A Lecture ON MEANS FOR THE PROLONGATION OF LIFE.

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THE subject of the prolongation of life is a very large one, especially if considered with regard to the whole population from infancy onward.

The diminution of infant mortality and the improvement of the hygienic conditions of towns and houses have raised, and will continue to raise, the average duration of life. Here is a wide field of usefulness, and one of the most important sections of it will be the combat with the various forms of pathogenic microbes (Pflueger) in which men like E. Jenner, Pasteur, Lister, Koch, and others, have rendered immortal services to humanity. And, besides, the physical education of the entire population, which ought to commence in the nursery, and ought to be insisted on at all schools, public and private, will not only contribute to the prolongation of life, but improve the whole race, so that our grandchildren ought not to hear any more of the deterioration of the physique of recruits and other candidates for the army and the professions and trades.

This very promising subject will, as far as possible, not be touched in the present discourse, which will relate principally to the prolongation of the life of adults, by the arrangement of the manner of living. It is a purely empirical contribution, and does not enter into the pathological anatomy, so ably described by Dr. Savill¹ in his interesting paper before the Medical Society of London in March, 1897, into the clinical symptoms sketched by Dr. Clifford Allbutt,² by Dr. Savill and others, nor into treatment,³ which is purely preventive.

Much has been written on this subject from remote antiquity up to the present time. When I think, for instance, of Galen's *De Sanitate tuenda*, Cicero's *De Senectute*, Bacon's *Historia Vitae et Mortis*, and Hufeland's *Makrobiotik*, Sir John Sinclair's *Code of Health*, Pflueger's,⁴ Ebstein's,⁵ and many other good essays on this subject, it may look presumptuous that I address on it so learned a body; but the facts that I have occupied myself with it for half a century, and with a certain measure of success as well in others as myself, and that I may perhaps open up some fresh aspects, embolden me to place before you in a condensed form some of my experiences and views.

Mr. T. E. Young⁶ cites from the records of life assurance and annuity societies in England 7 cases of male and 15 cases of female lives having lived to between 100 years and 105 years and 8 months. This statement we may receive as perfectly trustworthy, but considering the very large number of lives among which these 22 cases of the duration of life beyond 100 years have occurred we see that such a duration of life is excessively rare. Dr. Tatham, Superintendent of Statistics, General Register Office, has kindly informed me that according to the census of 1903 there were in the whole population of England and Wales living above 90 years 3,056 males and 6,482 females, in all 9,538; and above 100 years 47 males and 99 females, in all 146.

The results of the inquiries of the Collective Investigation Committee of the British Medical Association are most judiciously analysed and interpreted by Professor Humphry in his delightful little book, *Old Age*, and give similar proof.

We are therefore justified in assuming that, although life is usually limited to 80 years, it may occasionally be prolonged to 100 and even more through the operation of particular internal and external agencies. By carefully studying these agencies we may sometimes succeed in prolonging life to the limit natural to the human species.

In examining the circumstances under which man is likely to reach the natural term of life, and especially the manner of living by which this end can be promoted, we must not allow ourselves to be deterred by the experience that some of the most long-lived persons have led injudicious lives, and that great longevity occurs occasionally under the most different circumstances. After having carefully entered into the records of more than 100 cases of very long-lived persons, I

have reason to say that by far the majority of them were temperate; were small meat eaters; lived much in the open air; led an active life; many a life of toil with great restrictions as to food and comforts; that most of them were early risers; that a great number of them had a joyful disposition, and performed their work cheerfully; and that only few were intemperate or idle and lazy persons.

HEREDITY.

I have endeavoured to ascertain what is the principal factor of inherited longevity. There were differences in the different long-lived families; but all of them were endowed, as far as I could learn, with a good heart and good blood vessels, and I am inclined to ascribe to the circulatory system the greatest share, which, however, cannot be separated from the respiratory system and from the vaso-motor part of the nervous system.

The chances of a person belonging to a long-lived family are, *caeteris paribus*, much better than those belonging to ordinary families, but it is dangerous to rely too much on such a privilege. In a family, for instance, of 11 children, whose parents (both) died above 90, 5 men and 4 women, leading satisfactory lives, lived to 88 and more, while two addicted to alcohol, died between 60 and 70. The tendency to early death is likewise hereditary in some families, to such a degree that careful assurance offices refuse members of such families; but by judicious management, if commenced early enough, the life can be considerably prolonged in spite of the inherited tendency to early death, which seems to be mostly associated with a weak vasomotor system.

It seems to me a matter of importance to keep the idea of our power of influencing heredity constantly before our mind. In the same way as different hereditary varieties can be produced in animals and plants, hereditary tendencies can, I think, be produced in man to long life and early death. If this view were to be taken up, not only by medical men but also by the public, we might have in the course of time many long-lived and few short-lived families. Much, no doubt, can be done by physical education, great moderation, and suitable occupation; but the most powerful influence would be exerted by well-selected marriages, and this, I fear, will never be quite in our power, and it would not be quite natural.

In advising persons with a hereditary tendency to rather early death it is most important to become acquainted with the causes of death of their parents and blood relatives, since by combating the tendency to these causes of death from as early a period as possible we often succeed in prolonging life. This is conceded by the majority of medical men with regard to tuberculosis; but numerous deaths between 50 and 70, which are caused by the weakness of the fibres of the heart and of the coats of the arteries and capillaries, can be avoided, or at all events greatly retarded, by regular exercises, including walking and breathing exercises, and great moderation in food and alcohol; the tendency to atheromatous and allied changes by similar means; and not less so that to stone in the urinary organs; the tendency to senile bronchitis and pneumonia, which form so frequent causes of death in advanced life,⁷ by much air in and out of doors, by respiratory and other exercises tending to strengthen the heart and the lungs; dipsomania by total abstinence from youth onwards; and almost all other hereditary causes of death can mostly be warded off by judicious arrangement of the manner of living.

I could give a great many instances of persons who escaped the diseases of their parents and near relatives by well-adapted management. I will, however, confine myself to my own case, because you know me and see me before you. My mother died before she was 60 from inherited weakness of the heart, which led to frequent attacks of bronchitis and general dropsy. My father died in his 60th year from cerebral apoplexy; he had not been an abstainer himself, and his forefathers during four generations had taken largely the strongest kinds of hock, and port besides, and died from affections of gouty nature. By moderation and abundant exercise of mind and body I have escaped death from these causes and have prolonged my life, although I must confess that I have not quite effaced the gouty tendency inherited from five generations.

Death from old age is caused by a kind of atrophy of the tissues and organs connected with the changes in the blood vessels and the atrophy of the haematogenic glands. For the more accurate description of these senile changes, I again refer to Dr. Savill's paper already mentioned. We must counteract this tendency to senile atrophy by supplying the

tissues and organs with healthy blood; and to do so we must endeavour to produce a healthy state of the blood and to maintain the blood vessels and lymphatics in a sound and vigorous condition. Life, we may say, depends to a great extent on the state of the organs of circulation.

The physiological processes connected with this all-important question have been studied by Ludwig and his pupils, including in this country especially Sir Lauder Brunton, and independently by Dr. George Oliver, of Harrogate. During the action of an organ its arterioles become widened, more blood flows into the capillaries and the lymph spaces, more food and more oxygen are carried to the tissues, and at the same time the waste products are removed. This has often been demonstrated on the muscle whose regular contraction causes increase in size and strength; it is, however, not only the muscular fibre which gains, but the nutritive vessels and absorbents gain equally much. The increased flow of blood which is caused by the action of the muscle forces the small vessels to work to bring more blood to the organs and tissues, and to remove the used up material, and thus their coats are kept in a sound condition. Similar is the case with the brain and nerve centres; the acts of thinking and of movements in the voluntary muscles lead to afflux of blood to the nerve centres, to increased nutrition of the ganglion cells and nerve fibres, and of the minute vessels efferent as well as afferent. The afflux of blood to the brain by the act of thinking has been shown by the ingenious experiment of Mosso, one of Ludwig's pupils, who has constructed a finely balanced table on which he placed a man in the horizontal position, and demonstrated that during the act of thinking the lead becomes heavier, so that the head portion of the table goes down. My attention has been directed to this experiment by Sir Lauder Brunton.

If we review the different means in our power to prevent early decay and to keep the circulatory system in a healthy condition, we find that the most efficacious are given by the different forms of exercise.

The mode of action of muscular exercise Dr. George Oliver explains ingeniously in his address delivered before the British Balneological and Climatological Society in May, 1903, to which I must refer you. He has lately made a large number of observations on the effects of respiratory and muscular exercises on the blood pressure and on the tissue lymph circulation, and he informs me "that all these exercises (respiratory and muscular) produce the same effects—namely, (a) a rise of blood pressure and an increase of tissue fluid during the continuance of the exercise; and (b) a rapid decrease and immediate fall in pressure, and a diminution of the tissue fluid on the cessation of them;" and he has found "that the rise and subsequent fall in pressure and in tissue lymph are greater when these two forms of exercise are combined than when one or the other is practised alone." He concludes that exercise (whether respiratory or solely muscular, or both combined) stimulates the fluid exchange between the blood and the tissue spaces, and he hopes to have the opportunity of demonstrating these and other conclusions furnished by these observations before this College.

WALKING.

In this, the most natural form of exercise, the action of the heart and the breathing are accelerated; more blood is passed into the blood vessels, which are obliged to contract more frequently and carry it with greater energy to the different organs and tissues, nourish the latter, and become themselves nourished. At the same time the number and depth of inspirations are increased, more oxygen is taken up and more carbonic acid is given out. Walking, however, does not only act directly on the heart, but, by the action of the muscles of the legs, more blood is attracted to them and all afferent vessels of the lower extremities carry away more blood from the heart and the efferent vessels, the veins and lymphatics, carry more blood back to the heart, and force it to contract more energetically. The circulation of the blood and lymph in the abdominal cavity is likewise powerfully accelerated by the act of walking, as well through the direct pumping action of the heart, as also by increased contractions of the diaphragm and abdominal walls. All the organs of the abdominal cavity share the improved state of the circulation. The act of walking causes, through increased action of the heart, an increased afflux of blood to all the organs of the body, and thus improves the state of the organs and their blood vessels. In addition to these effects we must take into consideration the fluid exchange between the blood and the tissues explained by Dr. Oliver's observations. Another effect of walking and

of all muscular exercises is the nutrition of the muscles themselves; and this is a most important means of counteracting the natural tendency to decay, for the atrophy of the muscles is one of the first manifestations of senility, and is one of the main causes of the loss of weight in aged people.

The amount of walking necessary to maintain health varies widely in different persons and under different circumstances, we may say from half an hour to two or three hours a day, part to be taken in the morning, part in the afternoon. People in advanced age mostly are unable to take as much as those in middle age. Those who possess fairly healthy organs of circulation derive more benefit from gentle uphill exercise than from walking downhill or on level ground. Also in weakness of the muscular fibre of the heart and moderate degrees of dilatation, graduated uphill exercise, as suggested by Oertel, has a most beneficial effect. It is, however, scarcely necessary to say that these suggestions as to walking are intended for fairly healthy persons, including valvular affections with perfect compensation.

This regular walking exercise, provided the health is fairly good, ought not to be interrupted by so-called bad weather; it ought to be taken in all kinds of weather—rain or sunshine, cold or warm. Almost every one becomes easily accustomed to every state of the weather, and the tendency to rheumatism and catarrh from chills is either totally overcome by it, or, at all events, very much diminished. When a friend of mine asked Moltke, the great general, by what means he had maintained his health and activity, he answered, "By great moderation in all things; by regular outdoor exercise in all weathers, good and bad; never a whole day at home." He was in his 90th year at that time.

THE WEEK-END HOLIDAY.

It is of great use for those who are still in fair vigour to take regularly, once a week, a day of more prolonged exercise up to four and six hours; and those who live in town ought to spend this day of extra exercise in the country, if possible, on account of the purer air and the change of scene. The benefit of such a long walk is increased if only a very small quantity of food and fluid is taken during the walk, for instance, a sandwich or a few biscuits and an apple or an orange. One of the visible effects of such a walk, combined with a very restricted taking in, is that the body loses mostly between two and seven pounds during the walk.⁸ This loss consists almost entirely of water through the skin, the lungs and the kidneys, but with the water some salts and other excretory substances are removed. By the simultaneously increased removal of fluid and diminution of supply, more used up material is withdrawn, and the somewhat starved tissues are enabled to take up more new material. The weight lost on the long walk is usually regained within two or three days.

Many persons, including some medical men, are of opinion that it is injurious to take much active exercise, especially in advancing years, that the body is sooner worn out by it. A friend of mine, who was known by many of you, the late Mr. George Pollock, often told me this and tried to dissuade me from my long walks, as he believed that they would wear me out sooner than rest. He did not succeed in dissuading me, as I am sure that the "wearing out" theory of the organs is wrong.

The animal body is not a machine, made of dead substance like wood or leather, but is made of living organs and tissues, which by action are not worn out, but nourished and maintained in working order, provided always that the exercise is not over-exercise. It is true that work causes wear of tissue, but the wear is compensated by increased supply and increased power to assimilate this supply. Dr. Martin Luther's motto, "*Rast ich so rost ich*" (If I rest, I rust), is perfectly true. Old persons accustomed to much exercise may go on walking as long and as much as agrees with them; but they must keep up the habit if they wish to keep up their power, for if they leave off walking for some months, or even weeks, it frequently happens that they cannot resume it without injuring themselves. In this respect there is a great difference between the old and the young. One of the great advantages of several hours' exercise in the country is the exposure to the open air, which is scarcely to be overrated; it strengthens the skin and the nervous system, and, through this, the digestive system and the whole organism; it cheers the mind; it increases the resisting power to meteorological influences, and diminishes the tendency to chills and other morbid affections; and this resisting power is one of the great factors of longevity. Life in the open air, by itself, without exercise, increases the resisting power. It is not for tuberculosis alone

that open-air treatment is useful, but also for almost all other chronic affections.

THE SUMMER HOLIDAY.

Still more beneficial than the once-a-week extra exercise is the plan of taking once or twice a year a walking or climbing tour of three to four weeks or longer in mountainous districts, especially on glaciers, with three to six, or occasionally even eight, hours' active walking or climbing on most days of the week; provided that the organs of the body are free from disease, and that they be gradually accustomed to the increased work. The amount of benefit to be obtained from such tours, if judiciously arranged, can scarcely be exaggerated. They exercise an actually rejuvenescing influence, in which every organ of the body shares more or less, from the brain to the skin and hair. The power for mental work is increased, the view of life's duties, and its worries and hardships, is corrected; and often I have observed that the hair of the head and beard, when commencing to turn grey, has resumed after good courses of climbing more or less of the original colour. The action of the heart is likewise in all persons tangibly improved, in some to an astonishing degree. Again and again I have witnessed in many others and in myself that before the climbing tour a slight exertion in walking rather quickly caused the pulse to rise from 60 or 65 to 110 and 130, while after the climbing tour the same or even much greater exertion produced only a rise to 80 or 85. The pulse tracings by the sphygmograph are equally significant.

RESPIRATORY EXERCISES.

The remarkable improvement in the heart's nutrition and action is, I think, to a great degree caused by the deep inspirations which are necessitated by the act of climbing, especially steady and prolonged climbing. This consideration has led me to pay particular attention to respiratory exercises, which since then have been very useful to myself and many others, especially persons with weak heart muscles. I make no claim of originality for these exercises; they are only a modification of several older systems of gymnastics. As in walking and other bodily exercises, the amount and modus of respiratory movements which are useful greatly vary with the individual condition, and must be adapted to the latter. It is often injurious in cases of weakness of the heart or lungs, or the sequelae of pneumonia or pleurisy or other acute disease, especially influenza, to begin at once with forced respiratory movements. I have mostly commenced with moderately deep inspirations and expirations continued during three to five minutes, once or twice a day, and have gradually increased the exercises to ten minutes or a quarter of an hour. The depth of each inspiration and expiration, is likewise to be only gradually increased. At the beginning a sixth or a quarter or half a minute, for every inspiration and every expiration ought to be sufficient; if this is well borne, each act may be gradually be prolonged in duration, so that in the majority of cases each inspiration and each expiration may be brought up to a minute. All the movements are to be made slowly, not rapidly. I usually advise to inspire in the erect position with the arms and closed mouth, and to bend down the body during expiration so that the fingers touch the ground or the toes. By degrees one can learn to make several up-and-down movements during every inspiration, and bend and raise the body several times during the expiration. By this alternate bending and raising of the body we gain the additional advantage of strengthening the lumbar muscles and through this successfully combating the tendency to lumbago. Another useful combination with the respiratory exercises is the turning of the body round the axis of the spinal column, alternately with deep inspiration from left to right, and with expiration from right to left with half raised arms. By this movement we bring into action some of the muscles of the spine which are apt to be only imperfectly used by most persons in advanced years; and the stiffness of the neck and spine, and the tendency to stoop, so common in old people, can be to some degree corrected by this kind of movement, if commenced early enough and practised regularly and thoroughly. The swinging of the arms round the shoulder-joint is likewise a useful combination. Other combinations with muscle and joint movements will occur to those who have accustomed themselves to these respiratory movements; but the latter ought always to have our principal attention, since to them the beneficial effect on the heart and lungs is mainly due. In addition to the influence on the circulation the respiratory movements keep

up the nutrition and efficiency of the lungs themselves, which undergo in old age a kind of atrophy; the walls of the smallest divisions and air cells become thinner, and a kind of senile emphysema is developed, which by these exercises is to some degree prevented. Another important influence consists in maintaining the elasticity of the chest walls, which are apt to become stiff in old age, and thus to interfere with free movements of the lungs and the pleura.

If for some reason the erect position should be inconvenient, the mere respiratory movements can be made also in the horizontal and sitting positions. I have already alluded to the additional advantage of the compression of the abdomen and the blood vessels and organs contained in the abdominal cavity, and we may further point out that the action of the serous membranes, of the pleura, the pericardium, and the peritoneum are also beneficially influenced by the deep respiratory movements; they constitute a kind of massage to the lungs, the thoracic walls, pericardium, and heart (Sir Lauder Brunton). In trying to explain the effects of these respiratory movements we must not forget the important item of the fluid exchange produced by them between blood and tissues (Oliver).

We must, however, not be satisfied with the few minutes of respiratory exercises, but we must make a habit of taking at several other times of each day deep inspirations and expirations, especially while walking. Breathing exercises are especially useful to literary workers, statesmen, professional men, and others who are unable to take one of the usual modes of exercise. The most convenient time for practising them is in the morning before or after the bath, when the body is loosely covered with flannel. I ought to add that they are not suitable for very delicate persons; they are, for instance, injurious in great dilatation of the heart with or without valvular disease; such affections require much milder movements, like those practised by Professor Schott at Nauheim; nor are they suitable in active tuberculosis and in tendency to pulmonary haemorrhage, and in the early stage of convalescence from severe acute diseases. On the other hand, their judicious use may be regarded as one of the preventives of diseases of the lungs, and can also be rendered beneficial in the later stages of convalescence from acute disease, and under medical guidance in some apyretic forms of chronic tuberculosis.

These respiratory exercises are different from P. H. Ling's so-called "Swedish gymnastics," but the latter are likewise most useful for the maintenance of health, and they can be adapted with many modifications, according to individual conditions, to many persons who are unable or disinclined to take ordinary walking or riding exercise, or who have local defects of movement from disease or want of use. The so-called Danish exercises and Streber's gymnastics (Streber's *Zimmergymnastik*) too, have many similar advantages, and also ordinary gymnastics as they are practised, especially in Germany, under the name of *Turnen*, although these are less suitable to old age than to the earlier periods of life.

TENSION EXERCISES.

Another convenient form of exercise, especially useful in gouty people, recommended by Dr. Oliver, is what he calls the static or tension exercises, which consist in the static contraction of all the muscles of the body, while standing, from one to two minutes several times a day. In goutiness the arterial pressure is increased, and the tissue fluid is prevented from returning to the blood, and lodges in the tissue vacuoles. Tension of the muscles diminishes the arterial pressure and allows the tissue fluid to return. Dr. Oliver finds that one minute's tension clears up as much as 20 per cent. of lymph. These tension exercises may be practised best an hour before all meals, when Nature itself produces a normal fall in the arterial pressure; but other times may be substituted if more convenient.

While recommending walking and climbing tours and respiratory exercises and various forms of gymnastics, I must guard myself against the indictment that I disregard the value of riding on horseback and different kinds of sport. I, on the contrary, regard them as most useful to a very large number of persons, but I am unable to enter upon them here.

FOOD.

Attention to the digestive system and food is almost as necessary for the promotion of longevity as that to the circulatory and respiratory systems. It is impossible to lay down strict rules. One rule, however, we can lay down without

fear of harm—namely, that great moderation in the amount of food, and especially of the most nourishing articles (flesh food and pulses)—ought to be practised by everybody, particularly by old people, and is a great aid to longevity; but here, again, the term “moderation” must have a different meaning for different persons, and is to be judged individually. Many people think that if they only abstain from alcoholic stimulants they may eat large quantities of meat and eggs and other highly nutritive substances, and thus they, or, at all events, many of them, gradually develop changes in their blood vessels and other organs, which may not come to their perception at once, but for all that take place, and may later on show themselves as gout, arterial hypermyotrophy, atheroma of arteries, glycosuria, disease of the liver, the kidneys, etc. If you tell them that they must reduce the amount of food, must take only little meat and flesh food and alcoholic stimulants, they, or their relatives, especially ladies, think that you starve them—that it is impossible for them to do their work on reduced allowances. Few people know how little food is required to maintain health, especially in advanced age. Amongst the results arrived at by the Collective Investigation Committee of the British Medical Association we find that only few (5 per cent.) of the persons above 80 years had been large eaters of animal food, and that the majority had eaten only little meat, and this is the result of my own experience. Sir Henry Thompson has given excellent advice in *Diet in Relation to Age and Activity* (edition of 1901), and not less so Dr. George Keith in *Plea for a Simpler Life* (1896) and *Pads of an Old Physician* (1897), and also Dr. Burney Yeo in *Food in Health and Disease*. As long ago as 1568 and 1620, L. Cornaro of Venice has shown by the description of his own manner of living, when he was more than 90, in his *Discourses on a Sober and Temperate Life*, how, on a very small amount of food and wine, one can maintain perfect health and happiness and reach a very old age. He lived to over 100, and died without suffering. Addison gave a paragraph on this book in the *Spectator*, vol. iii, No. 195, and Abernethy recognized the practical correctness of Cornaro's precepts, if we may judge from an amusing sketch in the possession of the Royal Medical and Chirurgical Society to which Dr. Parkes Weber has directed my attention, and which those of you who do not know it ought to see. It represents Abernethy lying on the floor near a table covered with food and wine, at which two ladies and a gentleman sit; to them Abernethy delivers a very short lecture, from which I will only quote a few words:

You should take my blue pill now and then, fasting. Read Cornaro on temperance; he lived to nearly the age of Methuselah! Practise his rules and regimen (if you can); get up before sunrise and get to bed after sunset. Sluice yourselves every morning, winter and summer, with cold water. Lie on your back, as you see I do, every day after dinner.

Sir William Temple says in the chapter Of Health and Long Life: “Essentials amongst primitive people are—great temperance, open air, easy labour, little care, simplicity of diet, rather fruits and plants than flesh.”

Vegetarians, strict as well as modified, can attain long life; but I have not been able to convince myself that in fairly healthy people a moderate amount of meat, fish, poultry, and game causes any bad effects. At the same time, we must state our conviction, based on ample experience, that most people enjoy better health and live longer with only little meat and flesh food and a larger quantity of vegetables, to which milk and its derivants may be added. It is especially in advanced age and in gouty persons that meat ought to be taken very sparingly.

Almost all authorities are agreed on the subject that in old age the amount of food ought to be very limited. Dr. George Cheyne, for instance, says in one of his rules, “The aged should.....lessen the quantity and lower the quality of their food gradually as they grow older, even before a manifest decay of appetite force them to it.” Sir Henry Thompson says, “Less nutriment must be taken in proportion as age advances, or rather, as activity diminishes, or the individual will suffer.” Many old persons are alarmed by their becoming thinner, and to avoid this think they must eat more; but this is mostly quite wrong. In the majority of cases increase of weight after 70 or 75 is not good, and corpulence is to be counteracted by the quantity and quality of the food and other means, while a slow decrease is mostly observed in those who reach a very advanced age. *Corpora sicca durant* was a true saying already in antiquity.

An important subject, constantly preached, but almost as constantly neglected, is thorough mastication. Many forms of indigestion, many states of imperfect nutrition of the

whole body, are caused by what is called bolting the food. Nothing ought to be swallowed until it has been perfectly comminuted by mastication and by the admixture of saliva transformed into a kind of pap. Quite lately Dr. van Sommering of Venice has again directed attention to this point. Combined with the fault of bolting is often that of washing down the food before it is properly masticated. This is likewise a grave mistake, committed frequently by great eaters and by those who take much fluid during meals, which is in itself a bad habit.

ALCOHOL.

Alcohol is not necessary to healthy persons, and most men would be better without it. Many diseases are no doubt produced by the abuse of alcohol; many promising lives are destroyed by it; it is the most frequent cause of crimes and of the ruin of many families. The great mortality amongst public-house keepers is well known and is so general amongst all those who are engaged in the liquor traffic that insurance offices either decline their lives or take them only exceptionally at very high premiums. Yet a small quantity of wine or whisky, or cognac, or beer, according to the individual conditions, is to most persons not injurious, to some even useful.

A very prevalent idea with regard to alcohol is that it is most useful to aged people, in fact that “wine is the milk of old people,” that it does for them what milk does for children. This doctrine I regard as rather fallacious, in so far as it induces some old people to take it in large quantities with injurious effect, although moderate and exactly regulated quantities are often beneficial, as for instance, Dr. Savill found in the aged inmates of the workhouse infirmary. Alcohol taken in any large quantity diminishes the resisting power of the organism against chills, microbes, and other causes of disease, and this resisting power is one of the great agents in the prolongation of life, and ought to be strengthened in every possible way, not weakened. For a careful consideration of the question of alcohol I refer to the chapter on stimulants in Sir Lauder Brunton's volume on *Disorders of Assimilation*, etc.⁹

Persons with small amounts of albumen in the urine, combined with signs of arterio-sclerosis can with great restriction in alcohol and meat, prolong their lives considerably. The majority of them, however, are disinclined to do so, and are inclined to interpret the advice of their doctors in favour of their own inclinations. It has repeatedly occurred to me that when I told such persons that great restriction was necessary, they answered that Doctor X considered restriction quite unnecessary, that he said they were perfectly safe with only several glasses of wine at lunch and dinner. They felt perfect security, but in spite of it they died within three years, while they might have lived much longer with restrictions as to alcohol and meat food. Sir Isambard Owen has given a careful analysis of the results of the collective investigation returns comprising 4,284 persons, and shows that the average duration of life was greatest in the total abstainers and very moderate drinkers, and that only few hard drinkers were amongst the long lived.¹⁰

TEA, COFFEE, AND COCOA.

Amongst the food accessories, tea is regarded by the majority of people as an agreeable, useful, and harmless stimulant, and is consumed by some classes in very large quantities, which can scarcely be regarded as wholesome; although when taken in moderate quantity and strength, it exercises a pleasant effect on the nervous system, especially in physical or mental fatigue, and is not injurious to the majority; but in some persons, particularly amongst those affected with dyspepsia and heart weakness, it produces sometimes disturbance of the heart, the stomach, and the nervous system. When, however, some authorities condemn tea entirely as a poison, and class it together with meat as a most potent producer of gout, we cannot quite accept their view. We have not seen much real gout amongst great tea drinkers, if they were at the same time moderate with regard to meat and alcohol. Tea, Sir William Roberts says, is an inhibitor of salivary digestion, probably through the tannin contained in it.¹¹

Coffee contains in addition to caffeine, which has the same properties of theine, a volatile oil, developed by the process of roasting, some cellulose and extractive material (Parkes and Koenig). The infusion acts on most people in the same way as tea; but in some it causes indigestion and tendency to piles when they take it habitually, while they can take tea without harm. Parkes had a high opinion of the value of coffee specially for soldiers undergoing fatigue. Many of

those in whom tea produces flatulence and faintness, bear coffee quite well. Coffee likewise has an inhibitory effect on stomach digestion, and black coffee after meals ought, therefore, to be avoided by dyspeptics with slow digestion.

Cocoa is different in composition and action from either tea or coffee, although theobromine is chemically almost identical with theine and caffeine. The beans contain a large proportion of fat, in addition to other non-nitrogenous and nitrogenous substances. The cocoa prepared from cocoa nibs is well borne by most persons, but that prepared from the finely powdered kernel disagrees with some on account of the fat. The ordinary chocolate is mixed with much sugar, which makes it disagree with some dyspeptics. Cocoa and chocolate are much more articles of food than tea and coffee, and have much sustaining power in fatiguing climbs and other exertions.

TOBACCO AND SNUFF.

Tobacco is to many persons a means of enjoyment, and is well borne by them, if they take it with moderation; it soothes nervous irritability and makes men often look more contentedly on their troubles. On the other hand excessive smoking is decidedly injurious to the majority of people by affecting the heart, the digestion, the nerves, and the throat. In many cases diminution of the amount of smoking, or taking a milder kind of tobacco, remedies the bad effects; in some, however, the use of tobacco has to be given up entirely.

Snuff is out of fashion at present; but to some people with stiffness of the nose a pinch taken once or twice a day is useful by rendering the breathing through the nose more easy, and also by maintaining to a certain degree the sense of smell, since it acts by its stimulation as a species of gymnastics on the capillaries of the Schneiderian membrane. Many old doctors maintained that snuff taking was a good practice against some forms of frontal headache and blear eyes, and not without some reason.

CONSTIPATION.

An important matter with regard to the digestive system is the action of the bowels. There are great differences in this respect with different persons; many only feel well if they have one or two evacuations daily, and even more, without being obliged to pay any attention to the nature of their food; others only every second or even third day, with perfect health. On the other side there are many persons who have great difficulty in this function of the bowels; they go for three and four days, and longer; some do so without feeling inconvenience, but in the majority in course of time the health is disturbed by this habitual constipation, especially by interfering with the portal circulation, by piles, by the absorption of ptomaines. Constipation is also not rarely the cause of anaemia.

The amount and quality of food are of great importance to persons with sluggish bowels. With many people the intestines are so torpid that the stimulus of ordinary food is not sufficient to make them act. They require substances which cause a certain amount of local, mechanical stimulation, such as is produced by the bran of brown or wholemeal bread, and they also cannot do without a larger bulk of less nutritive food. The best brown bread in my experience is the wholemeal bread recommended by Sir Henry Thompson, which is a modification of the ordinary brown bread or Graham bread, and for travelling, Hill's or Spiking's wholemeal biscuits. The best qualities of Smyrna figs are likewise useful, partly, no doubt, by the seeds they contain, but partly also by the other portion of the pulp. A large part of the food of such people ought to consist of green vegetables, and some fruit such as prunes, and especially apples either baked or, if they are tender and can be easily and completely masticated, raw, in which state they have with many persons a greater influence on the action of the bowels than cooked. Some are perfectly regular when they take two or three fair-sized soft apples at breakfast or lunch, while others prefer bedtime. The quantity of meat food ought to be small.

There are many people who think that it is better to take only the nourishing parts of food, which are, in their opinion, more easily digestible, and save their digestive organs the labour of extracting them; they prefer meat extracts to meat, fruit jellies to the whole fruit, the finest flour to the entire wheat meal; but this is for most persons a great mistake; the stomach and intestines ought to be kept at work, like all other organs of the body, provided there is no ulceration or catarrhal affection of the gastro-enteric canal.

If the arrangement of food is not sufficient to produce

regular action of the bowels, massage of the abdominal organs is in many people a satisfactory measure, and almost every individual can learn to practise this on himself. Another help, and a very useful one, not only with regard to the motion of the bowels, is the voluntary and systematic contraction of the muscles of the abdominal wall, the abdominal pressure ("Bauchpresse" of the Germans). By slowly and thoroughly contracting the abdominal muscles from above downward fifty or sixty times not only the intestines, but also the liver, the bowels, and the blood vessels in the abdominal cavity are compressed, the blood squeezed out and moved on towards the heart, which is strengthened by the extra work, as well as the abdominal muscles themselves. This abdominal pressure can most conveniently be practised at the closet after a motion. A glass of hot or cold water, or of some aerated table water like seltzer, or Apollinaris, or Giesshübler, or a cup of weak tea, taken about one to two hours before breakfast, has often the desired effect; in others, a ride on horseback before breakfast or a brisk walk. A wet bandage round the stomach and loins worn during the night is often a successful measure. If by all these helps the regular action of the bowels cannot be obtained, and if the health of the individual suffers in consequence, mild aperients become a necessity in many, and especially in gouty old people, as the tendency to imperfect removal of excretory matters is often part of their constitution, and may lead to various deviations from health, and ultimately shorten the life.

THE NERVOUS SYSTEM.

Equally important with the organs of circulation and digestion is the nervous system, which, we may say, governs all the other systems and is inseparable from them. We must therefore prevent its degeneration as long as possible; we must nourish it and keep it in action. The state of the blood vessels and the circulation is, again, all-important. Degeneration of the blood vessels of the brain, and the impairment of the brain structure and functions consequent on it, is a frequent cause of premature death, and the tendency to this degeneration is in many families hereditary; but it is to some degree preventable by great moderation in food and stimulants, by regular physical exercise, and by judiciously arranged mental work and occupation. I have often witnessed this, and in a very striking way in a family whose male members had for generations died between 56 and 64 from apoplexy or paralysis or mental decay. Of five brothers in this family two led an active life, mentally and physically, coupled with moderation, and lived to beyond 70 and 73 years, and died from heart affection and pneumonia, while the three others, with less active and less temperate habits, died between 60 and 64 from apoplexy.

The brain often decays from want of physical exercise or mental work. Many men retire rather too early from business; others, especially officers in the army or navy and civil servants, are obliged to do so by the regulations. Amongst these men we see not rarely weariness, dejection, and an inclination to give up occupation and active habits; to remain longer in bed and sit longer over their meals; and, in consequence, sickness of different kinds and also premature decay of the brain functions. Such men ought to find occupation for their brains and take regular bodily exercise. They ought to seek some objects of interest in art or in literature, in studying the habits of insects or birds, in history, geography, geology, zoology, botany, in gardening or agriculture, in the beauties of Nature, in travelling, or in adopting and educating a child, and in other philanthropic matters, etc.; they ought to cultivate a hobby, and this ought to be commenced already while people are still at active work, since the inclination and the aptitude to begin something new disappears not rarely long before 60, when they have to retire from their work. Many old people derive great benefit from chess and other intellectual games, but also from games at cards, especially when the eyesight fails, provided overexcitement or passion is avoided. The families or companions of old people ought therefore to play with them, instead of allowing them to go to sleep during the day or the long evenings. A great point is to keep up variety in mental occupations, and to keep awake the interest in many things so as to prevent mental torpor, which is akin to ossification of cartilages or arteries. All mental occupation leads to increase of flow of blood to the brain, activity of the small blood vessels, and nutrition of the nerve cells. I have already mentioned Mosso's experiment. I could produce the most remarkable proofs of the influence of mental activity on

the condition of the heart, the digestion, and the whole body. I cannot resist mentioning a very striking case which I had the opportunity of watching from day to day, as the subject was an intimate friend of mine. A man of great energy and intelligence, who was the leading spirit in a well-known hospital, began to become languid and to lose his interest in his work at the age of 78. The action of his heart became weak and very irregular, he lost the expression of intelligence, the saliva ran constantly from his mouth, and a viscid and acrid fluid from his swollen eyes; oedema of the legs and at last effusion into the pleural cavities developed themselves in his 82nd year, when suddenly the arrangements which he had created at the hospital were in danger of being overturned. This caused violent excitement in him, he began at first to dictate and soon to write letters; he held meetings, and succeeded in saving his arrangements and his influence. Marvellous was the improvement manifesting itself from day to day. The pleural effusion and oedema disappeared, the heart became almost regular, the eyes and mouth returned to their natural condition, the puffiness of the face subsided, and the intelligent expression came back. He remained in this improved condition about a year, when he died of pneumonia from a deleterious meteorological change. It was the work of the brain which improved the circulation, and especially the joy at his success, which caused this astonishing improvement. Wonderful is the effect of success, and especially of joy, and shows the immense power of the mental condition over the whole organism. But we see also in our professional intercourse the influence of the opposite mental conditions. Grief and loss of hope cause in some people the greatest mental depression, total indifference for their surroundings, combined with at first functional, afterwards organic, changes in the heart, and thus they may die of what may truly be called a "broken heart." Diminished respiration and imperfect supply of blood to the brain probably have a great share in these conditions of depression. Sometimes, but not always, we are able to produce a favourable turning in such cases by awakening an interest in near relatives or friends, or by some other powerful mental influence, which is followed by arousing the depressed functions of the brain, the heart, and the rest of the body.

We must endeavour to cultivate cheerfulness and a happy and placid mind. "A merry heart does good like a medicine, but a broken spirit drieth the bones." (Prov. xvii, verse 22).

In order to promote cheerfulness and avoid mental depression, it is of great importance to educate the sense of duty. The feeling of dissatisfaction or satisfaction with oneself exercises a powerful influence on the mind and, through this, the whole organism, and the thoughts ought to be turned to this from early life. The head of a family, for instance, who neglects the happiness of his wife and the training of his children for his personal enjoyment; the woman who shirks her duty in bearing children and in nursing them for frivolous motives, prepare for themselves, in most instances, worry and often disease and premature death; while those who bring sacrifices for home and family, for the improvement of the condition of the poor with whom they come in contact, earn mental satisfaction and happiness, which act like sunshine on the whole body, and thus become means of prolongation of life and a happy old age. A further point of self-education is the restraint of our passions; not only that we must not allow ourselves to become furious, if anything displeases us; but we must also conquer our ambition, our avarice, our jealousy, our sexual desires, which often become the sources not only of unhappiness, but, as you know, of bodily and mental disease, premature death or "miserable" old age.

A powerful agent in health matters is the will. We must develop it from youth and cultivate it throughout life. A large proportion of those whose lives I have been able to prolong exercised their strong will in carrying out the precepts which I gave them, although they appeared to them at first tedious and difficult. "I will not decay early," they said, "I will maintain my powers and faculties as long as possible." And not only is a strong will a great aid in attaining longevity by maintaining health, but it is also a powerful agent in overcoming disease. This is generally acknowledged with regard to pulmonary tuberculosis; but I have also seen many, and amongst them some almost marvellous cases, in other diseases.

SLEEP.

Under the head of the nervous system we must pay some

attention to sleep, that most wonderful function of our organism. The amount of sleep required differs very much in different people. Children require much more than adults. Most adults do not require more than five and a half to seven hours, but some take nine hours and over. Much depends on the nature of occupation and on habit, and there are in this matter, too, good and bad habits. The habit of sleeping too little is less frequent than that of sleeping too much. There are some hard brain workers who never sleep more than five hours, and even less, and enjoy good health with this small amount up to old age if they live otherwise correctly. Some people fly to sleeping draughts if they wake during the night. This is a very bad habit and ought never to be resorted to, excepting under the well considered advice of the doctor. The frequent use of anodynes and sleeping remedies weakens the heart, the nervous system, often also the digestion and the resisting power. Much sleep, namely, over eight hours—I speak here of adults—is often as injurious as too little, and perhaps more so, especially in persons of full habits, by causing diminution of nervous energy, or degeneration of the small arteries or capillaries of the brain, and in consequence apoplexy or premature decay of mental faculties. Immanuel Kant, who was not only a great philosopher but had also very judicious views about most matters of life, says that much sleep exhausts the energy and shortens life.¹²

With few exceptions, the long-lived reported on and analysed by the Collective Investigation Committee¹³ rose early and went to bed early, and my own observations are entirely in accordance with this. Sir John Sinclair,¹⁴ in his excellent and most diligently compiled work, says: "It is proper to add, that nothing is more pernicious than too much sleep. It brings on sluggishness and dullness of all the animal functions, and materially tends to weaken the body. It blunts and destroys the senses, and renders both the body and the mind unfit for action. From the slowness of the circulation which it occasions there necessarily follows great corpulency, a bloated habit of body, and a tendency to dropsy, lethargy, apoplexy, and other disorders."

At the risk of being blamed by those who maintain that a certain number of hours of sleep, say six to eight, is absolutely necessary, and that it must be taken by day if it cannot be taken at night, I may say that I have always recommended working men, physical or mental, to rise at the same early hour, even if they had gone to bed later than usual, or had not slept well. There are, I need not say, a few necessary exceptions to this rule. It is, at present, the habit of most men doing literary work, to do it during the late evening hours; they say that they cannot collect their thoughts and bring them into proper shape in the morning, but can do so in the late hours of the evening, and better and better the nearer they are to midnight. John Wesley, the well-known divine, it is stated, rose for sixty years every morning at 4 o'clock, and never slept more than six hours.

Before leaving the mental condition and the influence of mental work I must again express my conviction against the doctrine that under ordinary conditions work wears out the organs sooner than idleness or great restriction in work. It certainly is wrong with regard to well-organized brains, if the work is well-arranged and is not "overwork." Judiciously-arranged mental work in itself, with fair intervals of rest, does not wear out the brain. We have fortunately many instances of great brain-workers attaining considerable ages and maintaining their faculties to the end in science, in arts, in politics, in the law and divinity, and also in medicine. Hufeland himself, although he supports the wearing-out theory, was a hard worker and lived to 74. Cicero says: "The intellectual powers remain in the old, provided study and application are kept up, and old age need not be inactive, indolent, and drowsy." We have striking instances in painters, in Titian and in Sidney Cooper; we have amongst other brain-workers Sophocles, who is said to have written tragedies at 90 and more; Plato, Galen, Cato (Censorius), Cicero, Michael Angelo, Heberden, Wesley, Samuel Rogers, Chevreul, Sir Henry Holland the physician, William I of Germany, Moltke, Bismarck, Dr. Holyoke an American physician (died 100 years old), Leopold von Ranke, Mommsen, Gladstone, and many others who exercised their brains to the end of their long lives, and probably contributed through this to their longevity.

THE SKIN.

An important organ, by which the health and the duration of life are influenced, is the skin, one of the functions of which is the removal of excretory matters. This function

which it performs jointly with other organs is apt to become defective in old people, especially the gouty. The skin of old people is mostly drier than in earlier life, partly, no doubt, from the obliteration of some of the capillaries. All active exercises help in keeping the skin more active, but one of the most powerful means is the bath. Many persons with an active circulation can use cold baths from early life to very old age, others with poor reaction do better with a hot bath. Again, others begin best with a warm bath, and then let in cold water and sluice themselves, head included, rapidly with cold water at the end of the bath. The active rubbing and drying with a rough towel after the bath does not only dry and massage the skin, but obliges the bather to make many movements with the arms, which he would not do otherwise. Thus the bath acts as a kind of gymnastics to the skin itself but induces also gymnastics of the arms. One of the great advantages of the bath, especially the cold bath, is that it hardens us against chills by increasing our resisting power, in a similar way as the constant stay in the open air does. It is most useful to combine with the bath the sponging or sluicing the whole head with cold water and thoroughly rubbing and drying it afterwards. Many people can keep themselves free from "colds" by this process. This hardening is further helped by keeping the head uncovered whenever possible not only indoors, but also in walking and driving. If a full bath cannot be managed it is advisable to take a hip bath, and to sluice the head with cold water; and if this, too, is impossible, the whole body may be rubbed with a wet towel.

Before I leave the attention to the different organs of the body I may mention that I have repeatedly seen in elderly persons some advantage from massage of the eyes, ears, and nose in retarding the decay of the corresponding senses. Massage of the thyroid gland is possibly useful in maintaining general energy. Massage of the scalp not only retards the loss of hair, but also prevent some forms of headache.

Amongst the important matters into which I am unable to enter are the clothing, the house to live in, and the climate. A regular change for six to eight weeks every year from one part of the country to another, or to the seaside, or to the Continent, to different elevations above the sea, is a great help to mind and body, and, through this, a powerful agent in the prolongation of life. The exact choice depends on individual points. To some people travel from one place of interest to another is preferable to a long stay at the same place. Travelling is, in fact, a great promoter of longevity. Old people whose mental activity begins to be stagnant ought to go to localities where their attention is stimulated by art, by history, by scenery, by the manners of the people, such as Egypt, Rome, Naples, Palermo, Florence, Venice, Athens, Constantinople, Vienna, Munich, Berlin, Paris, etc.

With increasing years the resisting power of the organism decreases, in some more and in others less; in some earlier, in others later. While in youth and in the prime of life the cold, the dampness, the high winds, the fogs, and mists are fairly well borne, they cause in many old people, especially those who neglect regular open-air exercise, catarrh, rheumatism, inflammation of the lungs, mental depression, and other ailments, and through these lead to disease, premature senile decay, and death. Warmer clothing is useful, but often not sufficient to counteract the inclemencies; it is therefore prudent for many of those who have lost much of their resisting power to spend the winter and early spring in milder climates, where their mind is cheered by sun and flowers, where their accommodating powers are less tried, such as the South and South-west of England, the Riviera, Corsica, the Canaries, Sicily, Algiers, or Egypt. In addition, the larger amount of sun in these localities and the flowers cheer the mind and render it more hopeful, and hope and cheerfulness exercise a most beneficial influence on the whole body. The first Lord Brougham showed his wisdom in this matter by spending the winters of his later life at Cannes, where he enjoyed much better health and prolonged his life considerably.

CONCLUSIONS.

The main points of my advice may be comprised in a few sentences:

Moderation in eating, drinking and physical indulgence.

Pure air out of the house and within.

The keeping of every organ of the body as far as possible in constant working order.

Regular exercise every day in all weathers; supplemented in many cases by breathing movements, and by walking and climbing tours.

- Going to bed early and rising early, and restricting the hours of sleep to six or seven hours.

Daily baths or ablutions according to individual conditions, cold or warm, or warm followed by cold.

Regular work and mental occupation.

Cultivation of placidity, cheerfulness and hopefulness of mind.

Employment of the great power of the mind in controlling passions and nervous fear.

Strengthening the will in carrying out whatever is useful, and in checking the craving for stimulants, anodynes, and other injurious agencies.

In laying down these precepts I wish not to create a life of privation, but to promote a long life and a useful and happy one to the end without suffering, and I can assure you that it has been my good fortune to succeed in a great many cases.

NOTES AND REFERENCES.

- ¹ Old Age in Health and Disease, *Med. Soc. Trans.*, vol. xx, 1897: Arterial Hypertrophy, *Med. Chir. Trans.*, 1897-8; I may also refer to Charcot's lectures on senile diseases. ² On Senile Plethora, Hunterian Society's Transactions, session 1895-6, p. 38; Rise of Blood Pressure in Later Life, *Med. Chir. Trans.*, vol. lxxxvi, 1903. ³ *Die Kunst der Verlaengerung des menschlichen Lebens*, Bonn, 1890. ⁴ *Die Kunst das menschliche Leben zu Verlaengern*, Wiesbaden, 1891. ⁵ I may refer amongst many other works to Dr. G. W. Balfour's *The Senile Heart*, London, 1894. ⁶ *On Centenarians*, 1890. ⁷ See the statistics in Dr. Savill's paper already quoted. ⁸ The loss of weight varies according to circumstances, such as the size and weight of the walker, the amount of fluid taken before starting, the duration of the walk and whether combined with much climbing, the temperature and humidity of the air, the stillness or agitation of the air. ⁹ Macmillan, 1901, pp. 71 to 148. ¹⁰ BRITISH MEDICAL JOURNAL, June 23rd, 1888, p. 1312. ¹¹ *Lectures on Dietetics and Dyspepsia*, by William Roberts, M.D. Smith Elder and Co., 1885, p. 29. ¹² *Journal der praktischen Arzneykunde und Wundarzneykunst*, vol. v. Stück, 4, Jena, 1798. ¹³ Humphry, *Old Age*, p. 53. ¹⁴ *The Code of Health and Longevity*, 5th edition, London, 1833, p. 249.

The Harveian Lectures

ON

THE TREATMENT OF SOME ACUTE VISCERAL INFLAMMATIONS.

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LECTURE III. PNEUMONIA.

It may be well to combine the suggestions of the preceding lecture into an outline plan of treatment for pneumonia, though it may involve some repetition.

Every case in which a rigor occurs and the temperature rises should be sent to bed at once in a well-ventilated room without draughts, the warmth of the room being maintained at 60° F. If pneumonia is apparently developing, a trained nurse should be obtained from the first. The temperature, pulse-rate, and respiration-rate should be observed and recorded on a chart, and this should be repeated every four hours. If the patient, when first seen, is cold and at all collapsed, it is desirable to give him a "hot pack," by swathing him in a sheet wrung out of hot water of temperature of 110° F. (the head being kept cool), and covering him with blankets. Some hot brandy and water may be given to him to drink. He should be kept in the pack for about twenty minutes, then the sheet should be removed, the patient dried quickly, and placed in a warmed bed.

When he has thus been rendered warm, let the practitioner make a careful examination of (1) the tongue, mouth, throat, glands, (2) the left heart, (3) the right heart, (4) anterior pulmonary regions, (5) posterior and lateral pulmonary regions, (6) liver, spleen, abdomen. If pneumonia is developing, it is usually possible, by a very careful percussion, to detect some slight indication of the coming trouble, and it is extremely important to make sure of the diagnosis as soon as possible, for before the expiration of twenty-four hours from the onset there is a chance of arresting the disease by vigorous treatment. There will probably be pain on one side of the chest, with somewhat limited expansion of that side in inspiration, and some slight local impairment of resonance at base or apex. Over this area there may be a very little subcrepitant *râle*, but the chief auscultatory indication will be local feebleness of breath sounds. This comparative absence of breathing