difficulties. The rapid advance of climatology during recent years, an advance made possible by the extension of meteorological observations to places not previously provided with instruments, has put the climatologist in a position to furnish medical men with reliable and more or less complete meteorological data from nearly all parts of the civilized world. A more careful and systematic study of climate in its relation to health and disease is therefore more possible to-day than ever before. The physician needs two things in order that he may know the effect of climate in causing and curing disease. He must be in possession of accurate data as to the various climatic elements of any place. And he must know what physiological effects these different elements have on the human body. The

information needed under the first head the well-equipped climatologist is ready to furnish. There is no longer any reason on this score for delaying the teaching of climatology in our medical schools.

With a view to ascertaining the feeling of the faculties of our medical schools and colleges on this matter, and also in order to see just how much climatological instruction is now being given in these institutions, the writer sent out, on November 16th last, a circular letter, addressed to the deans or secretaries of a considerable number of our leading institutions of this class all over the United States. In this letter the following questions were asked:

A. What instruction, if any, in meteorology and climatology is now being given in the institution under your charge? (In answer to this question I should be glad to have information as to the number of hours occupied in such instruction; the year of the medical course in which it is given; a general outline of the course or courses, and the name of the instructor.)

B. If no such instruction is now being given, do you consider such course or courses desirable and practicable in your institution?

C. In what portion of the medical course should this instruction come? And how many hours a week, or a term, should be given to it?

D. If considered impracticable to have such instruction given as a part of the regular medical course, would it be advisable to have it given during the regular college, or later school years?

The results accomplished by this letter have been most satisfactory, and the writer is much indebted to the gentlemen who have so cordially answered his inquiries and have shown such interest in the scheme. As was confidently expected, the general sentiment of the majority of those from whom replies were received is decidedly in sympathy with the suggestion that climatology should be taught in our medical schools, and, as was also anticipated, there is a considerable feeling against adding any additional burdens in the way of new studies to the already overburdened medical course. As regards the present teaching of meteorology and climatology in these institutions, very little is done in the great majority of cases. A few lectures on these subjects are given in some of the schools, in connection with the work in hygiene, therapeutics, practice or bacteriology, but, with very rare exceptions, no special course in climatology seems to be provided.

We come now to the question, What should the instruction in climatology provided for our medical students include? The first answer naturally is, As much of the subject as possible. It would be well if every medical man could spare the time to master some such book as Davis's "Elementary Meteorology" (Ginn & Co., Boston, 1894), at once the most concise and the most scientific of the newer text-books of meteorology, and, if he could add to that a general knowledge of Haann's "Klimatologie" (Stuttgart, 1883), a veritable store-house of information on climatic matters. It is certainly not to be expected that any such extended course as is embraced by these two books will be introduced into our medical schools at present. In view of the great diversities in the arrangement of the medical courses in our different schools, and of the greater or less opportunities of introducing a course in climatology into the medical curriculum, it is not thought possible or even necessary, to present here anything like a definite outline of such a course.

The writer ventures, however, to suggest a very brief summary of what he believes a general course in climatology might well include in order to be most useful to medical men.

The main object in the work should be to teach the student what climate really is — how many factors are concerned in it; what its controlling influences are; why, for example, the winter climate of the southern coast of California is so unlike that of the southeastern Atlantic-coast States, or why Cape Town has different climatic conditions from those of Montevideo; what data must be at hand if an accurate knowledge of any climate is to be had. The common impression among all classes is that climate is a simple thing; that if the mean annual temperature and rainfall are known, and a little something as to the humidity, that is all that is necessary. Nothing could be further from the truth than this.

Climatology proper cannot be understood without an elementary knowledge of meteorology. The general facts as to the composition of the atmosphere and its physical properties should be made the starting-point; and in order that a proper appreciation of the value and meaning of climatic data may be gained, every one should become familiar with the construction and use of the ordinary meteorological instruments. These include the wet and dry bulb and maximum and minimum thermometers; the aneroid and mercurial barometers; the self-recording barometer or barograph, the rain gauge, the anemometer, the sunshine recorder, etc. Actual use of these instruments, the determination of the dew-point, relative and absolute humidity, the reduction of the barometer readings to sea-level, the determination of mean temperatures, pressures, and similar reductions, will be found to give a training in practical meteorological work that will prove of great value. This "laboratory work" is of great importance and should not be omitted.

The broad facts as to temperature, pressure and wind distribution over the earth's surface can be learned from the isothermal and isobaric charts in the text-book, and a study of these should precede any more detailed work that may be done later on special climates. In a short course, adapted to the use of medical students, no careful study of the general circulation of the atmosphere need be attempted, but the control of the general wind system of the globe over rainfall, with the important climatic results thus brought about, need special emphasis. Owing to the importance of atmospheric humidity from a medical standpoint, more attention might well be given to that subject than to most others, but perhaps the most important part of the whole study concerns the control of our weather by cyclones and anti-cyclones. A careful study of the daily weather maps, from day to day, supplemented by the text-book, will very soon impress upon the mind of the student the chief facts in our ordinary weather changes. Without such knowledge our weather and its changes from hot to cold, and wet to dry, mean nothing. With this understanding, we are far better fitted to appreciate the climates of other places.

For this preliminary work, thus very briefly outlined, perhaps ten lectures would suffice. The laboratory work with the instruments and on the weather maps, should run parallel with the lectures. The best text-book, as already stated, is that of Professor Davis, and the "Instructions to Volunteer Observers," issued by

the United States Weather Bureau (obtainable on application to the Chief of the Weather Bureau, Washington, D. C.), will be found useful in the instrumental work. It would, of course, be very desirable to have every medical student complete a full course in elementary meteorology, together with laboratory work, before going on to the further study of climatology, but that is hardly possible owing to the time which such a course would occupy.¹

After some preliminary training in meteorology, there should follow a course in climatology proper, of which the following may serve as a rough outline: The astronomical relations of earth and sun; the changes of the seasons; the control of our temperatures by the sun; climatic factors (temperature, humidity, rainfall, cloudiness, wind pressure, composition of the atmosphere), and the data which should be given for each factor — as, for example, in the case of temperature: (a) mean annual, (b) mean monthly, (c) mean annual range, (d) mean monthly range, (e) mean diurnal range for the several months, (f) absolute and mean annual extremes, (g) absolute and mean monthly extremes, (h) mean diurnal variability, (i) average dates of first and last frost, (j) average number of days without frost, etc.; controls of climate (latitude, altitude, distribution and influence of land and water, ocean currents, proximity of mountain ranges, rainfall, prevailing winds, soil, vegetation); the climatic zones and their general characteristics; the physiological effects of temperature, humidity, pressure; the distribution of disease geographically and climatically; acclimatization.²

In this part of the work the most useful reference books are Hann's "Klimatologie," a new edition of which is promised shortly, and van Bebber's "Hygienische Meteorologie" (Stuttgart, 1895), a short and concise volume specially adapted to the use of medical men. Hann's work is divided into two parts, of which the first treats chiefly of the controls of climate and the climatic elements, and the second concerns the climates of the different parts of the world. Van Bebber's book considers the composition of the atmosphere and the climatic elements in their physiological aspects, and discusses the relations of the climatic zones to health and disease. Hirsch's well-known "Historical and General Pathology" will be found useful in treating of the geographical and climatic distribution of disease. With the assistance of the books already mentioned, any teacher may prepare a general course in climatology. In them will be found the essentials, and the course may be made longer or shorter as occasion requires.

A medical man ought to know how to interpret climatic tables. He should understand thoroughly what data he needs, and he should be able to supply any missing data from his own observations, if necessary. There are many facts in regard to a new climate that should be known before delicate patients are sent there for their health. It is not enough to know the mean annual rainfall. This should be supplemented by data as to the monthly rainfalls; the probability of rainy days in every month; the kind of precipitation (whether general rains, lasting for some

¹ In Harvard University the course in elementary meteorology (Geology I) is a half course, and includes about forty lectures, besides laboratory work occupying one to three hours a week for about fifteen weeks.

² In Harvard University the course in general climatology (Geology 19) is a half-course, and includes three lectures a week for about fifteen weeks.

hours at a time, or thunderstorms, giving a heavy precipitation in an hour). A very useful addition is separate rainfall records for night and day, so that it may be known whether the patient will be able to be out during the day and enjoy the sunshine, or whether the general occurrence of the rain by day will keep him indoors most of the time. This point has been brought out by a recent writer in the *Lancet*. So, also, it is well to be informed regarding the prevalence of fog, and regarding its character, whether it is a sea fog, or a land fog; whether it is a general one, or is found only in the valley bottoms at night. Important temperature data, not generally considered by medical men, are the absolute extremes of heat and cold likely to be met with, and the average change of temperature from day to day (mean diurnal variability). The diurnal distribution of cloudiness is an important factor. Whether the cloudiness is greater in the morning, afternoon or night may be of great consequence in some cases, for if the morning and early afternoon are most cloudy and the night clear, some delicate patients might be obliged to stay indoors all day, and might not be benefited at all by the change in climate.

Such instances might be multiplied almost indefinitely. It may be asked at once, Are such complete climatic data available for most places? They certainly are not yet; but the remedy for this state of things lies in the hands of the physicians, for as soon as there is a general demand for additional data, such data will be forthcoming. Our Weather Bureau has always shown itself willing to meet the demands of the people in every possible way. Its recent active interest in the sanitary aspect of climatology is the best possible proof of this. As far as the United States is concerned, our Weather Bureau can be relied upon to furnish physicians with all information of which it is itself possessed, and to take steps to acquire any desired information which it has not.

It can hardly be expected that a brief course, such as is possible in our medical schools, will fully equip the student in climatology. At best it can only partially equip him. But it can at least give him access to the literature that may help him should occasion require; and this, if it accomplishes nothing else, is sufficient warrant for giving such a course. At present comparatively few medical men know where to go for such information. Some of the most important books have already been mentioned. In addition, the following will be found useful:

"Meteorology, Practical and Applied," by J. W. Moore. London: Rebman, 1894. 8vo, pp. 445. A readable book, written by a physician, and containing chapters on "Acute Infective Diseases" and on "The Seasonal Prevalence of Pneumonic Fever."

"Elementary Meteorology," by R. H. Scott. International Scientific Series, 1889. 8vo, pp. 410. This is one of the standard text-books.

"American Weather," by A. W. Greely. New York: Dodd, Mead & Co. No date. 8vo, pp. 286. This volume deals chiefly, as its name implies, with American meteorology, and is especially useful if general climatic information is sought concerning the United States.

"Die Klimate der Erde," by A. Woeikof. Jena: Costenoble, 1887. 8vo, pp. 396, 422. This is in two parts, the first treating of general climatology, and the second of the special climates.

More or less information as to climate is, of course, to be found in the books on hygiene, and medical men do not need to be reminded that in the "Index Medicus" will be found many references to articles on various subjects connected with medical climatology. Most of these articles are on the relation of special climates to special diseases, or concern the physiological effects of some one element, such, for example, as diminished pressure, and do not treat of the general aspect of the study.

A very complete bibliography on acclimatization will be found at the end of the admirable paper under that title, by Prof. Wm. Z. Ripley, in *Appleton's Popular Science Monthly* for March and April, 1896.

In seeking definite information as to the climate of any part of our own country, or any other, it is always best to write to the chief office of the Weather Service for the desired data, rather than to trust chance reports on local climates, unless such reports are issued by physicians or associations of recognized standing. So many circulars containing climatic statistics have been published for advertising purposes that great care is necessary in making a proper selection.

As already stated, it is impossible to lay out any definite course which might answer for every institution. There seems to be a pretty decided majority of the deans of our medical schools in favor of having some instruction in climatology given in their institutions. As to how such instruction should be given, is the question; whether as a part of the regular course, or as a voluntary subject. In the opinion of the writer it would be best at the outset, in most cases, to have the course a short one, at which attendance would be voluntary. Then, if the students showed a disposition to take the course it might easily be extended. He believes further that the subject is of sufficient importance to stand by itself, independent of any other. It would certainly be well for any instructor who wished to do so to speak of the effects of climate in any lectures on hygiene, or therapeutics, or bacteriology. Each man would probably wish to treat the subject differently from any other instructor, because he would see it especially in its relations to his own branch of medicine. But the broad general facts as to climate, which can be and ought to be taught independently of their bearing on any special diseases, should be considered in a separate course. Whether that course shall come in the first, or second, or third, or fourth year; whether it shall be voluntary or required; whether long or short, must be settled in each institution for itself. That the subject is one of prime importance in the education of a medical man none will deny. And that it should be generally taught in our medical schools is acknowledged on all sides.

SMOKING AT MEDICAL MEETINGS.—The Physiological Society of London, we learn from the *British Medical Journal*, has been the only learned society in that city which has allowed its members to smoke at its meetings. The Council of the Harveian Society has lately proposed that smoking be permitted at the meetings, except those at which the presence of patients is required. The object is apparently to increase the attendance at the meetings. Whether the society will approve the proposal or not remains to be seen.