

XII.—Medical Thermometry.¹

THERE is no better example of the truth that the success of a discovery depends upon the time of its appearance than that of the value of thermometry in disease. In very early times it was known that those suffering from disease often presented marked changes of temperature; but this knowledge was not formulated nor its full meaning perceived until the present day. That the fluctuations of temperature in disease are now accurately traced, measured, and noted, depends partly upon the far greater scientific ability and the more thorough training of modern clinical observers; but it depends also upon the corresponding advance of the collateral sciences, and derives both its interest and its means of growth from its participation in this general advance, and from the significance which would have been wanting to it in times when its phenomena stood alone.

There was no reason why the thermometrical measurements of Sanctorius, of Boerhaave and Van Swieten, of De Haen, of John Hunter, and of Currie, should not have been carried on by other observers, and established in doctrines. Everything necessary for the prosecution of such researches was at hand, and many very interesting observations were indeed made by the authors I have quoted, and by some others; but the period was not ripe for it; no rational idea of the essential meaning of the changes could be entertained until the more general laws of heat were known, and until it was established that the human body is at one in its movements with the forces without it, and until the laws of the generation of heat in the body and its correlation with the "vital" and all other forces were discovered and confirmed. It is this solidarity between the vast onward movement of modern medicine and that of the other sciences which makes modern medicine so inspiring a study, and which is now drawing into our profession the ablest men of the time.

That elevation of the profession of medicine which is seen in the improvement of practitioners at large, in the higher estimation of the calling by the older universities, in the breaking up of the antiquated routine of the medical academies, in the closer alliance of medicine with statecraft, and in many other such signs as these, is due to the fact that it is becoming a worthier calling, and is surely gathering into its ranks the highest intelligence.

The sciences accessory to medicine are pursued for their own

¹ *Das Verhalten der Eigenwärme in Krankheiten.* Von Dr. C. A. WUNDERLICH Professor der Klinik an der Universität Leipzig, &c. &c. Leipzig. 1868.

sakes, and as parts of the whole scheme of knowledge, so that medicine has the services of physicists, chemists, and biologists, each of whom, labouring directly for the furtherance of his own science, indirectly labours for us.

The student of medicine must now educate himself in the methods of the exact sciences, of optics, hydraulics, electricity, heat, of chemistry also, and of experimental physiology, so that he brings to the mystery of life that habit of mind which will lead him, with Huxley, to regard it as an "orderly mystery," and that method which will require him to weigh, measure, and co-ordinate its phenomena, which method alone can produce results of lasting value. At the same time we are still at liberty, as Dr. Anstie says, to use "a frank empiricism" in those districts which exact investigation has not as yet reached. Meantime, the researches of Fraser, Crum Brown, Liebreich, W. B. Richardson, Broadbent, and others, are leading up by ways of great promise to the most precious kind of therapeutical knowledge.

In all these respects medical thermometry is of the deepest significance and importance. It gives us, perhaps, the most intimate knowledge we can have of the variations of functional balance. It is the best means of recognising a sound constitution; it is the most subtle indication of disorder; it is the most accurate measure of conditions affecting the body, whether in health or disease; and it is the most trustworthy test of the operation of drugs.

As yet thermometrical observation is a recent industry, and must be said to be, if not in its infancy, at least in its youth; many interesting essays have been written upon it, and many physicians are now at work upon it, but as yet only one treatise has been published which deals adequately with the whole subject. This treatise (that of Wunderlich) displays, however, so much perseverance and thoroughness, such admirable caution and insight, and such wide and minute learning, that it may be said, not only to establish this branch of investigation for the first time upon a deep and lasting basis, but also to build up a very great part of the edifice, and to point out with clearness the directions in which future labour must be applied.

I need not say, therefore, how much I am indebted to Dr. Wunderlich for the materials of this review; indeed, had it not been for his treatise, my article could not have been written, or could only have dealt with a small part of the subject. It would be tedious to the reader were I to acknowledge my debt to this author in every page, and I prefer to content myself at the outset with this general expression of it. At the same time I may add that I have consulted at first hand almost every original

essay on medical thermometry, whether by home or continental writers, and that thermometry has formed a part of almost all my own clinical investigations ever since I read Mr. Simon's article in 1860, and the pages on the same subject in the first edition of Aitken's 'Medicine.'

Before passing on to the subject of practical experience in thermometry, I propose to make a few remarks upon its historical aspects. This I do in no curious spirit, nor even to serve the larger ends of history itself, for which this is not the occasion, but because a reference to some points in the history of thermometry will make the meaning of the present practice of it more distinct; for in this, as in all other scientific studies, the mental attitude of the observer is an integral part of the process of his observations. That heat was a pathognomonic symptom of fever was, of course, known from the earliest times of rational medicine; it was commented upon by Hippocrates, by Galen, and by the Arabians, and it has long been a matter of popular knowledge; but the relation in which this increment of heat stands to the bodily processes has only been suspected in very recent times, and cannot as yet be set down as known. It is rather surprising in times when cold, as well as heat, was regarded as a positive existence, and when so much importance was attached to the various combinations of the two qualities and their degrees of opposition, that no attempt was made to measure either. Nothing could show more clearly the fecundity of the inductive method and the sterility of metaphysical doctrines. It is also remarkable that, after the discovery of a thermometer, in obedience to the needs of physical observers, and, indeed, after the application of positive methods to the investigation of disease, the measurement of temperature in febrile diseases was so long overlooked. But this delay accords with our observation of progress in other departments of knowledge.

Temperature variations are less appreciable, and depend upon more complex and less known laws; their study was, therefore, postponed for the study of the simpler mechanical phenomena, of the changes in the circulation, for example, which were more easy to determine, and which so obtained an undue prominence. Though then the changes of temperature were recognised, and accurate instruments at hand to measure them, yet they remained unrecorded until a beam of light was thrown upon the whole meaning of temperature in the body by the brilliant discoveries of Liebig, Mayer, Helmholtz, and Joule. These great men revolutionised our conceptions of heat and its relations, and made an epoch, not only in the simpler sciences, but also in physiology.

It is but just, however, to remember the observations of older physicians. Sanctorius, in 1638, had constructed and employed a thermometer for use in disease, and, what is more interesting still, had brought heat fluctuations into parallel with the fluctuations of bodily weight. For a hundred years little more was heard of the thermometer. Boerhaave makes the next allusion to it, but his attention was chiefly given to the mechanical phenomena of the circulation; for he says, "*Velocior cordis contractio, cum aucta resistentia ad capillaria, febris omnis acutæ ideam absolvit.*"¹ But his scholar Van Swieten, while still saying that "*pulsus aucta velocitas*" is the pathognomonic sign of fever, yet has the acumen to point out also that the heat of fever should be recorded by thermometers, because the sensibility of the physician's hand is quite untrustworthy as a medium of observation. He recommends the mercurial thermometers made by Fahrenheit, as being "*pulcherrima et portabilia quidem*" as well as "*accuratissima.*" He used to put the instrument in the mouth or the axilla, but either his instruments or his methods were not "*accuratissima,*" for he gives us some very loose results.² Very different were the observations of De Haen. Before the publication of Wanderlich's treatise, I had lighted upon De Haen's thermometrical studies while consulting him for another purpose. I then made many extracts from his remarks upon temperature, and very interesting they are. They are scattered throughout the volumes of his '*Ratio Medendi,*' and deal with many important points. For instance, he had observed the temperatures of healthy men, and had discovered the increase of temperature in the aged. In diseases he had evidently made a careful study of temperature, as he himself says "*Non autem deciesve, sed pluries ipsissima experimenta iterata sunt et semper idem docuerunt.*" He had discovered the rise in temperature during rigor, the morning and evening fluctuations, the want of parallel in many cases between the temperature and the pulse, the frequent contrast between actual temperatures and the patient's perceptions, the settling of temperature as a sign of convalescence, the thermometrical indications of the actions of drugs, and many other points. It is strange that in the days of few books these observations of De Haen had so little influence upon others.³ In England several observers of the eighteenth century had studied animal temperature, and I have taken some interest in collect-

¹ '*Aph.,*' 581.

² Van Swieten, '*Comment.,*' Lugd., 1745, tom. ii, p. 26.

³ See, particularly, De Haen, '*Rat. Med.,*' ii, 10; iii, 3; iv, 6; vii, 5; x, 1, 2; xii, 2, &c. &c.

ing and comparing their opinions. Wunderlich refers to some of these writers, and more especially to the experiments of Blagden in the 'Philosophical Transactions.' These experiments, though communicated by Blagden, were really due to Fordyce, who was, however, joined in his researches by Blagden, and also by Banks and Solander. By exposing themselves to high temperatures in heated chambers these observers established the independence of animal heat, and proved, as they say, that the animal body has the "power of destroying heat." This is clearly due, they add, "to a principle of life;" for what "chemists or mechanical physicians" have been able to imitate such a process? While referring to these articles I came across a remark in a letter by Governor Ellis,¹ where, in describing the great heat of Georgia, he says, "a thermometer hanging at the end of my nose would often stand at 105°, while in close contact with my body I could never get it above 98°."

I have found some similar observations, also, by the Abbé Chappe d'Aueterroche, who describes the Russian baths in his 'Voyage en Sibérie' (tom. i, p. 51), and in the 'Memoires de l'Académie des Sciences' for 1764 are some experiments by Tillet on the bearing of heat by animals. Dr. Martin, in the third volume of the 'Edinburgh Medical Essays,' takes great pains to show that animal heat is caused by the attrition of the blood upon the sides of the containing vessels. He is a strong disciple of the mechanical school, all of whom looked for the causes of animal heat in the velocities of the blood, and he was opposed by John Hunter, who in a quarto volume called 'Observations on the Animal Œconomy,' published in 1786, says, "It is, then, most probable that it (the heat) arises from some other principle; a principle so connected with life that it can and does act independently of circulation, sensation and volition, and is that power which preserves and regulates the internal machine." He notes that the temperature of man is 1·5° (!) lower during sleep,² and he gives a plate of a thermometer with an ingenious sliding scale which he used for experimental purposes. One or two writers hint that in putrid fevers the heat is due to the putrefaction; but others reply that, as heat is known to cause putrefaction, the heat in fevers is rather the cause than the effect. Cullen adds little to the controversy; he speculates on the differences of heat in animals being due to differences in their vital principles, and altogether he is not happy on this question.

¹ Vide 'Phil. Tr.' vol. 1, p. 755.

² During sleep the relation between production and dissipation of heat remains unchanged.

The chemists treated the inquiry more ably than the physiologists. The great Lavoisier, who is quoted by Wunderlich, was working more fruitfully, if not more methodically, in conjunction with Laplace, and by them animal heat, in 1780, was referred to the combination of oxygen with hydrogen and carbon in respiration. I must claim attention to the fact that Dr. Black also declared that animal heat was generated in the lungs by respiration. Against these views was urged the rise of temperature after death, established by De Haen, and also the independent heat of the fœtus.¹

The "absurd attempts of men who never extended their views beyond the laboratory, and, imagining their influence unbounded, attempted to explain all operations of the animal machine by ferment or mixture," were resented by the physiologists, and the discussion was somewhat barren until there appeared at the close of the century the work of Currie, a work destined to a far higher reputation than it has yet obtained, and entitled 'Medical Reports on the Effect of Water, Cold and Warm, as a Remedy in Fever and other Diseases.' It passed through many editions, but seems, nevertheless, to have exercised but little real influence upon contemporary opinion. This remarkable man based the whole of his observations upon thermometry; he made careful records of the temperature in his case histories, and he proved, in the same way, the relative power of various modes of treatment. He says, moreover, "A careful attention to the changes of animal heat, and to the state of those functions on which it depends and by which it is regulated, though more requisite in febrile diseases, perhaps, than in others, is, however, of importance throughout the whole circle of diseases." In our own century the subject gained more way, and Brodie gave a new turn to the question by referring to the nervous system as the source of animal heat.² Brodie was followed by several home and foreign writers among the physiologists; and Chossat, in his well-known essay on animal heat, referred more particularly to the sympathetic system as the source of heat. The chemists manfully withstood this tendency of the physiologists to disinherit them, and the echoes of the controversy are still resounding in our ears. From this time numerous experiments were made and carefully recorded. Among the chief were those of Breschet and Becquerel, made with the thermo-electric apparatus, and tending to establish a comparison between the local temperatures of different parts of the body.³

¹ It is interesting to find that by Black, Haller, and many other observers, the relation of red blood-corpuscles to temperature was recognised.

² *Vide* 'Phil. Trans.,' 1811, p. 36, and *ibid.*, 1812, p. 378.

³ Cf. 'Annales d. Sci. Nat.,' 2 sér., 'Zool.,' vols. iii, iv, and ix, 1835.

A good summary of the state of knowledge at the time will be found in Todd's 'Cyclopædia.'¹ We shall not be surprised to find Bouillaud and Andral² in the first rank of those clinical observers who seized upon thermometry as a true method of investigating disease, and in the books of both we find a number of accurate records. In Germany, which has been the chief centre of medical thermometry, much was done at this time.³ Fortunately Dr. John Davy stepped in to save the honour of English men of science, and published that series of laborious records so well known, collected in his 'Physiological Researches.' I cannot help speaking with much affection of this book, which came into my hands on its publication in 1863, and which was one of my first guides in thermometry; it cannot be called an unerring guide, but, in addition to the spirit of accuracy and faithful labour which animates it, we have in it also a collection of observations of permanent value. Dr. Davy's researches carry us forward beyond the time of the great discoveries of Liebig, Mayer, Helmholtz, and Joule, whose brilliant revelations, appearing almost at once, carried the dawn into full day. Liebig, as a chemist, following out the work of Black and Lavoisier, proposed those conceptions of animal combustion which, modified as they have been by his followers, must, nevertheless, be to his immortal honour. At the same moment Mayer, Helmholtz, Faraday, Joule, and Grove, by their grand idea of the circulation of one force in many forms throughout all nature, organic and inorganic, and of the mutual conversion without loss of these forms one into another, placed us upon a pinnacle of observation.

Carpenter industriously applied these principles to the animal body, and completed the doctrine that the activities of histological elements are translated into equivalents of heat, of movement, of chemical products, and of intellectual energy. In 1850, then, the scheme of work which lay before us as physiologists and physicians was completed, and Bärensprung and Traube, initiating the era of active medical thermometry, stepped into the field at the same moment. Since that time medical thermometry has found many able investigators in Germany. Wun-

¹ Vide Art. by Edwards.

² Cf. Bouillaud, 'Clin. Méd. de la Charité,' tom. i, 293-4. It was very interesting to see these two veterans re-open the subject of thermometry four months ago. Vide 'Comptes Rendus de l'Acad. des Sciences,' Dec. 6, 1869.

³ Cf. e.g. Gierse, prize dissert. on the 'Cause of Organic Heat in Inflamed Parts,' 1842, and Zimmermann, who made a large number of valuable observations, which are scattered throughout many periodicals; references to his papers are given by Wunderlich, p. 44.

derlich took up Traube's work in 1851, and in his volume published in 1868 he may be said to sum up the results of almost twenty years' researches. If in England we have little to show which will compare in extent and accuracy with the German observations, this is due in a great degree to the very different conditions of our medical professoriate, which chiefly consists of physicians occupied in practice. At the same time we, too, are able to point with pride to such researches as those of Dr. Parkes, who, by his investigations into the tissue changes of febrile disorders, has contributed largely to the extent and accuracy of modern doctrines. I shall endeavour, so far as is possible in a short essay, to review these doctrines as we now have them. We believe, first of all, that the balance of heat in the human body is very nearly constant for all conditions, and that the narrower the limits of variation the more sound and stable the individual constitution. Secondly, we believe that in the numerous disorders which are attended with variations of temperature above or below the normal, such variations stand in a very intimate relation to the variations of the whole bodily processes. Thirdly, we believe that in the thermometer we have an instrument of sensitive and exact observation, one which determines the patient's state without the bias of subjective influences, and also unbiassed by the prepossessions of the observer. The thermometer, then, gives us, definitely and simply, and at any moment, an accurate key to those general variations in waste which otherwise could only be detected by prolonged and laborious search, or which might as frequently escape notice altogether.

That the normal standard of human temperature should be so invariable for all conditions was not beforehand to be expected; but it is the establishment of this standard of measurement which makes medical thermometry possible. If there was not a certain known and constant regulation of waste, if its degree depended without any regulation upon all and any accidents which might affect it, then thermometrical observations would be altogether illusory, as having no foundation. It is equally valuable in practice to know that while the temperature of the healthy body is so uniform, the temperature of the sick body is so fluctuating; also that the organism which in health resists powerful influences brought to bear upon it so long as these are not morbidic, yet in disease becomes very sensitive to influences of far less power. It is evident that in these propositions lies the whole secret of the method, and to them, therefore, we must give our early attention. Before passing on, however, to the comparison of records taken in the healthy body, let me say a few words upon the means and the methods neces-

sary to ensure the ease and the accuracy of recording. I need not say that degrees of temperature cannot be measured by the touch of the hand, and can least be appreciated in those cases where measurements are most important. Again, certain conditions of radiation or of superficial congestion may give a sensation of excessive heat to the touch when no such excess is present.

On the other hand, too sensitive an instrument is to be avoided, except in special researches, as the indications are too delicate for ordinary purposes. For certain ends I have myself used the thermo-electric instrument, but I have found that the mercurial thermometer is the best for common use, and is, of course, far more portable. Indeed, in choosing even a mercurial thermometer, it is not well to have too sensitive an instrument. The first clinical thermometers made in this country were those of Casella, under the direction of Dr. Aitken, and for hospital purposes they cannot be improved. They are, however, too cumbersome for general practice, and for this reason the thermometer long remained a stranger to the busy practitioner.

I hope it is no undue presumption on my part to please myself with the notion of having had a share in introducing the thermometer into general practice. A few years ago, when convinced of the vast improvement, both direct and indirect, which would follow the general use of thermometry, I began to think how the labour of carrying Aitken's instruments from place to place might be lessened. I applied to Casella, but he had no pocket thermometers, and seemed indisposed to make any. I therefore set to work with Messrs. Harvey and Reynolds to manufacture one; and it was not so easy as it may seem to devise an accurate thermometer of a new form, and with a safe and portable case.

The instrument was made in numbers by Messrs. Harvey and Reynolds, and the sale, at first slow, has during the last three years increased rapidly. I am glad to see the same instrument is now being made and sold by Hawksley and others, so that I have reason to suppose the thermometer is now in the hands of most medical men as a daily companion. It is a matter for much regret that these instruments are all made on the Fahrenheit scale. It is an inconvenient scale in itself, and it has the additional disadvantage of making English and foreign observers mutually unintelligible. There is really no excuse for its retention, as no human being supposes it to have any merit of its own. The new scale is very easy to learn, and the change would not unsettle the mind of the nation, as the use of thermometers is confined to a minority of competent persons. I urged Mr. Reynolds to make his thermometers on the centi-

grade scale, which has the additional advantage of being much more distinct in a short instrument] than the Fahrenheit, but it stopped the sale promptly. He has very recently made an instrument having both scales upon it, but no one buys it. Do let me urge my readers to have the nerve to make this change at once, for it must come sooner or later, and meanwhile authors are spoiling their records for posterity.

Every thermometer should be tested, not only when purchased, but also every six or twelve months subsequently, as the molecular changes in the glass, caused by alternate expansions and contractions, tend to a certain degree of permanency. Any such permanent change, with the date of testing, should be noted on the case of the instrument. The instrument which I commonly use was correct when purchased, but as I have been so fortunate as to keep it for about three years, it now registers two tenths too high. This change took place during the first ten months of its use; and it has since that time been stationary. It is easy to allow for this kind of incorrectness at each observation; but if the bore should change in calibre, so as to make the spaces of elevation unequal for equal increments of heat, then the best thing to do is to destroy the instrument at once.

Most busy practitioners will need more than one thermometer, as it is often necessary to leave instruments with the nurses of the sick; in this case they should be numbered or otherwise distinguished. A coloured band round the case is a good distinction. As to sensibility, it is, generally speaking, true that the sensibility depends upon the size of the reservoir, and all directions as to the time of imbedding the instrument must be made with due regard to the size of the reservoir. The old round bulb is decidedly the best kind of reservoir for measurements in the axilla, but we cannot always have the best possible, and in this instance a long oval is practically better, as being quicker in visible expansion. We cannot wait for a slow rise; and, moreover, we want an instrument which, if occasion require, we may insert into the rectum or vagina. On the other hand, a certain sluggishness is desirable, for too sprightly an instrument may gain time at the expense of steadiness.

The length of six inches in the stem is useful, in order that the instrument may be more easily inserted, watched, and removed, and six inches is within the length of a stethoscope;¹ but a three-inch thermometer may be as accurate as a six-inch. I constantly use a three-inch thermometer of Messrs. Harvey and

¹ When I first designed pocket-thermometers I made them to fit within stethoscopes, but I did not like the result myself, nor did others. Dr. C. Fox has lately proposed this arrangement again.

Reynolds', made for me more than a year ago, and it is very accurate. I use it for observations upon myself, in this way: I wrap a band of wash leather around the upper scale, which I do not need, and thus the instrument may be imbedded under the tongue, and the projecting end held by the teeth without fear of displacement. With this instrument in my mouth I have gone through many exercises—such as climbing, diving, &c.—which would be impossible with any other.

For some experiments upon the healthy subject, however, a non-registering instrument is required; no instrument is better for this than Aitken's curved thermometer, which can be watched in position with or without a little mirror.

Next, as to the place of application, I nearly always make use of the mouth in observing myself, but in others this plan is liable to various misleading influences. For patients I always use the axilla. A discussion arose upon the point at the last meeting of the British Medical Association, and doubt was thrown upon the value of records in the axilla.¹ I had not then made any comparative experiments between records in the axilla and in the rectum, but I have since made many, and find the returns from the axilla so uniform as to inspire confidence, and so valuable in practice as to give the information I want; still, if the temperatures in the rectum do not run parallel to those in the axilla, a grave difficulty exists. For my part, I have found the temperatures of the rectum quite parallel with those carefully taken in the axilla, except in cases of collapse, when the temperature of the outer body falls, and that of the inner body rises. Here again, also, we must look to what is practicable. If patients allow of single rectal observations, which is doubtful, they will certainly rebel against their frequent repetition; and this is as true of the coarser as of the more sensitive natures, for in the former class of patients my assistants and myself have by such examinations excited comments, the narration of which would not tend to edification.

Again, in restless patients there is the very serious risk of breaking the instrument and leaving pieces of glass two inches within the anus; in others it excites reflex emptying of the bowel, or, short of that, rectal spasms, which tend to raise the local temperature.² Finally, the bulb may often be imbedded in a faecal mass, which has a temperature of its own. Anal examinations must, therefore, be rare, and must be confined to a few cases of extreme emaciation and to cases of col-

¹ Many recent observers have contrasted the records of the mouth and the axilla as between internal and external parts. The axilla, well closed, ought to be as much an internal part as the mouth, or nearly so.

² This cause of error is pointed out by Billroth.

lapse. In children I generally put the instrument between the thigh and the body, but sometimes in the anus. Children are often alarmed by axillary observations, and in these cases we do better to make them out of sight.

In making observations in the axilla, besides the precautions, which are too well known to need repetition, the axilla should be wiped dry from sweat, and then closed a few minutes before the insertion. If this be done the instrument may be removed a little sooner. If the patient be somnolent, violent, or thin, the thermometer must be held in place. There are two other technical points which need some remarks. These are, firstly, the duration; secondly, the frequency of the insertion of the instrument. In discussing both these points it must be always borne in mind that we have to prove the value of the thermometer in general practice, and to commend it to busy men; we must, therefore, be very careful not to frighten them with elaborate and tedious rules. Fortunately the frequent and protracted insertions, so much dwelt upon by some writers, are, under ordinary circumstances, quite unnecessary. In making exhaustive researches for standard purposes, no time and no care can be too much; but for the ordinary ends of practice two observations a day, each of four minutes' duration, is sufficient, even in bad cases. If the thermometer is an enemy to slovenly practice we may be glad, and surely in a bad case there ought to be time enough for the medical man to wipe the axilla when he enters the room, to close it for a minute or two, and then to insert the thermometer, gently warmed, for four minutes. Six minutes in all are thus required, and during this time the pulse and respirations may be counted and other inquiries made. If the instrument remain for fifteen minutes more it may gain one or two tenths, or it may lose as much; but unless we are dealing with very high degrees indeed, such as 106° and upwards, the difference of two tenths is as unimportant as the difference of a few beats in the pulse. Certainly no opinion can be based on differences so slight. A slight fall is quite as probable as a rise, for differences like these are easily set up in the sick by such trifling causes as food, drinks, evacuations, exertion, and the like, and mean little. Indeed, a distinctly engraved thermometer, marked to half degrees only, is quite sufficient for ordinary purposes. So it is again with repetitions.

In special cases, however, at special times, in insidious or capricious diseases, or about times of crisis, it may be needful to take measurements every two hours, or even every half hour, for that matter; but such instances are quite exceptional, and when they occur an intelligent attendant is easily taught to

make trustworthy records. Far from annoying either patients or their friends, thermometry generally commends itself quickly to their good sense, and is well carried out. The observations of nurses, indeed, are on the average much better than those of students, as they have nothing to distract them. In hospitals it is well to use Aitken's curved non-registering instruments, and to have them *in situ* at the time of the house-physician's visits. He then quickly transfers the number to a chart, and places with it the number of the pulse and of the respirations. In the great majority of cases two observations a day are quite enough, and these should be taken between 7 a.m. and 9 a.m. for remissions, and between 4 p.m. and 6 p.m. for exacerbations. It is all important that, whenever made, the hour of observation should be noted. Of the value of single observations to the consulting practitioner I shall speak more at length hereafter.

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(To be continued.)

XIII.—Hospital Efficiency.¹

THE consideration of hospitals, in reference to their utility and their salubrity, as compared with the so-called cottage-hospital system, and with treatment at the homes of the humbler classes, cannot be better prefaced than by the following quotation from the 'Sixth Report of the Medical Officer of the Privy Council,' 1863:

"English rural hospitals have acquired, on false grounds, a reputation for comparative healthiness; by their regulations, their practice, or their position, they receive habitually a far less serious class of cases than is admitted into the hospitals of London and other large towns. This difference in the quality of the practice is much greater in respect of medicine than of surgery, but is considerable, even as regards surgery. The result is marked lowness of death-

¹ 1. *Sixth Report of the Medical Officer of the Privy Council*, 1863.

2. *Hospitalism and Zymotic Diseases*. By EVORY KENNEDY, M.D., &c. London, 1869.

3. *Circular Report by the Surgeon-General of the Army Medical Service, in the United States, on the Organisation of Military Hospitals* (quoted in the 'Lancet').

4. *Outline of Observations on Hospital Gangrene as it manifested itself in the Confederate Armies during the American Civil War, 1861—65*. By JOSEPH JONES, M.D. New Orleans, 1869, &c.

5. *Reports of the Dublin Obstetrical Society* ('Dublin Quarterly Journal of Medical Science,' 1869 and 1870).

6. *Edinburgh Medical Journal*, December, 1869, and January, 1870 (several papers), and previous reviews on *Hospital Construction*, on *Scandinavian Medical Literature*, &c., in the 'British and Foreign Medico-Chirurgical Review,' 1866, 1869, 1870.