The climate of Egypt and North Africa and its influence on disease by H.E. Leigh Canney, reprinted from the Proceedings of the Royal Society of Medicine, May 1910

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The Climate of Egypt and North Africa and its Influence on Disease

BY

H. E. LEIGH CANNEY, M.D.

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London

JOHN BALE, SONS & DANIELSSON, LTD.

OXFORD HOUSE

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W.

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1910

The Climate of Egypt and North Africa and its Influence on Disease.

By H. E. Leigh Canney, M.D.

Some years ago I was asked to read before the Fellows of this Society a paper on "The Climate of Egypt in Relation to Disease," and at that time I was unable to comply. Last year, however, I informed the Society that if it was still thought by the Council that a paper on this subject would interest the Fellows of the Society, I should be ready to accept the honour thus conferred upon me by the original request, and communicate a paper on certain aspects of the influence of desert climate on disease. I was influenced in this decision by the consideration that, possibly, the experience gained during some sixteen years' practice amongst invalids sent to Upper Egypt, and especially to Assouan, the furthest southern health resort of North Africa, might be of interest to the Fellows of the Society who, owing to their own pressure of work and the difficulties of time and space, might find a study *in situ* of the influence of the climate of the desert difficult of attainment, and yet of interest owing to the increasing number of invalids seeking benefit from the deserts of Africa in winter.

After observing for some years the varied success or failure attending examples of the various pathological conditions advised to winter in Africa, I have become convinced of the importance of the realization, both by doctor and patient, of certain features of desert climates presenting some difficulty and requiring suitable modifications of custom pursued elsewhere if the best results are to be obtained or even danger to be avoided.

I will first ask you to allow me to draw your attention to the general features of the climate of the desert and the varying modifications presented at the principal health resorts of Egypt and North Africa, and then I will ask you to consider the action of these features on the physiological and pathological processes of certain diseases deriving special benefit from the climate. I shall endeavour to limit the figures in the statistics given to those necessary to a broad view of the climatic features of these desert resorts. These figures are the result of a research extending over several years conducted by myself and several colleagues at different stations in Egypt by self-recording instruments under exactly comparable conditions. Those desiring a more complete account of this subject will find the same in a work entitled "The Meteorology of Egypt and its Influence on Disease," which was published in 1897. The chief features of the climate of the desert are warmth, extreme dryness (both as regards absolute and relative humidity), extreme purity of the air, freedom from all organic life, and marked diathermancy. The winter climate is marked by great regularity, there being very few violent changes, although the range of the curve from the heat of the day to the cool of the evening is considerable. This daily oscillation is greater at such stations as Assouan and Luxor, owing to their greater dryness, than at Cairo, Mena House, or Helouan, and adds a sense of exhilaration to the climate. Desert air, on account of its great dryness, imparts a sensation of elasticity and freshness, persisting even during the warm hours of the day, which is quite remarkable, and most noticeable at the driest resorts, and towards the centre of the desert, as in Upper Egypt. As the borders of the Sahara are reached towards the north, west and south, so the dryness, buoyancy, and diathermancy diminish, the sky becoming more cloudy and less blue.

The great dominating feature of North Africa is the Sahara Desert, the direct result of the climate, stretching from the south of Algiers away to the east until it reaches the Red Sea. It is across this desert that the Nile is alone able to reach the Mediterranean Sea, carrying its annual deposit of Abyssinian mud to form Egypt or that part of the Sahara, eight or ten miles wide except the Delta, that this river is able to water. Neither the sun nor the soil is the cause of the desert, but the climate alone. The important factor modifying desert air is the presence of water capable of being taken up into the atmosphere by rapid evaporation owing to the extreme dryness. Water being an essential to life, we naturally find the health resorts of Egypt and North

Africa situated within its vicinity, and therefore more or less modified by it. It is observable that the later established resorts have taken some advantage of this factor, and placed their hotels more or less remote from the influence of cultivation or evaporation, and the ultimate success or failure of any resort will depend upon the ability with which this localization of its hotels, as regards the vicinity of gardens, water, &c., taken into relation with the prevailing wind, has been considered.

In North Africa we have one group of resorts, including Tangier, Morocco, Algiers, Hammam R'Irha, Tunis, Tripoli and Alexandria, all situated on the north fringe of the great Sahara. These resorts are mainly under the influence of the Mediterranean or Atlantic, and but slightly under that of the desert. Though in Africa, they are found to have a marine climate, mild, bracing, and tonic in winter, with a low maximum temperature and only half the daily range of the desert resorts. If we consider Algiers, its climate closely resembles that of Malaga, Sicily, and Southern Greece, all situated in the same latitude, rather than that of the desert, the description of the "Torquay" of Africa being quite appropriate. From December to March the weather is that of an English autumn with twice the sunshine and rain. The relative humidity is the same as Alexandria, though it has a rainfall of 31 in. to Alexandria's 8 in. It is much colder than the Egyptian health resorts, but warmer, less dry and less exciting than the Riviera.

Let us now consider another group of health resorts, all but one—Biskra—being situated in the Nile Valley, and so practically possessing the desert climate, though in every case we find this modified by the presence of moisture to a greater or less degree either from the presence of the river or cultivation in the vicinity. These resorts include Biskra, Mena House, Helouan, Luxor, and Assouan. By continuous records, as I have shown elsewhere, the influence of cultivation or river is exhibited in three modifications of the purely desert air: (1) The absolute and relative humidity is increased; (2) the temperature towards sunset and the hours following is rapidly lowered; (3) a far lower minimum temperature is reached than in the adjacent desert at the same hour, 20° lower being attained, although only a mile may separate the two stations. The precision with which this influence of cultivation or river can be traced enables us to divide the climates of these resorts into two classes :—

(a) "Egyptian," or desert climate, largely influenced by cultivation.

(b) "Saharan," or desert climate, very little influenced by cultivation.

The dryness of the Egyptian resorts is the great factor of importance

in treatment, and therefore it is important to see how these stations stand relatively. On the one hand we have Cairo, at the apex of the cultivated Delta, and Biskra, in the midst of a large oasis, both exhibiting the "Egyptian" type, and Assouan, the driest of the existing health resorts, presenting the most striking example of the "Saharan" type. Intermediate between these we have Mena House, but slightly drier than Cairo, and Helouan and Luxor approaching the Assouan type. Apart from the Egyptian resorts, Biskra is the only resort in North Africa presenting desert conditions. It is the southern resort of Algiers, on the northern fringe of the Sahara, yet not far enough inland to escape the influence of the Mediterranean, having a rainfall closely resembling that of Alexandria (about 6 in. to 8 in.). Although 200 miles south of Algiers, it is still in a latitude 4° north of Alexandria, and therefore some hundreds of miles further north than Cairo. It presents a climate closely resembling Mena House, but colder in the winter months. It is colder by 3° F. than Algiers, 7° F. than Helouan, and 10° F. than Luxor, and therefore far less advantageous for the treatment of the diseases commonly sent to Egypt. It is less dry than the Egyptian resorts, the relative humidity being 60.

The two factors of importance in the Egyptian desert climate are (1) the dryness, (2) the warmth.

The dryness must be considered *(a)* from the point of view of the *absolute humidity*, or total moisture, in a given quantity of air. It is this factor which is of importance in respiratory conditions, for it is obvious that a given volume of air possessing very little moisture, when inspired and raised to the body temperature, will be able to take up from the lungs a larger quantity of moisture than one less dry. The accompanying chart (A) represents this drying power of the inspired air at the different stations. The inspired air of the High Alps in winter is able to take up 15 gr. or 16 gr. per 10 cubic ft. more moisture than that of Assouan, the driest of the desert resorts, but the advantages possessed by Egypt are:—

(1) The amount of water required to be excreted by the lungs and kidneys is far less than in the Alps in winter, owing to the highly increased excretory action of the skin.

(2) The relative humidity being very low, the chance of rain, or clouds, is remote, hence the steady conditions of the Egyptian climate offer no interruption to a continuous outdoor life, and far longer hours during which sitting out is possible. Thus a patient with chronic asthma, and somewhat embarrassed heart, requiring sedatives elsewhere

two or three times during the night, was able this winter to spend four or five hours daily in the desert on a donkey for four months, with the exception of one day only.

If we now consider the desert climate from the point of view of the *relative humidity*, we observe we are dealing with such low relative humidities (Chart B) that the possibility of rain or dew, mist or cloud,

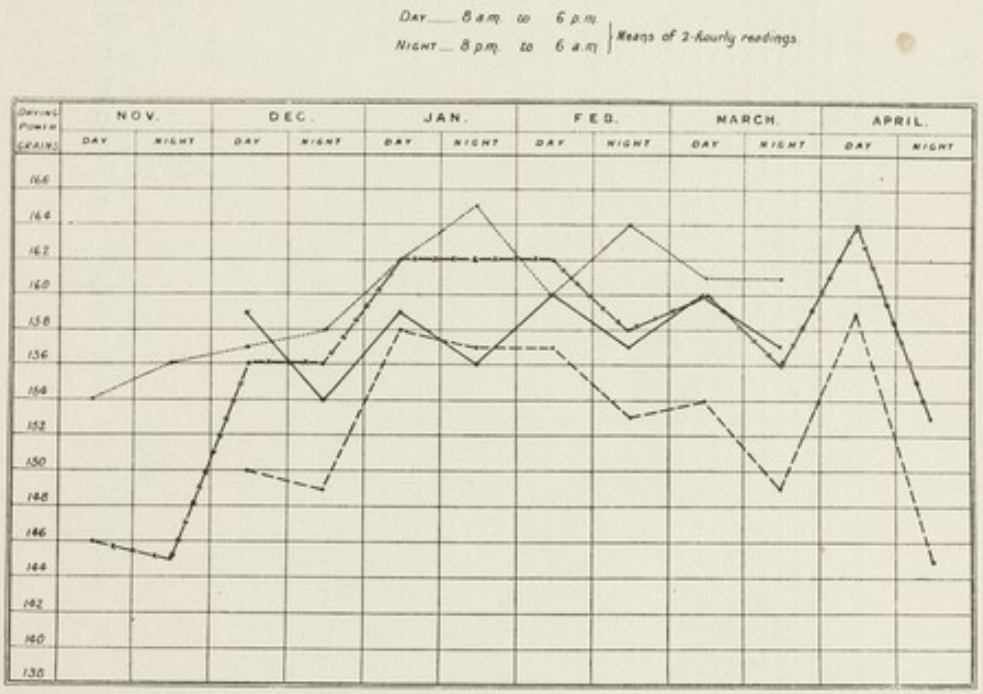


CHART A.

Drying power of the air at the temperature of the body.

becomes, at the driest stations, such as Assouan, very remote. The accompanying chart (C) shows the drying capacity of the air at the different stations. The lower the relative humidity the greater the amount of moisture, and the quicker the rate at which it is vaporized

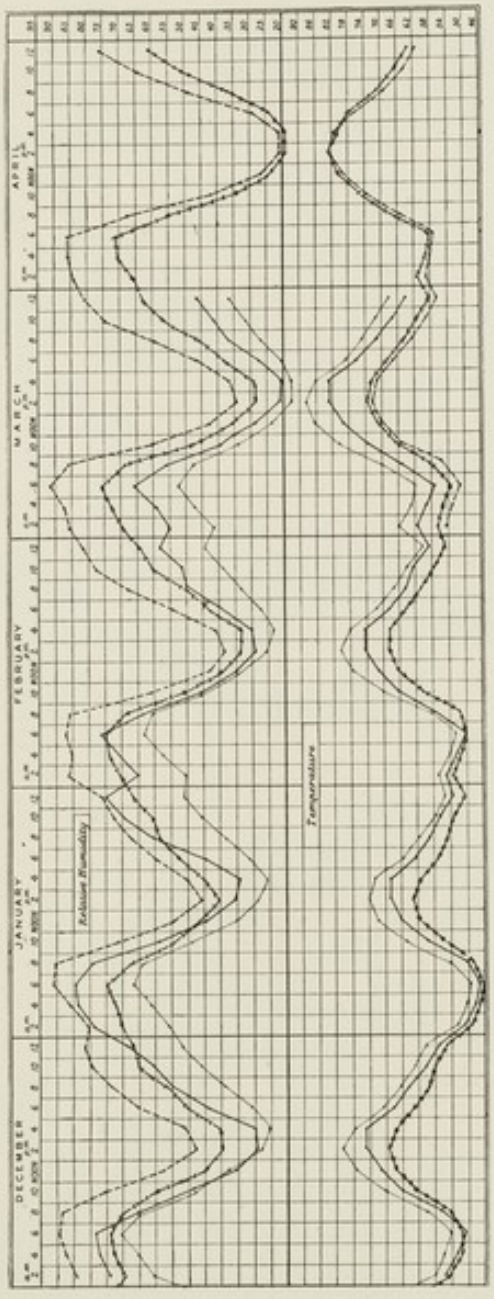
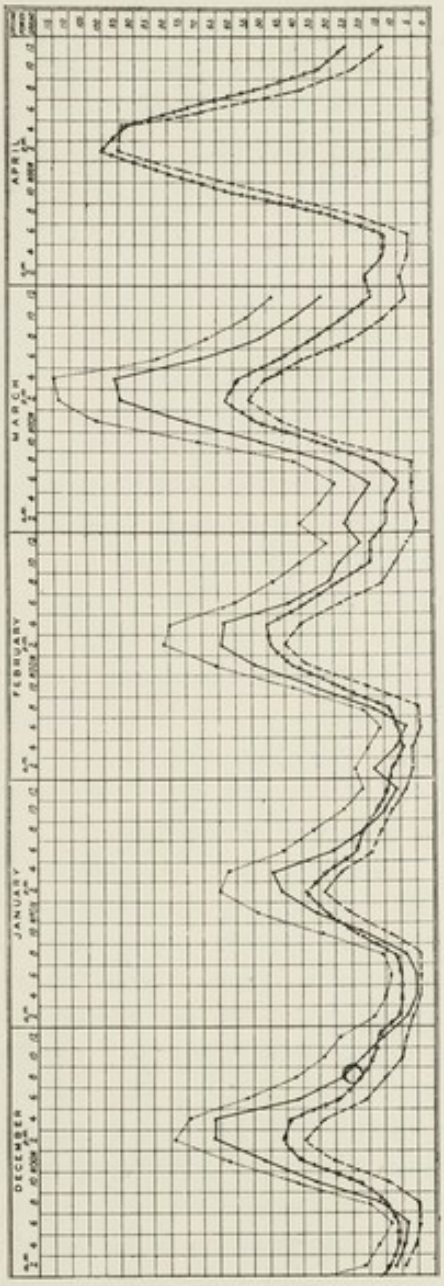


CHART B.

Temperature and relative humidity at Helouan, Mena House, Luxor, and Assouan December, 1895, to April, 1896.



(The drying power is represented in grains per 10 cubic feet of air.)

Mena House.....

Heleuan.....

Luxor _____

Assouan.....

CHART C.

Drying power of the air at the temperature of the air.

from the skin. The greater this drying power of the air, as expressed by low relative humidities, the greater the sense of exhilaration. If the drying power is reduced, owing to the presence of less dry winds or the moisture from local irrigation, tissue change is reduced and the body has difficulty in getting rid of heat as it is produced, and a sensation of depression results with marked lassitude. Hence, the tonic effect of low relative humidity must not be overlooked.

The other great factor of importance in the desert climate is the warmth. The significance of this factor is seen when we consider that the vital processes are so largely concerned with the production or removal of heat. If the temperature of the air is raised, loss of heat conduction and radiation from the body is diminished, the vessels of the skin dilate and sweat is increased, the internal organs receive less blood, tissue change is far less active, urea elimination is diminished. Mainly, however, when the increased temperature of the air passes the critical temperature (or point at which the lowest amount of tissue change takes place with effective working of the body), the body protects itself, not by less production of heat, but by arranging for greater loss by evaporation, radiation and conduction, and it will be seen later how these processes affect certain conditions.

It is well known that heat and cold, if alternated, have a greater influence on tissue change and, therefore, a more stimulating action on the body, than either if continued without change. This point must not be lost sight of in considering the exhilarating effects produced by the wide range of temperature, often 20° F. to nearly 30° F., found in the regular daily curve of desert climates. One of the effects of a warm or hot climate is the increase, probably temporary only, in the vital capacity of the lungs, and Rattray attributed this to the diminished amount of blood found in the lungs, in the Tropics. On the circulation, the effect of warm, dry climate is to dilate the peripheral circulation; this diminishes the arterial tension generally, and the pulse is somewhat quickened. On the skin the effect of a hot climate is greatly to increase the amount of perspiration, but in the desert the low relative humidity allows this increased perspiration to be taken up so rapidly (in Upper Egypt ten times as quickly as in England on a dry summer's day) that unless exercise is energetic the skin remains apparently dry. It is this power of the climate, by rapid evaporation to rapidly cool the body, which requires special attention. In the urinary system the flow of water from the kidneys is greatly diminished, as well as urea and other solids to some extent, and in certain conditions, notably gouty affections, this must be compensated for by suitable intake of extra fluid.

Some of the broad effects strikingly observable in various pathological conditions may here be noted. Firstly, owing to the dryness and warmth of the air, the rate at which fluid is removed from the lungs and skin permits of a very high state of oxygenation, far beyond what is possible in colder and damper climates. A superficial observation of a number of visitors, or invalids, a week or two after their return to the more humid Cairo, will at once detect a loss of that hæmoglobin oxygen-carrying power which was so noticeable a feature in the desert climates of Upper Egypt. In the pathological states where cyanosis is a feature we at once detect great improvement in the dry and warm desert air. Very marked is the change in the asthmatic, in the man with portal obstruction and cyanotic venules, the embarrassed right side of the heart, in the cold, damp and blue hand of rheumatoid arthritis. Doubtless, every organ feels the effect of this heightened vitality; dyspepsia is no longer heard of, and in the long and indecisive struggle between toxin or micro-organism and badly-nourished cell a decisive factor is added.

The intensity of sunlight in the driest desert climates must not be overlooked as a factor, when it is remembered that animals absorb more oxygen and give out more carbonic acid under its influence.

As regards temperature, it is generally supposed the conditions are much the same at most of the health resorts of North Africa—viz., a generally prevailing warmth. This is an error (Chart B). I have shown how much colder Biskra and Algiers are than the Egyptian resorts; and in Egypt we have the relatively cold winter months of Cairo, and the neighbouring resorts Mena House and Helouan, and the genial warmth of Luxor and Assouan in Upper Egypt. The mean minima temperatures are much the same for all stations, but the mean maxima vary widely, and it is these latter which are the best index of the length of day possible to be spent in the open with advantage. This is of great importance in cases requiring sufficient warmth to insure the action of the skin, as in Bright's disease, gouty affections, bronchitis, rheumatoid arthritis, asthma, &c., and neglect to take this point into consideration in the choice of a resort for such cases would not meet with the best success. In considering the higher temperatures, owing to the dryness of the air, at least 10° F. in Cairo and 15° F. in Upper Egypt must be added before a similar feeling of warmth is experienced to that afforded by a given temperature in Northern Europe—thus, 80° F. or 85° F. at Luxor or Assouan is pleasant and refreshing, whereas 65° F. to 70° F. would be felt cold, especially if wind were present. A maximum of 85° F. and a minimum of 52° F. gives the most desirable day in Upper

Egypt, and for the most part the winter months (Chart B) are rather too cold by day and certainly by night, but during the months of November and March in Upper Egypt, and April at Helouan or Mena House, the temperatures may be considered almost ideal.

There are four principal health resorts in Egypt: two in the north near Cairo—Mena House and Helouan—and two in the south—Luxor and Assouan. They are all well arranged, and at all English physicians of experience will be found. All outdoor games are available, and much time is spent in the desert, riding donkeys, camels, or horses.

Mena House is eight miles west of Cairo, near the Great Pyramid, on the edge of the desert, and only a few feet above the cultivated land separating it from Cairo. The air is drier, purer, and fresher than Cairo, where, of course, no invalids should stay, the conditions being totally unsuitable. The season here, as at Helouan, is from November 1 to the end of April, the first and the last months being of great value, the months of December, January, and February being too cold for many cases above referred to.

Helouan is in the desert on the east side of the river, fifteen miles south of Cairo, two miles from the cultivated land, and 115 ft. above the same. Helouan is a well-appointed resort for those who wish to be near Cairo and yet have a pure desert air only moderately influenced by the cultivation of the delta and by the river. There are important natural sulphur waters, and baths have recently been erected on an elaborate plan. The thermal waters consist of sulphur, saline, and chalybeate springs, and are of considerable value in cases of gout, lithæmia, bronchial and pharyngeal catarrh, rheumatoid arthritis, sciatica, stiff joints, engorgement of the liver and other viscera. The climate resembles Mena, but the relative humidity at night is more favourable to Helouan. It is drier somewhat than Mena, nearly as dry as Luxor, but much less dry than Assouan.

Luxor is of great antiquarian interest, and is 418 miles from Cairo by rail, in the midst of a cultivated plain three or four miles wide on either side of the river. It has long been known as a health resort and is more equable in its climate than Northern Egypt. The winter mean maximum temperature for four months is 6° F. to 7° F. higher than the resorts near Cairo, and this extra warmth is of great value to most cases. The relative humidity is 52·2 (average of two-hourly readings, December to March).

Assouan is at the foot of the First Cataract of the Nile, 551 miles by rail from Cairo, being reached in twenty-two hours. Assouan was

selected as a health resort on account of its favourable position in Egypt, as regards the most important features of the Sahara climate. There is practically no cultivation on the west bank (the direction of the prevailing wind) for many miles north and south, and very little on the east bank, hence it is practically within the Nubian Desert, the driest part of the Sahara, uninfluenced by cultivation. The best time for invalids here, as at Luxor, is November 20 to the end of March, the dryness and warmth of the month of March being of great value to most cases. The average maximum temperature of the four winter months is 82·1° F., and the minimum 54·5° F. The minimum is 5° F. warmer than Helouan or Luxor by night, a factor important in cases of albuminuria, rheumatoid arthritis, bronchitis, &c. The mean temperature is 65·6° F. in December, 64·3° F. in January, 67·4° F. in February, 75·8° F. in March. The cold mornings so noticeable in the northern stations of Egypt are not felt here nor is there any chill at sunset. Assouan is the driest health resort in the world. The relative humidity is 40·9. It is 28·2 per cent. drier than Mena, 14·6 per cent. than Helouan, and 11·3 per cent. than Luxor. This dryness gives a bracing character to the climate. The prevailing wind reaches Assouan over many hundreds of miles of pure desert destitute of any form of life, even of a microbic character.

The dominating factor of the desert climate requiring the greatest attention medically is its power of rapidly cooling the body surface, mainly by evaporation. The effect produced is known as a "chill." Unfortunate is the patient whose doctor's mind is not large enough to admit any other view of disease but a microbic one, or who thinks that his patients can withstand, without precautions, a rate of cooling which I have shown is ten times more rapid than the patient or his ancestors have ever had to accommodate for, without any fear of so old-fashioned a notion as a "chill." Chill is practically the only risk the patient has to accommodate for, and it is the paramount duty of the doctor to point out clearly how this is to be done. From neglect to recognize this factor, I have seen an ordinary catarrhal enteritis or dysentery due to this cause, and curable in four days, treated as ptomaine poisoning indefinitely, to the patient's discomfiture even two years later. I have seen cases of Bright's disease, either from want of warning or total disregard of the same, recklessly exposing themselves, when hot, to wind and shade, who have paid the penalty within a few days of their mistake. I have seen cases of phthisis accepting the same risks of rapid cooling in the wind or cool shade of a dahabeah progress to total disorganization, and every

case of broncho-pneumonia which I have seen in Egypt has been directly traced to this cause, and has arisen in individuals quite ignorant of the climatic requirements, and of the fact that their illness was quite unnecessary. On the other hand, year after year, I have seen patients in large numbers, equally susceptible to this factor, and some much more so, following suitable advice and precautions, not only easily arrange to meet this difficulty, but obtain excellent results from a climate otherwise of unparalleled excellence and importance. I have, however, thought it desirable to draw your attention to these cases, as I have observed a tendency to accept these evils either as something inherent in the climate or in the malady occasioning the visit to Egypt, instead of as accidents entirely preventible, and foreseen and guarded against in other similar cases. Whilst on the subject of precautions advisable in Egypt, let me remind you of the advisability, as in the case of India, of inoculation against enteric fever and small-pox, though in the case of the former protection is easily obtained by the use of boiled milk only, protected water, the refusal of salads, strawberries and ice. Very high preventive results have been obtained year after year by these means at Assouan and other health resorts of Egypt.

The best time for invalids to arrive in Egypt is early in November, staying at Mena House or Helouan in the first half of that month. The physician must then decide whether the condition is one that will be benefited by special warmth and dryness, for, in such cases as Bright's disease, rheumatoid arthritis, asthma or bronchitis, to suggest that Algiers, Biskra, or even Cairo, and the northern resorts would offer alternatives as favourable as Upper Egypt would be to deprive the patient of much of the advantage he would otherwise have obtained.

To avoid serious mistakes, it cannot be too strongly urged that plans should be carefully considered before leaving home in consultation with some one having special experience. The great care in travelling required by all patients with pulmonary lesions, asthma, bronchitis, albuminuria, or catarrhal conditions of any organ, unless foreseen, may lead to unhappy results. These cases should travel in Egypt by railway rather than by steamer on the Nile.

The diseases influenced beneficially by desert climates are :—

(*A*) Rheumatoid arthritis, gouty and other conditions of joints. In these cases the feeble circulation, the cold, perspiring, cyanotic extremities rapidly improve. The temperature falls after some weeks, pain ceases, nutrition is good, and with outdoor exercise a new life comes to the sufferer. The hands become warm, dry, mobile to the extent permitted

by previous damage. The importance of sending such patients to Egypt the first winter of the attack, before damage results in irretrievable limitation of mobility, is quite obvious and serious.

(*B*) Bright's disease and albuminuria. The great relative dryness of the air, coupled with the warmth and uniformity of the daily conditions, is of such value that no alternative climate can be found for such cases. It is important that these cases should be sent to Egypt as early as possible after onset or persistence of the symptoms.

(*C*) Pulmonary : (1) Phthisis—(*a*) non-acute cases of the first or second stage, with or without hæmorrhage ; (*b*) chronic quiescent phthisis, especially associated with bronchitis. With regard to cases with repeated tendency to pleurisy, it may be observed that not all patients are amenable to the strictness necessary for these cases to do well ; possibly such would do better in the Alps or the Grand Canary. (2) Asthma, especially associated with gout, bronchitis, or dyspepsia ; very great benefit results. Attention, in detail, to points peculiar to the climate and locality is essential. (3) Chronic bronchitis and emphysema. (4) Convalescents from pneumonia, not thoroughly cleared. (5) Chronic nasal and pharyngeal catarrh.

(*D*) Cases of mental strain and breakdown from overwork, especially if associated with gout and arteriosclerosis. Very great is the improvement visible from week to week.

(*E*) Excellent results follow also in such cases as dyspepsia, neuritis, neurasthenia, neuralgia (rheumatic, gouty, or malarial) and insomnia.

The great value of the climate of Upper Egypt in rheumatoid arthritis induces me to add to this paper Chart D (p. 128), showing the typical progress of a case of this illness during last winter. The patient, a married lady, aged under 40, had her first attack eleven years ago, and by successive advances of the disease almost every joint has been involved. Since January, 1909, the patient also had attacks of fever, reaching 100° F. in the mornings and 102° F. for two or three days a week in the afternoons, with shivering, sweating, and nausea. Contractions had set in in various positions, notably the elbows, fingers, and toes, and seemed to be starting at both knees. The pain suffered was very severe ; 20 gr. to 30 gr. of aspirin were taken daily for fifteen months. The mitral valve had recently become affected, and there was œdema of the ankles. This lady I was asked to see last October, in consultation in England, with a view to deciding what good might be expected from a winter in Egypt, and I pointed out how serious her condition would be within six months if the contractions starting at the knees were not

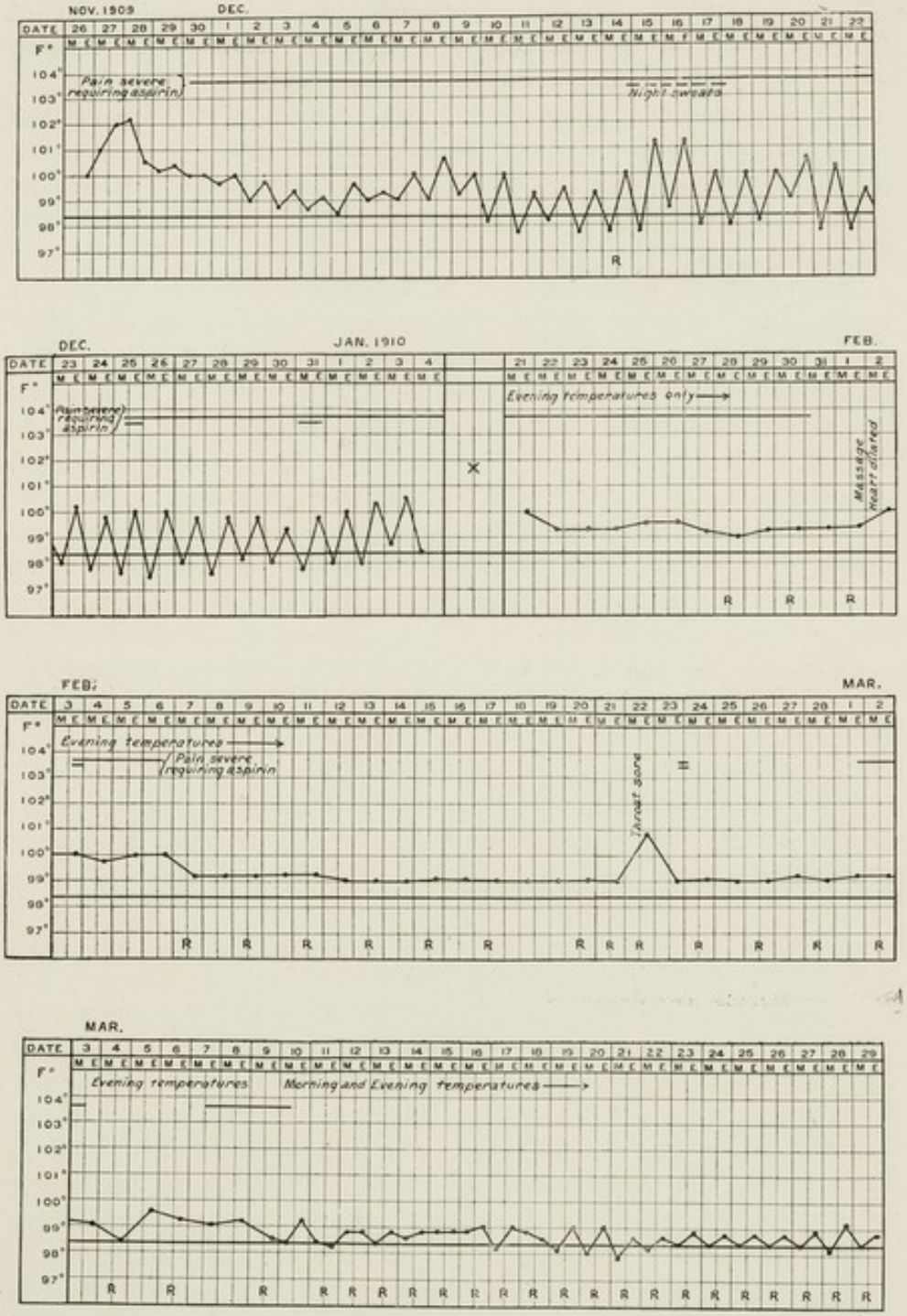


CHART D.

Case of rheumatoid arthritis. X indicates a gap in the recording of the temperature. R indicates a ride in the desert.

arrested. On my advice she went to Assouan, being carried into the hotel, as she could not move without help, and only very slowly. The patient had a lady companion, as she was also unable to dress, get into bed, or raise herself in bed, take out a cork, or turn on the electric light without help. On this Chart D is indicated the diminishing character of the pain to practically *nil*, and the progress, slow at first, is indicated by the first attempt to ride a donkey (letter R) on December 14, and by the fact that the lady companion was able to leave now. This attempt to ride was too premature and led to a rise of temperature and malaise. By January 22 improvement is well advanced, as shown in the fall of the evening temperatures (evening temperatures being only shown from now till March 10), diminished pain, requiring very little aspirin. Riding was resumed on January 28 on alternate days, with good results, and in February and March the patient had made such progress that exercises with an elastic stretcher were introduced with success, the rides were taken daily for two hours in the desert, and walks were also taken. The rides included galloping on a donkey, and the contrast now between the condition when seen in England and the present radiant activity, with good digestion, high colour, practically continuous normal temperature, freedom from pain, with good nights, was very striking. The treatment followed in other respects I have not thought it necessary to add, varying so greatly as it does in each case of this disease.

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