A contribution to the theory of diathesis / by David J. Brakenridge.

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TO THE

THEORY OF DIATHESIS.

BY

DAVID J. BRAKENRIDGE, M.D.,

F.R.C.P.E., L.R.C.S., EDIN.,

PHYSICIAN TO THE NEW TOWN DISPENSARY, EDINBURGH.

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In ancient as well as modern times various temperaments or diatheses have been recognised as exercising a most important influence on the origin and type of disease. Each of these exhibits a special proneness to certain forms of morbid action, and an equally remarkable immunity from others, while such maladies as are common to more than one are modified accordingly.

An intimate knowledge of these constitutional predispositions is of great importance to all accurate treatment and prognosis.

It is, however, probable that until we have some clear ideas regarding the origin and nature of these diatheses themselves, their recognition will fail to have much influence on the advancement of our knowledge of disease and its treatment. The very possession of so many familiar pictures, each bearing a well-known name and character, is apt to blind us to the fact that underlying them is a mine of most valuable truth. The following views have for some years afforded to my own mind a satisfactory explanation of the probable nature of diathesis, and have

frequently guided me in deciding upon the treatment to be adopted in particular cases. As they differ from any I have hitherto seen, I offer them in the hope that they may throw some light upon this obscure and interesting subject. In this paper I shall confine myself as much as possible to the general treatment of the subject, and to the influence of climate in the production of diathesis, as the principal, although by no means the only, modifying agent. The consideration of the bearing of these views upon the particular diathesis I reserve for a future communication. The subjects which I propose to discuss at present fall under the following heads :—

1. The functional powers of all animal organs are developed by exercise, being perfected in proportion to the amount thereof.

2. The means by which organs are thus educated are those conditions which call forth their activity; hence in the same body some organs may be highly developed, while others are comparatively little so.

3. The constitution thus tending to become adapted to those external influences to which it is constantly exposed, modification of structure and function is, after a time, rendered so far permanent as to be more or less hereditary.

4. Relative health, under any given set of circumstances, depends upon the perfect adaptation of the physiological habits to those circumstances. Absolute health is to be met with only where the balance of development of the whole body is maintained.

5. The wider the range of the education, the more vigorous will be the health, and the greater the range of circumstances under which it may be preserved.

6. While this habitual condition of the constitution is the only one compatible with health in the circumstances under the operation of which it has been developed, under

altered circumstances it becomes the predisposing cause of disease, and is thus manifested as a diathesis.

7. The conditions under which a diathesis is developed being the opposite of those under which the diseases depending on the diathesis are generated, the means employed for the treatment of the latter will be the opposite of those necessary for the alteration of the former.

1. *The functional powers of all animal organs are developed by exercise, being perfected in proportion to the amount thereof.*

Within certain limits the great importance of the law of habit in education and development is well understood. Did facility not come with frequent repetition, progress would be impossible.

To those who desire to become skilled artisans, musicians, gymnasts, tea-tasters, auscultators, microscopists, &c., the certain knowledge of such a law is unquestionably the stimulus to those arduous, and apparently fruitless, tasks which are so perseveringly undertaken. As this law in its most comprehensive sense will be often alluded to in this paper, I may, at the outset, state that when habit or the result of education or training is spoken of, there is implied a power of performing an operation acquired by frequent repetition, and due to a gradual education of the presiding nerve centres in certain directions, and perfecting of the whole apparatus necessary for carrying out the operation, so that nerve-force acts more readily and effectually in such a channel than before, or than through any less educated media. In the examples given above, and many others, it is well known that the muscular apparatus or the special senses are capable of being trained to a remarkable extent. Almost every case of vital action which has come under observation demonstrates how invariably re-

petition is followed by increased power and facility of performance. But in many of those unseen processes which are constantly taking place within the body, the same law has not been clearly recognised. Yet if it does apply to these, as well as to the more obvious acts of the body, the vast importance of such a fact cannot well be overestimated. That the internal organs of the body do undergo an education and development in functional power proportioned to their exercise will, I think, appear from the following illustrations.

There is ample ground for believing that some lungs habitually do much more work than others. The amount of hydrocarbonaceous food which the Esquimaux consumes in order to maintain the normal temperature of his body, exceeds by many times that required by a healthy adult in our own country. The carbon contained in this, must, in the form of carbonic acid, for the most part pass off by the lungs in exchange for a proportionally large amount of oxygen. But as this exchange constitutes the chief function of the lungs, it follows that those of the Esquimaux do many times the amount of work done by ours. And the ability of their lungs to perform such work is, by training, rendered so many times greater than that of ours. This can be easily proved. Admit, for the sake of argument, that their habitual amount of respiratory work is only double ours—a very moderate computation—and assume that our respiratory power is equal to theirs. If the latter is true, one of our lungs will, if required, be able to perform without embarrassment the work of both lungs, or double its present work, the amount allowed to be habitually performed by the lung of the Esquimaux. Such being the case, when the function of one lung is suddenly and completely arrested by disease, the whole amount of respiration should be quietly taken up by the remaining healthy lung.

Experience, however, abundantly shows that the embarrassment produced by such partial arrest of function is so great as often to cause speedy death. Hence it must be granted that in cold climates the lungs are not only more active, but are proportionally more highly developed and stronger than in warm. We have, I think, a further proof of this in the results obtained by Dr Edward Smith, in the admirable experiments made by him to ascertain the influence of season on the exhalation of carbonic acid. He found, not only that the activity of the lungs, measured by the amount of carbonic acid given off, was greater in winter than in summer, in cold than in warm weather, rising and falling with the fall and rise of the thermometer, but that the uniformity of this response presented the following anomaly, which we give in his own words :—"The effect of temperature was very marked, but it failed to account for the great variations which were observed, and it was abundantly proved that, with the same temperature in the spring and at the end of summer, the amount of carbonic acid evolved was far less at the latter than at the former period. That mere degrees of temperature will not suffice to measure the results may be seen by noting the quantities evolved in various months with the same temperature—as, for example, 59°, when the quantities were 8·11, 9·13, 7·64, 7·3, and 6·76 grains per minute in April, May, July, September, and October, in their order." ("Cyclical Changes in Health and Disease," p. 153.) Here, doubtless, winter's use and summer's comparative disuse of the lungs, giving rise to a corresponding increase of power in the former, and decrease in the latter season, sufficiently explains how, with the same demand made upon the lungs, one grain more per minute was exhaled in spring than in autumn.

In a paper "On the Influence of a Digestive Habit in

the Production of Tuberculosis" ("Medical Times and Gazette," June 1868), I have endeavoured to show that the organs of digestion undergo a similar development in nature and degree proportioned to their exercise, a special education being required for every decidedly different substance. Without such a training, the power to nicely adjust a most complex process to the necessities of each case would be wanting, and perfect digestion of any substance would be impossible, although the necessary organs remained quite free from actual disease—just as the hand and eye of the musician, however perfect anatomically and physiologically, are quite incapable of transferring a difficult piece of music from the paper to the instrument, without a power to do so, acquired by long and steady practice, existing in them and in their presiding nerve centres. So special is this education that the training necessary for one fat or oil does not serve for all substances of the same class. Each requires a special modification of the powers; hence, as is well known, one form of fat or oil can often be taken when the others are rejected.

Many phenomena connected with disease appear to me to come under this law, such as restoration to apparent health after the loss of part of an important organ.

"If one kidney," writes Sir Thomas Watson, "wastes, or is spoiled by disease, an increase of function devolves upon the other, and, by a beautiful law of compensation, the sound organ, without any alteration of its peculiar fabric, enlarges. The same is observed to be the case with the lungs." I do not, however, think that this enlargement—although it is undoubtedly an early result of suddenly increased function—sufficiently accounts for recovery in such cases. The following appears to me to be the most satisfactory explanation:—All organs of the body being capable of an almost unlimited amount of

training and development, when a portion of one has perished, the remainder, if healthy and sufficient in amount to avert actual death, may, by education, become quite capable of taking up the work of the lost portion in addition to what it previously performed. The lungs and kidneys of the Esquimaux, although capable of performing many times the amount of work done by those of the negro, do not greatly exceed his in bulk. In like manner, when an organ has been partially destroyed by disease, we should anticipate recovery rather through an increase of power than of size on the part of the remainder.

2. *The means by which organs are educated are those conditions which call forth their activity; hence in the same body some organs may be highly developed while others are comparatively little so.*

However various or changeable the state of the surrounding influences may be, it is necessary to the maintenance of health that, within the body, uniformity of certain conditions should be preserved. For this purpose a most complex machinery is provided, having arrangements specially adapted for every kind of climate. It is owing to this admirable provision of a number of organs intimately related in function one to another, and presided over by closely associated nerve centres, that the habitual powers of the body are capable of becoming adapted to the most varying circumstances, and that man in a healthy state is to be met with in every region of the earth, however extreme its climate. As it is against the influence of external agencies that this highly efficient organic apparatus is intended to operate, the direction will be given to its activities, and consequent development and powers, by the prevalent conditions to which it is exposed. Should an equal amount of work be thrown by these upon each

organ—as is probably the case in temperate climates—the balance of development will be preserved. In extreme climates it will not be so. Under the influence of such, a maximum pressure will be exerted on one set of organs, a minimum on the remainder, and the corresponding development and functional powers will be unequal. Hence the organs and functions most perfect under a cold climate, will be least advanced under a hot one, and *vice versâ*. Each variety of climate will give rise to an answering modification of the constitution.

That other circumstances than climate influence the type of constitution is unquestionable. Man's body is not merely a machine regulated by the physiological necessities imposed upon it by a surrounding atmosphere, but is, besides, the habitation of a governing mind not less peremptory in its demands. He has, moreover, in his position and surroundings in the social world, another series of influencing circumstances to which he must become adapted. A powerful effect is thus produced upon the constitution by the restraints of poverty and the license of riches, by occupation and its accompanying conditions, by social customs, and by the self-imposed restrictions and indulgences of religious or other belief. In our own land a marked difference of configuration and constitution is observable between the extreme ranks of society. But the striking influence of even purely self-imposed conditions in antagonism to that of climate is well seen in the two following opposite examples. On the one hand, strictly different habits of thought and diet have, notwithstanding the influence of the same climate, for several thousand years maintained a striking difference of general appearance between the different castes in India. On the other hand, uniformity of customs and creed, dating from an even more remote period, has preserved the

typical characteristics of the Jew against every variety of climate.

3. *The constitution thus tending to become adapted to those external influences to which it is constantly exposed, modification of structure and function is, after a time, rendered so far permanent as to be more or less hereditary.*

From what has already been said, not only is it evident that the organs of the body must gradually come to harmonise in their habits with surrounding influences, but it is also most probable that what was originally an acquired property will become in each succeeding generation more and more an inherited part of the constitution. In animals we find that habits acquired by training are thus transmitted to the offspring. A certain race of dogs, for example, has originally been taught to point; and now the puppies of that race "may be seen pointing at swallows or pigeons in a farm-yard." "The breed of shepherds' dogs," also, "often display an extraordinary hereditary sagacity respecting their peculiar avocations." Organs which have become educated and developed to an unusual degree by increased use and activity, are also, after a time, inherited in this condition. Thus, in Europe, the constant practice of milking has gradually enlarged the udder in the cow, and this peculiarity is now inherited. In like manner, after prolonged subjection to climatic training, a race will come to inherit a special adaptation of organic power to the particular climate. After a time such adaptation will cease to be acquired by each individual, the infant being from birth so constituted. The rapidity with which this change is effected from the entirely acquired to the entirely inherited, depends chiefly on frequency of repetition. Hence, as climate imposes upon the body constant demands,

which meet with an unceasing responsive effort, we can understand that the acquisition of inherited power will, in this case, be much more rapid and decided than in the case of any volitional act. The extent of the change from previous conditions, and the consequent amount of organic alteration thereby necessitated, will influence the time required, lesser modifications being more speedily established than greater ones. The power to perform habitual acts is never altogether a permanent attainment of those by whom it has been acquired, but is, on the contrary, maintained with difficulty, and, for the most part, readily lost. Some portion, however, of such acquired power is always retained, those who have once learned any difficult performance being able to re-acquire it much more readily than those to whom it is entirely new. The amount of power transmitted to the offspring in such cases probably bears some relation to this permanent portion of acquired habit. In each succeeding generation, provided the training is kept up, this will be still further augmented and confirmed, until ultimately the perfect power will be inherited. Instinct may, in like manner, be habit originally acquired, and persistently cultivated through many generations, until structure has gradually become so modified to favour the easy performance of the particular act, that it becomes the most natural effect of outgoing energy. Acquired power must, in strength and permanency, fall far short of that which is inherited. The infant who inherits perfect adaptation to a particular climate, is thus a very differently constituted being from the infant of a stranger born in the same climate. The latter is, in this respect, in danger from the first ; the former possesses from its birth immunity from risk ; the latter has to be educated and developed, the former has merely to grow.

4. *Relative health, under any given set of circumstances, depends upon the perfect adaptation of the physiological habits to those circumstances. Absolute health is to be met with only where the balance of development of the whole body is maintained.*

A. Relative Health.—When the powers of the system are so developed as readily to respond to all the demands made upon them by surrounding agencies, the body is in a state of relative health. As each decidedly different locality varies somewhat from all others in climate, each will be represented by a different state of the organs in health. We have already seen that harmony of the habitual activities of the constitution with surrounding requirements depends upon an education which can be had only under the influence of the more or less continuous operation of these demands. Hence it may be safely assumed that, other conditions being equal, the most healthy persons in any given locality will be found amongst those who have spent their own lives there, and whose ancestors have dwelt there for many generations. These have inherited a constitution relatively healthy. It is evident that the body, as its various organs exist in definite and, it may be, different degrees of development, can only operate safely under such conditions as will exercise each organ proportionally to its power. Circumstances so completely harmonious with the existing state of the body are, however, not likely to be met with, except in the locality where the constitution has been formed. The popular belief in the healing virtue of the native air is founded upon the recognition of facts, of which the foregoing may be regarded as the explanation.

B. Absolute Health.—In body, as well as in mind, development, to be perfect, must be equal. Therefore, although it is true that the highest education of particular

organs is to be met with in extreme climates, yet, as along with this there is the lowest development of others, the balance of all the organs is not maintained, and the animal is, as a whole, imperfect. This is, as we can understand, a condition incompatible with the greatest vigour and activity of the body; hence we do not find man in his highest condition in any extreme climate. The regions in which man has attained his highest development and made the greatest advances, lie midway between the extremes, enjoying what, from its evident suitability to the human frame, has been called a temperate climate. Under the influence of such, although individual organs may be less advanced than elsewhere, the body, as a whole, is more perfect. Such an equal development is most compatible with that vigour and enjoyment of life which constitutes absolute health. Man instinctively craves such a state. It is not improbable that the periodical longing for change of air and locality experienced by most persons springs from some disturbance of the balance caused by local conditions. The satisfaction of such a longing is not essential to relative health, but it is in the direction of a higher and more perfect development. It is a familiar fact that, in marriage, opposite temperaments attract one another, and it is not unlikely that this arises from a similar intuition of a beneficial character, as we shall again see.

5. *The wider the range of the education, the more vigorous will be the health, and the greater the range of circumstances over which it may be preserved.*

Were the constitution limited to one constant unvarying set of influences, health would be incompatible with the slightest deviation from this. The provisions of nature secure a considerable variety in this respect. In the rotation of the seasons we have a constant succession of

changes which check the tendency of the body to fall into a too narrow series of habitual activities. The width of education thus afforded renders it possible to move with comfort and safety to considerably distant localities at seasons when their climate approaches in character to one or other of the seasons in the native climate. Thus, we may indulge in a change to colder places during their summer if it is not colder than our winter, and to warmer places during their winter if it is not warmer than our summer.

It is evident that the extent of this capacity for change must be regulated by the range of conditions to which the body has been accustomed, being greater or less according to the variability or equability of the developing climate. The development brought about by any one locality must, however, be, at the best, very limited compared with man's capacity. Doubtless the craving for change which man feels with regard to many things is not without its physiological importance.

Such deep-seated yearnings as the love of travel, and the great inventions to which, for its satisfaction, it stimulates him, hint that this local development, even where the balance of functional power is best preserved, by no means represents the highest state which he is capable of attaining. He possesses, in a rudimentary condition it may be, but none the less truly, powers which, were they all fully educated, might render him cosmopolitan. Greatly increased rapidity of locomotion is already doing much to extend the range of his physiological education, and, in addition, the blending of different races which is thus favoured, and the consequent intermarriages of those possessing constitutions widely different, will hasten the higher development of the whole race. For when we have the organs which in the one parent are highly trained, unedu-

cated in the other, and *vice versâ*, it is reasonable to suppose that the positive, and not the negative, properties of each parent will have the greater tendency to be transmitted to the offspring; hence it will possess somewhat of the special powers and capacities of both. Thus the offspring of aboriginal and European parents in Hindustan is said to "inherit from the native parent a certain adaptation to the climate, and from the European a higher development of brain." ("Combe's Constitution of Man," page 194.) Many examples might be adduced to show that mixed races of men surpass in vigour and in the tendency to multiply the parent-races from which they have sprung. It must to a considerable extent be regarded as the explanation of the high vigour of the Anglo-Saxon race, that in it there are blended together so many constitutions, originally very differently educated, and consequently possessing widely different powers.

6. *While this habitual condition of the body is the only one compatible with health in the circumstances under the operation of which it has been developed, under altered circumstances it becomes the predisposing cause of disease, and is thus manifested as a diathesis.*

That very perfecting of the animal mechanism which secures its most efficient working under a given set of conditions, becomes, when these conditions are greatly altered, the source of derangement. For if unexpected demands are made upon the weak organs, and these are still further increased, as is the case in many instances, by the continued, although no longer necessary, activity of those organs which habitually work well, it is not surprising that deranged function, congestion, or inflammation should be the result. For the sake of illustration, we may assume that in cold climates, while the kidneys, lungs, and

organs connected with fat digestion are well developed and educated by activity, the skin, liver, &c., are deficient in functional activity and consequent development, this arrangement being necessary for the generation and conservation of a sufficient amount of heat. Let such a constitution be transplanted to a hot climate, where the demands are exactly the reverse, and what must be the consequence? The liver, skin, and bowels, comparatively untrained and weak organs, are suddenly called upon to act energetically to keep down the heat of the body, and functional or structural disease is the result. Hence that very condition of the organs which was so suitable for the maintenance of health under former circumstances is here diathetically predisposed to diseases of the liver, skin, and bowels. What we have thus assumed to be the maladies most likely to affect those going from a cold to a hot climate, are shown by the writings of the highest authorities to be the disorders which actually result from such a change. The converse of the foregoing has also been amply verified by experience in the case of natives of warm climates who have changed to cold ones. In these the lungs, kidneys, and digestive organs are most likely to suffer, and particularly from those tubercular disorders which result from the non-digestion of fats. These examples I have merely sketched for the purpose of illustrating my proposition. It is impossible, in so narrow limits, to discuss fully and exhaustively these and the numerous other constitutional modifications which depend on an equally great variety of influences. Suffice it for the present that I make my meaning clear. It is, I think, evident that while a diathesis becomes manifest as such only under circumstances which elicit its proneness to certain diseased actions, it is formed under very different conditions. The diathesis, where its essential constitution has been built up, is a salu-

tary relation of the body to surrounding agencies—a healthy response of its organs to all the demands made upon them. It is only when it is transplanted to an altered set of influences that inconvenience from it begins to be experienced.

Diathesis will manifest itself variously, according to the direction in which the change is made. A predisposition to quite different diseases, for example, will arise in the European, according as he moves northward or southward, It is well known that those whose ancestors have for generations been healthy inhabitants of a particular district, whose own health has previously been good, and who have inherited no apparent predisposition to disease, invariably discover, on making their first great change of climate, that they have weak points of which they were until then ignorant. Nor is a great change necessary. A hundred miles—often much less—may bring the traveller into a climate sufficiently new to be trying. It is the common experience of those coming from not distant counties to reside in the Scottish metropolis, that several years elapse before the constitution becomes adapted to its severe spring seasons.

So numerous and various, however, are the diatheses which we encounter on every hand, that any attempt to unravel the tangled web may well appear, at first sight, to be quite hopeless. Only by tracing out thread after thread can we do it successfully. By taking a diathesis, and thoroughly analysing its strength and its weakness, noting the diseases from which it is free, and those to which it is prone, and then ascertaining which changes of climate or of other conditions give rise to similar manifestations, we shall gradually arrive at such a knowledge of its probable causes and nature as may prove a useful guide to us in our treatment.

7. *The conditions under which a diathesis is developed being the opposite of those under which the diseases depending on the diathesis are generated, the means employed for the treatment of the latter will be the opposite of those necessary for the alteration of the former.*

The cure or removal of diathetic weakness resolves itself very much into the question of acclimatisation ; for climate must be regarded as the chief cause of constitutional modification. It is, of course, quite unnecessary to attempt the removal of a condition of the body which is highly beneficial under certain circumstances, unless those circumstances are to be altered. In the latter case a right anticipation of the effects likely to be produced by any particular change may be of the greatest importance. Many might thus be deterred from exposing their bodies to risks of which they would otherwise be ignorant. Even in cases where great changes must be undertaken, to be forewarned is to a great extent to be forearmed. Much may be done to ward off danger, through a previous knowledge of the directions in which it is likely to assail. We have already seen that all organs of the body are capable of a certain amount of education. In this process the work must be gradually increased as the power to accomplish it increases. Great and sudden augmentation of effort will prove disastrous. Hence it is not surprising that, where extreme changes of climate have been at once attempted, acclimatisation has been pronounced impossible. The history of many a colony, and the high mortality among European troops sent at once to tropical stations, testify to the fact that without constant new arrivals a race thus transplanted would soon die out. The sacrifice of human life brought about by such sudden transitions is so great that it is of the utmost importance to understand how it is caused, and how alone acclimati-

sation can be safely accomplished. In the adult great changes must in all cases be regarded as unsafe. High prospects in a foreign land are, however, often held out to the youths of a family, and it may be the duty of the parents to train them up so as to be able to avail themselves of these advantages. Analogy leads me to believe that, by a careful and gradual special education of the organs commenced in early life, much might be accomplished in this direction. We have seen that an internal organ, such as the lungs or liver, does undergo a development proportioned to its exercise, and it is probable that, by a carefully graduated scale of exercises, its functional powers might be developed as readily as those of the muscles or the organs of special sensation. Mr Darwin speaks of "an innate wide flexibility of constitution," as being "common to most animals," upon which "adaptation to any special climate can be readily grafted," which is, in reality, this readiness of the organs of the body to become educated so as to respond to new or increased demand. Such training, however, to be successful must be gradual. During their earlier years the children should be cautiously moved through intermediate climates towards that in which they are ultimately to reside, a few years being spent at each in turn of a number of places by degrees approaching in climate to their final destination. Thus acclimatisation might, to some extent, be effected in one generation. Such a plan may appear quite impracticable; but I fear there is no royal road over so great a difficulty. Again, the serious sacrifice of life resulting from the system of garrisoning our foreign stations with recruits fresh from home demands the deepest consideration. If our tropical colonies are to be garrisoned by English troops, they should have a permanent army, consisting of men whose constitutions have, in early life, by

a gradual removal from home through intermediate colonies, become educated and modified to suit the new conditions. Or the recruits should be taken from acclimatised families in some of the intermediate colonies approaching to the one alluded to in climate, these again being recruited from those still nearer home. Thus, a constant current of Anglo-Saxon blood, bearing with it English vigour, ideas, and customs, would be maintained, passing safely and profitably to the most distant British possessions. It must, however, be born in mind that acquired organic power cannot be so perfect as that which has, for many generations, been inherited.

In the next place, the actual diseases which specially merit the name of diathetic are those connected with the organs and functions which, in the particular form of the constitution, are habitually weak. In most cases these disorders result from unusual augmentation of function, caused by change of circumstances, and rest to the overworked organs is clearly indicated. This will be best obtained under the influence of conditions which make small demands upon their activity, and those under which the constitution has been formed are most likely to meet this requirement. While this is to be remembered in all cases, it is most clearly indicated when organic or functional disturbance has followed recent change of locality in a person not previously so affected. Here it is highly probable that an alteration in the surrounding influences is the cause, and it is evidently our duty to advise a return, if possible, to the native air until the disturbance subsides, and then to direct our treatment to the careful cultivation of those weak points which have manifested themselves. By judicious management much may be done to mitigate the risks of change. This is, however, impossible, unless the nature of those risks be understood

I would here again reiterate my belief that, in cases of partial loss of an organ, when the remainder is healthy and sufficient in amount to ward off immediate danger, we may hold out considerable hope of gradual recovery to the patient. The grounds upon which we venture to anticipate such a result will make us careful to see that such a gradual process of recovery is favoured. The reason why such recoveries are so few is apparent. Undue haste, arising from ignorance of the principles upon which they are to be affected, often frustrates the possibility of such a happy result. If we are to succeed, both we and our patient must be content to keep up our efforts and our hopes for months and years instead of days and weeks.

What we often attempt with medicines is to educate organs—sometimes to perform their own functions better, sometimes to take up the functions of other organs which have ceased to be able to perform them. We do the former when we stimulate a sluggish liver into its proper activity. We do the latter when, in the case of organic disease of the kidneys, we administer purgatives. Our treatment here is evidently an effort to teach the bowels to excrete those substances which have been wont to pass off by the kidneys. It is a practical application of the law of community of function, which Dr Carpenter thus describes :—

"As in the simplest or most homogeneous beings the entire surface participates equally in the act of imbibition, so, in the most heterogeneous, every part of the surface retains some capacity for it; since, even in the highest plants and animals, the common external integument admits of the passage of fluid into the interior of the system, especially when the supply afforded by the usual channels is deficient. In the same manner we find that whilst, in the lowest animals, the functions of excretion are equally performed by the entire surface, there is, in the highest, a complex apparatus of glandular organs, to each of which some

special division of that function is assigned; but as all these glands have the same elementary structure, and differ only in the peculiar adaptation of each to separate a particular constituent of the blood, it is in conformity with the law just stated that either the general surface of the skin or some of the special secreting organs should be able to take on, in some degree, the function of any gland whose duty is suspended; and observation and experiment fully bear out this result."—*Comparative Physiology*, p. 131.)

In conclusion, I venture to offer the following suggestions regarding climate, which plays so important a part in relation to health and disease. In change of climate we have undoubtedly the most powerful remedial agent of which we can avail ourselves in the prevention and treatment of disease. As it has, however, never been rightly studied, we at present know so little of its connection with, and effects on, morbid action, that the prevailing opinions on those subjects are most conflicting. If it is ever to be employed successfully, it must first be studied systematically, as other established remedies have been. It is not enough, although of great importance, to know the physical characters of particular climates, such as their moisture or dryness, equability of temperature, protection from certain winds, &c. Until the effects of definite changes upon particular diseases are carefully tested and settled by experiment, we shall not be in a position to avail ourselves with anything like confidence of this means of cure. Nor is there any insuperable obstacle to such an investigation. Had we, in our large hospitals, wards set apart for the purpose, and an understanding established between the principal hospitals over the world, definite knowledge on this important subject would rapidly accumulate. Such an inquiry would throw much light upon the great question of diathesis and disease, and change of air would soon occupy the important place to which it is

entitled in the treatment of disease. The expense of such an undertaking would not be great. A single ward at each selected locality would be sufficient for a commencement; and patients, willing, for the great benefit to be derived from such a change, to pay at least their travelling expenses, would always, I believe, be found in more than sufficient numbers. It would not, moreover, be unreasonable to expect from the wealthier members of society some support towards an enterprise, from which they themselves would ultimately be the chief gainers.

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