

The present aspect of the antiseptic question ... / by Edward Lund.

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LUND
ON THE
ANTISEPTIC QUESTION.

2 JULY, 1883.

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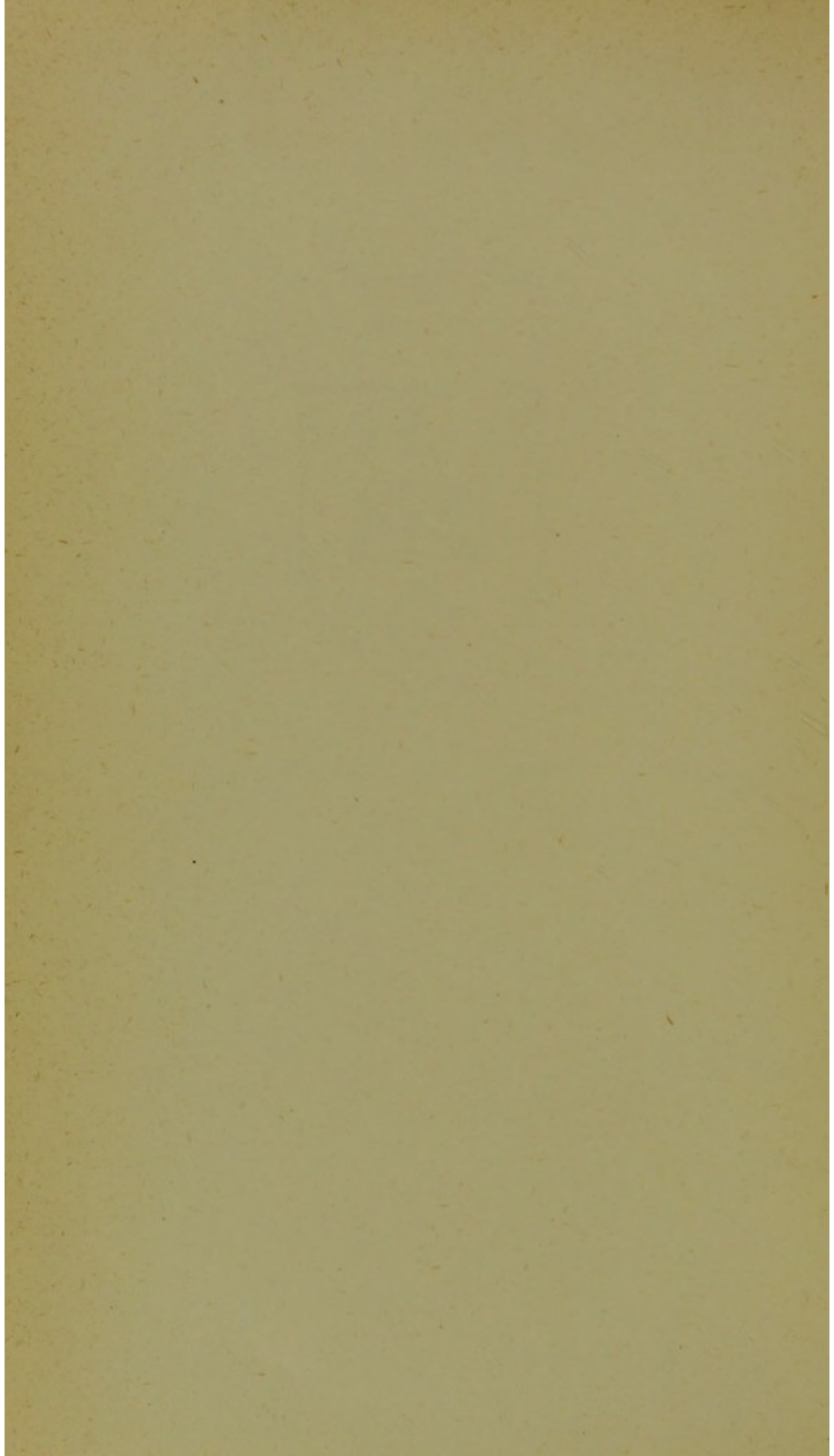
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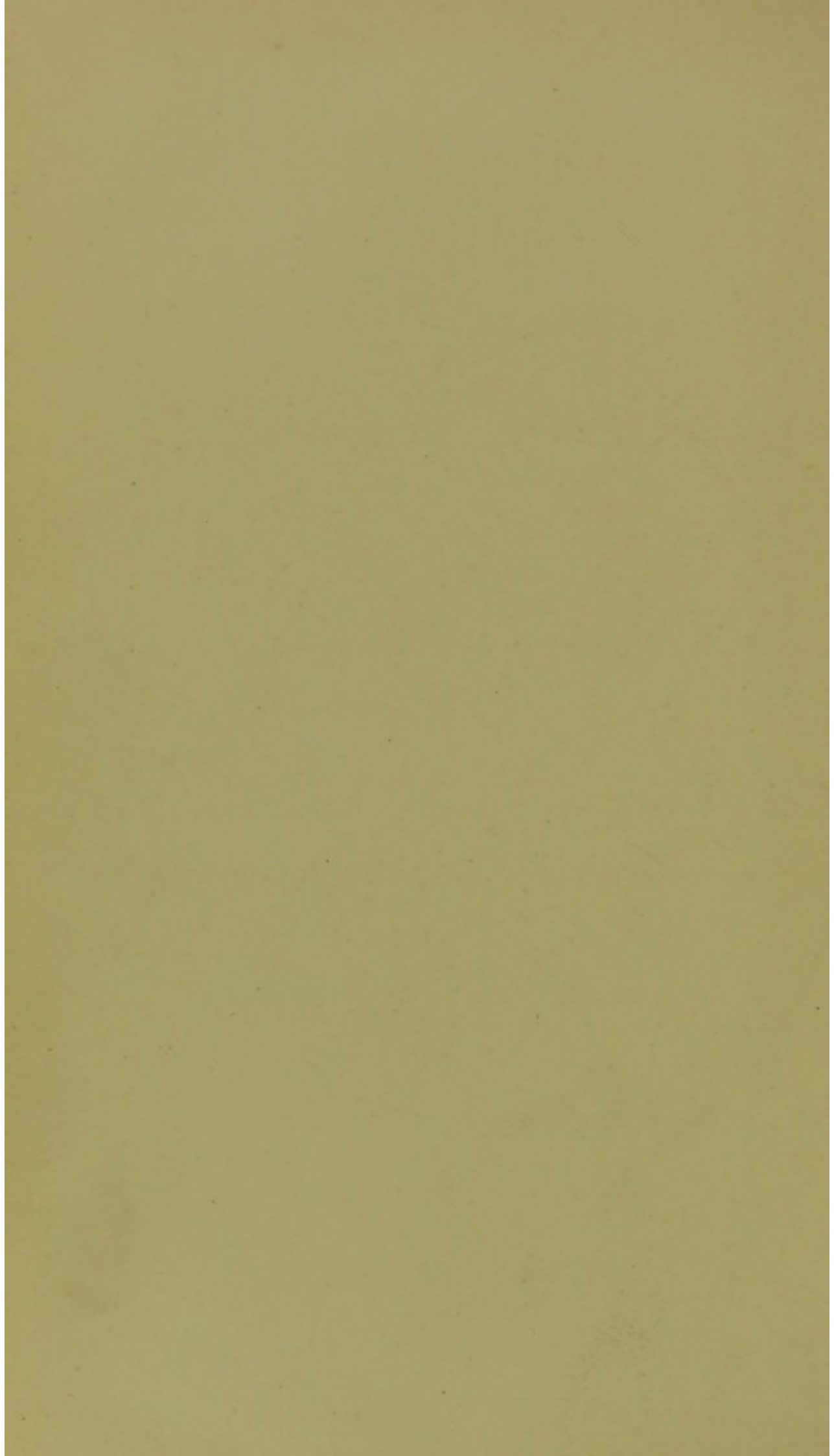
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THE PRESENT ASPECT OF THE ANTISEPTIC QUESTION;

BEING

THE SUBSTANCE OF THE ORATION FOR
THE YEAR 1883,

DELIVERED

BEFORE THE MEDICAL SOCIETY OF LONDON,

BY

EDWARD LUND, F.R.C.S.,

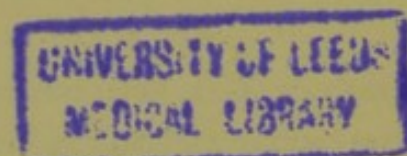
CONSULTING SURGEON TO THE MANCHESTER ROYAL INFIRMARY; PROFESSOR OF SURGERY
IN THE OWENS COLLEGE, VICTORIA UNIVERSITY, ETC., ETC.



MANCHESTER :

J. E. CORNISH, 33, PICCADILLY.

1883.



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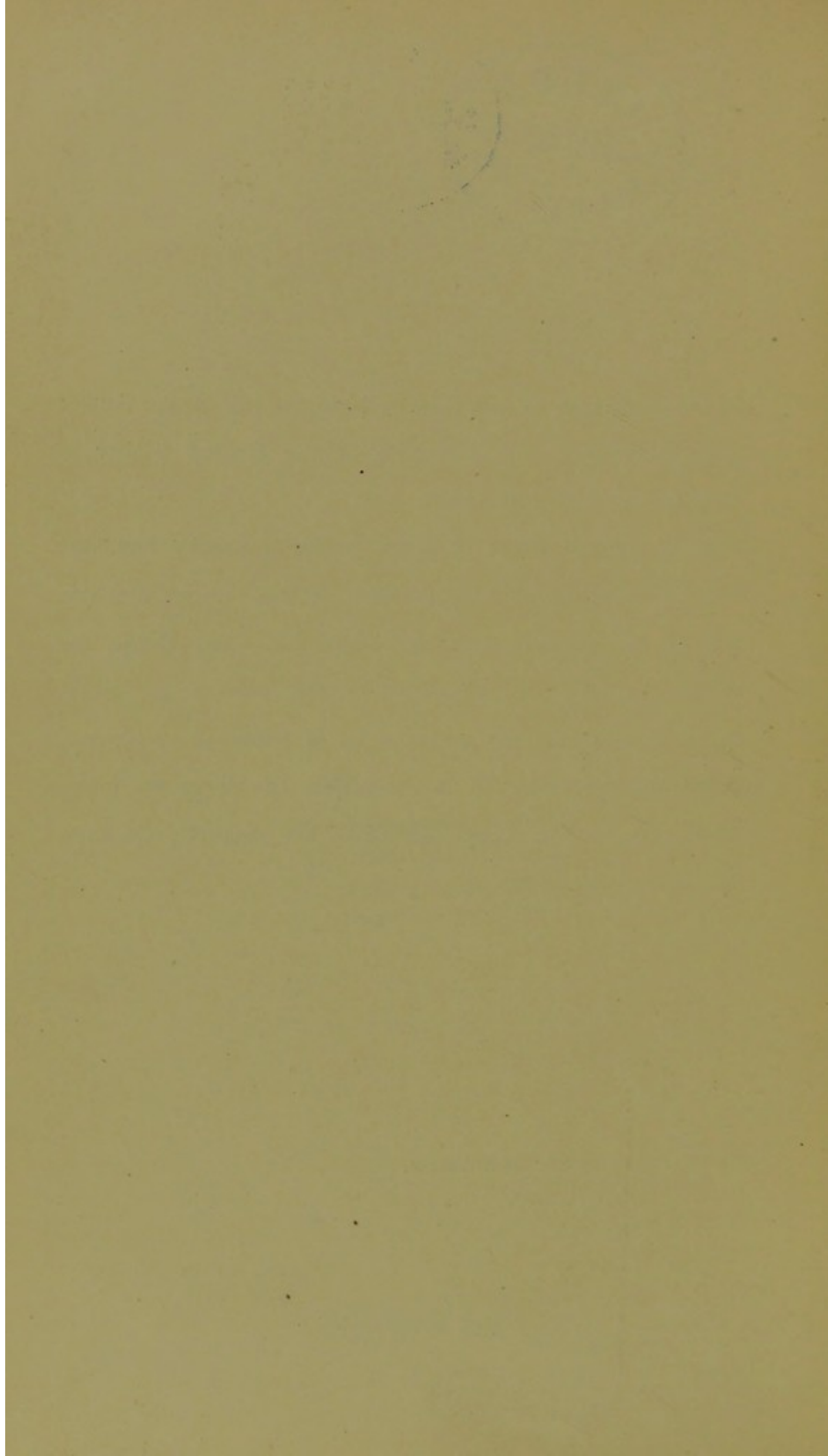


MANY paragraphs of this Address were omitted by the Author when he read it at the meeting of the Medical Society of London, on 2nd July, 1883.

H. R. H. the Prince of Wales having graciously honoured the *Conversazione* with his presence, it was thought desirable not to go minutely into the many facts and details by which the principles advocated in the Address are sought to be established. But now that it is published *in extenso*, those who are interested in the subject can judge for themselves how far the present aspect of the Antiseptic Question has been fairly stated.

22, ST. JOHN'S STREET, MANCHESTER,

July 10th, 1883.





THE PRESENT ASPECT OF THE ANTISEPTIC QUESTION.

It is a well-known fact that objects viewed from a distance seem of smaller dimensions than they really are, and so it is with events which are about to happen in the far-off future. A task which might be insuperable to-day, if not due for many months, is regarded as of ready accomplishment until the time for its performance draws near. Exactly in the same way it appeared to me, just twelve months since, when I received from one of your excellent Secretaries the very flattering invitation of your Council that I should deliver the Annual Oration of your Society for the present year. I at once accepted the proffered honour, as if an easy duty, and one of light importance; but as months rolled on, and the event came within measurable distance, and I had to decide upon the subject and manner of my address, many difficulties presented themselves which I had not foreseen. I was advised by the best of friends not to study the orations of the past; to carefully abstain from reading them and even from inquiring into their character, until I should have fixed irrevocably upon a topic that might appear suitable, lest unconscious memory should lead me to imitate their tenour; or even to touch too closely upon subjects already dealt with. This prudent advice I have followed most scrupulously, for it came from one whom we all greatly respect, and who tells me he has listened to your Annual Orations for sixteen years. Your worthy Registrar, Mr. Poolé, will thus perceive better than any one else present this evening, the originality of what I am now about to say.

If the subject I bring before you to-night is an old old story, let me hope that I may be able to place it before you in some new form, and possibly shed over it a ray of the truthful light which comes of exact and unbiassed inquiry, and by which the darkness of erroneous conjecture may be at length dispelled. On considering what might be the best subject for my address, it seemed to me essential that two conditions should guide me in my selection. I ought to speak to you upon a subject which from its nature should be one of acknowledged importance, so as to attract your attention. The subject ought, moreover, to be one in which the orator should be deeply interested; one in regard to which he has had considerable experience, and in regard to which, from the past current of his thoughts, he may be presumed to have arrived at very positive and definite opinions. Those who know me best will readily believe that I must have thought over very calmly, and with great deliberation, what none will deny to be the leading subject of the day in operative surgery,—the present aspect of the Antiseptic question, and this it is which I shall now proceed to illustrate.

I hesitate not to call it the leading subject, since, when looked at in all its bearings, there is not one in the modern practice of the healing art which has excited more enthusiasm amongst its advocates, or the value of which has been met with more direct public denial by its opponents, than antiseptic surgery. Like other great questions of dispute, antiseptic surgery has, from its apparent novelty, been received and adopted by some practitioners without comment, being to them, as it were, the fashionable treatment of the day, and one to which they assented because others set the example. More thoughtful men, although far from content with the older methods, have been slow to rush with the crowd after something novel in practice, and as yet untried. These, accordingly, have preferred, before adopting the antiseptic method of treatment, to ask themselves these important

questions,—Is it new? Is it true? Is it constant in its results?

First, as regards any essential or absolute novelty in the efforts which have been made in the treatment of injuries and wounds so as to avoid putridity or septicity in their progress, I may say at once that I shall not now attempt to deal historically with what has been done with that object, either directly or indirectly, by operative surgeons; nor shall I inquire how far the methods which they have employed (varied as they have been in detail) were founded, when most successful, upon the one grand principle of which modern antiseptic surgery is the legitimate expansion.

To approach the consideration of this great subject dispassionately, to keep our minds as free as possible from bias, and in that healthy state which will enable us to deal with evidence without prejudice, and to weigh it without partiality, it is desirable that we not only understand precisely what it is that we really wish to discover, but that we dismiss from our remembrance many phrases which by previous association are apt to suggest opinions already denied. In my remarks, therefore, to-night, I shall suppress, as far as possible, certain well-known terms which to some people, I am aware, are painfully provocative,—carbolic acid, septic germs, the germ theory, bacteria, and the like. These being thrown out of court, I shall invite your attention, in the plainest possible language, and in the simplest manner, to the mode of repairing injuries which nature adopts in wounded surfaces of the body.

It seems to me that, in surgery as in medicine, he is acting the most correctly who is most completely the minister of nature. I award the palm to the man who, while watching with ceaseless admiration how the nutritive forces of nature, like an army on a peace establishment, move about so silently as to escape observation,—when danger has arisen, when some valuable outpost has been attacked and broken down, notes, with equal reverence, these same forces responding to

the cry for help, and marching with redoubled energy to repair the breach of tissue, and to consolidate the broken walls. If we desire to be nature-helpers we can only fulfil that noble wish successfully by following undeviatingly the lines along which we see that nature works. My effort, therefore, to-night, will be to try to reconcile the conflicting statements of the advocates and the opponents of what is so confidently styled antiseptic surgery.

How comes it to pass, it may be asked, that men of unblemished reputation, and equally influenced by a desire for truth, differ widely on this great question? One class declares that antiseptic surgery in all its details is the greatest discovery of recent times, a priceless boon to suffering humanity, and deserving of universal adoption; while other workers, asserting with corresponding vehemence its utter uselessness,—declare that it is a delusion and a sham, and exhibit with pardonable pride results quite as good, if measured by statistics, as the most hopeful labourer on the other side could ever seek for. If we keep steadily in view the way in which, under normal conditions, wounds and injuries are repaired, and then ask ourselves how is it that these processes fail so frequently, and that wounds do not heal favourably in the conditions under which we have to treat them, we shall at least, I believe, have a clue to the right explanation of this matter, and be able to explain away many if not all of these discordant statements.

In the repair of tissue, and in the union of wounds, there are three stages or conditions which are well defined, and may be recognised by naked-eye observation, without dipping into the mysteries of microscopic changes or fresh cell-development. First, we have the stage of increased vascular action, closely allied to inflammation, if not identical with its early stage. This stage of increased vascular action precedes the second stage in which plastic lymph is formed, to unite the newly-divided tissues when of healthy quality, and when secreted

in sufficient quantity, for the office which it has to perform. It is through its agency that we have primary union of divided parts when they are placed favourably as far as distance and position are concerned. Yet, if the vascular action be in excess of such requirements, or if the mechanical conditions are such, from the shape or situation of the wound, that lymph cannot overlap the opposed edges, and form a nidus for further growth, then we have to encounter the third stage of change, the formation of pus, or in a word, suppuration.

I will not stay to consider the origin of pus,—its true genesis, if this be constant under all conditions of its presence. I am sure from careful observation that we may often see, in watching the repair of wounds on the surface of the body, that pus in its origin is closely allied to epithelial tissue; for if the perverted nutritive forces are not sufficiently active to produce pure liquid pus (the "*pus laudabile*" of our fathers), but just a little beyond the condition required to form lymph, then we have spread over the healing surface of a wound a layer of whitish substance which under the microscope is found to consist of swollen epithelial cells with just enough lymph-like secretion to bind them together, and to form what, from its physical appearance, I have called "*mucoid pus*," in which there may be no true pus corpuscles, or, if any, only a few sparsely scattered within it. The secretion, therefore, of pus, properly so called, may be taken, to a certain degree, as the measure of intensity or otherwise of the vascular action which has preceded it; and as far as repair of tissue is concerned, although suppuration is not a hindrance to its accomplishment, it is in truth a needless adjunct, and should be regarded under every condition in which we find it as superfluous.

Many wounds which are filled up, and which heal by the process of granulation, secrete an abundance of true pus, and do well, but it is in spite of the presence of pus, and not as a consequence

of it, that this favourable end is attained. The pus which bedews the highly vascular surfaces of advancing granulations in the healing of a wound, is but the outcome of excessive vascular action, and the production of it is often a relief to vascular tension and the attendant pain. Hence it is wont to be regarded by the patient and the lookers-on as a thing to be desired, and to be hailed as the harbinger of a highly favourable crisis. But it is simple superfluity, and comes of vital action uselessly in excess, for if the granulations which form new tissue are undisturbed, and are allowed to go on growing slowly, so as to fill up the yawning cavity of a wound, they will often do so without secreting any pus at all from their highly vascular surfaces,—at all events, if any, it shall be so small in quantity as to be nearly unobservable. But these results are only seen where the conditions are specially favourable.

Assuming, however, that in spite of every effort to restrain this excess of action in these local changes, we fail to do so,—it is then that still more unfavourable conditions are developed on the surface of the wound, not so much as an inevitable consequence, but rather as a more advanced result of these identical changes. Ulceration sets in,—ulceration of tissue already formed, either originally, as the old tissue of the part, or newly deposited in the early stage of repair. This molecular decay, this successive necrosis of small particles of tissue, which may be washed away in the stream of pus so constantly present in ulceration, will bring about a condition of things the very opposite to what we seek for in the healing of a wound, for in ulceration tissues are pulled down cell by cell; there is evident loss of substance, and the chasm of the wound is visibly enlarged. Or, again, perhaps from the original nature of the wound itself, the injury to nerves, or to blood vessels, with vascular obstruction and insufficient supply of blood, from constitutional exhaustion, or from other unhealthy states of the body, this death of tissue proceeds on a larger scale. We have then to deal with the sloughing

of a wound, with gangrene advancing in its most rapid form, so that in the wounded or injured parts the death of tissue is not insensible, but visible in its extent, presenting that melancholy spectacle to the eye of the surgeon, a sloughing sore.

If this be a correct description of the order in which these phenomena succeed each other in the attempted process of repair, it is quite evident that when the process is deranged the morbid changes have invariably been preceded by excess of vascular action in the part affected, and it is this excess of action which hastens on, with dangerous rapidity, all the subsequent changes. In some instances, in fact, the progress is so rapid that we might imagine suppuration and ulceration were the only changes there established, in place of the two—vascular-congestion and lymph-secretion—which ought to have preceded them. I am sure that if we watch minutely the order of events, we shall constantly find that vascular activity and abortive efforts at lymph-secretion were really pre-existent, and were followed, at an almost immeasurably short interval, by suppuration and ulceration.

It would seem, therefore, on this hypothesis, that the whole essence of success in the treatment of wounds and local injuries of tissue, must rest upon that amount of control over vascular activity in the part attacked which shall leave enough action for the purpose of repair, and yet restrain that over-action which is the starting point of morbid changes, useless in their nature, and often fatal in their consequences. This perversion of nutrition,—this misdirection, so to say, of the efforts for repair, may be due, at times, to constitutional causes pervading the whole system, as in the subjects of albuminuria or other wasting disease, and produce the very opposite condition,—not excess of vascular action, but a deficiency,—not an excess of lymph deposit, but the very reverse. And then we have to deal, not with excess of action, but with an utter failure on the part of the vital processes to respond as they ought to the requirements of repair. This may be observed

in treating cases of prolonged shock succeeding sudden accident, in which, no doubt, the primary injury is conveyed by impressions communicated through the nervous system of the sympathetic, and the requisite changes of repair are never really established.

Now if we eliminate from our inquiry these and similar cases in which the failure to repair is due to a general cause, acting upon the whole system and the nutrition of the whole body; and then, if we only study the cases in which the cause is local and confined to the part injured, we must watch minutely for evil influences, which acting primarily, to all appearance, through the vascular system, disarrange from the very commencement, the order of other changes which inevitably follow. If we are thoroughly convinced that the constitutional disturbance which follows wounds, such as septicæmia and its associates, has its primary seat in the local changes of injured tissue, apart, of course, from the general imperfections which I have already commented upon; it is then that we shall discover how great is the necessity for watching with jealous eye all the possible changes which may be set up in a wound from the first moment of its production. And I need hardly remark that by the term "wound" I wish to signify such damage to the surface of the body at some spot, no matter how small or unobserved, that if it be situated on the surface, the epidermic continuity of the skin being destroyed, tissues unprepared to resist the effect of contact with the air and its constituents are exposed to such influences. Injury to the deeper tissues of immense extent, with effusion of blood and laceration of fibrous and muscular tissue, advance on totally different lines of progress where air has access to a wound, or where it is effectively excluded.

Just as it has been beautifully remarked that the extensive cutaneous nerve-supply to the whole surface of the body acts as a nervous armour to protect it from the approach

of danger by tactile impressions more or less acute, so may I say the epidermic covering of the body, so long as it is intact and without a flaw, serves to a marvellous degree as a coat of mail against the inroads of contagion and the influence of poison. I am sure that I have only to utter the words "dissecting wound" or "post-mortem wound," and I shall bring to your minds an unmistakeable realization of the idea I have now in view. A bruise of any part with the skin entire, or with the skin but superficially wounded,—a mere abrasion, with perhaps deep and excessive injury, is one thing; but a similar injury to the deeper parts, with destruction or division of the skin, so as to expose them to the air, is a condition of totally different import. The one, from first to last, may cause no constitutional disturbance beyond the loss of rest and the effects produced by local pain fretting the general system; whereas in the other injury, from the moment of its infliction, there are immense risks of complications which may manifest themselves not only locally but in the body at large.

Here it is that we have to deal on the threshold of our inquiry with certain pseudo-chemical changes which must occur, to some extent, on the newly exposed surface of a wounded part. Why it is that they occur, or what it is that starts them into existence, is just the question which might be asked were it not that it would lead us into the very subject of the germ-theory of disease from which I promised to keep clear on this occasion. We must assume, as a postulate—a point granted for the sake of argument, the proof of which must be taken as existing, leaving the mode of action unanswered for the present,—that blood or serum oozing from a recently divided surface;—and that fatty matter escaping from the cellular tissue, or muscular tissue itself may—under certain conditions, while still in contact with the living body—undergo putrefactive change, or some change analogous to it.

If the fact be admitted that there is in the atmosphere such a thing as an exciter of putrefaction, and that where the conditions are favourable, this can alter the chemical constitution of the secretions of a wound, we have next to consider what are the conditions which operate thus favourably,—or, perhaps, I ought to say, what are the conditions which are essential for the full development of such change, and the converse of the proposition will then hold good, that by the removal of such conditions the establishment of putrefactive change may be delayed or prevented altogether. Now there are three conditions, all of which must be fulfilled, or be present contemporaneously, to bring about putrefaction in animal tissues or the fluids which they contain. There must be a certain temperature; there must be moisture; and there must be a proneness to change in the very chemical constitution of the substance which is said to putrefy.

We may assume that there is in the atmosphere at all times—there, at least, without our actual knowledge, so that it may act instantly if the conditions are favourable—such an exciter of putrefaction; some subtile power which, when once in action, has the property of starting the process which determines the re-arrangement of the component atoms of many of the complex bodies, viewed in a chemical sense, of which animal tissues are composed. Of course, in this somewhat vague but very general term “exciter of putrefaction,” I refer to those micro-organisms of which we hear so much—those little active disintegrating agents which are the true bacteria. While it is an established fact, confirmed by the most minute and patient observation, that we cannot have putrefaction without the presence of bacteria, there still remains the question as yet unanswered,—Can you not have bacteria without putrefaction? But how these ever-active organisms determine the commencement and continuance of putrefaction is, I take it, as much an unsettled question now as the *modus operandi* of the yeast plant—the *Torula cerevisiæ*—in deter-

mining the commencement and the progress of the saccharine or alcoholic fermentation.

Professor Huxley, in a lecture on yeast, after stating that the fermentation of sugar, the splitting of sugar into alcohol and carbonic acid, glycerine, and succinic acid, is the result of nothing but the vital activity of this little fungus, the *Torula cerevisiæ*, goes on to say—"Now comes the further exceedingly difficult inquiry, how is it that this plant, the *Torula*, produces this singular operation of the splitting up of the sugar?" Fabroni imagined that the effervescence of fermentation was produced in this way, namely, that the yeast was a kind of acid, and that the sugar was a combination of carbonic acid and some base, to form the alcohol; and that the yeast combined with this substance, and set free the carbonic acid; just as when you add carbonate of soda to acid you turn out the carbonic acid. Another view was taken by the French chemist, Thénard, and is still held by an eminent chemist, M. Pasteur, namely, that the yeast, so to speak, eats a little of the sugar, turns a little of it to its own purpose, that is, feeds upon it, and by so doing gives such a shape to the sugar that the rest of it breaks up into carbonic acid and alcohol. Another distinguished chemist, Liebig, rejecting both theories, declared that the particles of the sugar are as it were shaken asunder by the forces at work in the yeast plant, and that they undergo a rearrangement, the outcome of which is the formation of alcohol, the evolution of carbonic acid, and other changes.

To put these three hypotheses in a semi-popular form, Huxley compares the sugar to a card-house—a pack of cards adroitly raised up, poised on one another until a light but high pile or structure is built up. The yeast may then be compared to a child going near the card house. Fabroni's hypothesis would be that the child took half the cards away, but Thénard and Pasteur's that the child pulls out the bottom card and thus makes the house tumble to pieces; whilst

Liebig's is that the child goes by, shakes the table, and tumbles the fabric down,—the old theory of catalytic action in another form;—and the result of all the commotion is that the atoms re-arrange themselves in a certain definite order, the chief result of the whole process being the formation of alcohol.

But apart from any hypothesis which might be listened to as explaining the possible mode in which the changes are first excited, we have this one fact before us, that we may have yeast, and we may have sugar, but unless the conditions are present under which alone they can re-act on one another—the *Torula* to live and grow, and the sugar to break up and re-arrange its constituent atoms—no fermentation can be said to be possible. Yeast, carefully dried and mixed with sugar similarly prepared, will not ferment so long as moisture is excluded. Water may be added, but if the temperature is kept down below a certain thermometric range, no fermentative change is possible; so that we find that certain conditions or environments are to all intents and purposes as essential for the success of the process in question as the presence of the acting elements themselves.

If we apply this same principle to the study of the phenomena of putrefaction in animal fluids we shall observe a perfect analogy not only in the processes but in the conditions under which they alone can be manifested. What is true of the *Torula* in fermentation is equally true of the bacteria and all the other micro-organisms which act so mysteriously in determining by some strangely-associated action a metamorphosis, so to say, of the otherwise bland and innocent secretions of the body into irritating and noxious products, lethal in their effects. How it is done, we know not. There is some inseparable connection between the two conditions. Bacteria must be there if putrefaction be established; but putrefaction may not result although bacteria be present, if the conditions be wanting under which alone, by a rigid law, these organisms

can play their part. If we ask whence comes the *Torula* which determines the fermentation of some fresh saccharine liquid to which we have not knowingly added it;—if the fluid ferments, loses its sweetness, and becomes pungent in taste from alcoholic formation, to run on perhaps to that further change in which acetic fermentation is developed, we can only assume that in the air which touched the fluid a little germ or seed of the *Torula* was really present. The vital activity of this germ, if it had fallen, as thousands of other germs must daily fall, on less congenial soil, would have remained dormant; and, like a grain of mummy wheat, might have done so for centuries, but finding a suitable environment, with the other conditions, equally essential, of moisture and of heat, it fructifies, and, as an ever-enlarging organism, grows and branches out into the fully developed *Torula*. So it is needless to ask whence come the bacteria that start putrefaction, when it is possible that a solitary organism, coursing through the air, and alighting upon a surface where the conditions are favourable to its development, may go on multiplying itself indefinitely by fissiparous growth, until a whole colony has been founded by this single emigrant. Thus much we know,—we cannot avoid their presence. These germs, like the constant pressure of the atmosphere in which they float, are ever ready to show their power in a moment at any spot where their vital force can manifest its presence, so that all we can do, and all that antiseptic surgery ought ever to attempt to do, is to antagonize their action by robbing them of the conditions of development under which alone they can come into operation.

When we use the term putrefaction as applied to the fluids on the surface of wounds, or to the wounds themselves, or to secretions escaping from the body under any conditions, we generally refer to that extreme state of chemical change in which great fœtor or noxious odour is present, or where this is heightened by the evolution of two well-known

chemical bodies—ammonia, and sulphide of hydrogen, most generally in combination, though either may be found alone. This is what we call putrefaction, the putrid condition of a wound; and how rapidly this stage of metamorphic change may be reached under conditions favourable for the change, but not favourable for the patient, must have been witnessed by all who have dressed wounded surfaces, such as cut fingers and cut scalps in the victims of some pothouse brawl, say at night, with some ordinary dressing, as wetted lint or simple ointment. A few hours afterwards, when such wounds are exposed, a sickly or perhaps a pungent smell gives unmistakeable evidence of the presence of chemical change. What this same chemical change really leads to has always been to me a subject of deep interest. With our present knowledge we have no means of measuring or accurately registering the degree of chemical change going on in the animal fluids on these occasions, from their primitive or normal condition of sweetness, through all the many stages of rancidity, until brought at last to the ultimate condition of advanced putrefaction, represented, as I have said, by the evolution of ammonia from their nitrogenized parts, and sulphide of hydrogen from their proteine constituents. My own conviction is that the products of such chemical changes, which are the most dangerous for the organism in which they are developed (for the patient, that is, who is the subject of them) are those which strike our olfactory nerves the least powerfully. A faint sickly smell from a wound forebodes the greatest evil to the constitution at large. The pungent, acrid smell of advanced putrefaction indicates a condition of things associated with that excessive local vascular action to which I have already so specially referred.

I can never forget a remark made to me by a surgeon of excellent practical experience and of great observation, who, when talking of wounds said—"I like a good stink in a

wound. Give me a wound that is foetid. I don't care for it a bit. It is wholesome; there is power there: but what I do hate is that wretched, sour, sickly smell when you dress a wound, which is almost as deathlike in its nature, as it is the certain forerunner of a bad result." No doubt it is in this stage,—the stage to all appearance, of least chemical action, that poisonous products are generated in a wound, which are themselves so apt to be directly absorbed into the general system, and which, on the inevitable principle of auto-inoculation, become the starting points of more serious changes culminating in general septicæmia, pyæmia, and the like.

There is one element of such change, apart from, or even in addition to the certain presence of bacteria, which may arrest their development and the chemical changes resulting therefrom, and that is, the exact nature of the surface on which they rest, as far as its vital energies are concerned, and the changes there going on.

If we consider how it is that a body after death so quickly putrefies, and that a sickly smell is so soon developed, we shall see that it must be that with cessation of those complex chemical changes, the sum of which is life, these excitors, ever present, and ever ready to act, have it all their own way, and the consequent metamorphoses are absolutely unchecked. And so it is, that while the idea is forced upon us in any attempts we make to define what life is, and the one essential condition on which it rests, that, whatever else it may be, the actual essence of the vital principle is a force which controls and modifies in a wondrous way ordinary chemical action. As soon as a fluid, or a solid tissue of the body can be said to have died, certain molecular changes instantly commence; they may go on rapidly or slowly, but if heat and moisture be present, the tissue or the fluid will certainly undergo some putrefactive change in its chemical arrangements. These arrangements may be modified by the amount of vital energy still remaining, seeing that some

fluids and some solids of the body die more quickly than others, and lose, more rapidly than others, their special power of vital resistance.

Here rests the force of the argument which has been used with great propriety by many objectors, that we should not forget, when we contemplate the dangers by which we are surrounded in our surgical proceedings, from the constant presence of these excitors of putrefaction floating in the air,—that even if we disregard, in our efforts to prevent their action, the presence of moisture and special temperature, we have much more frequently than we know of, in certain exceptional cases, a power of vital resistance in the tissues of the body so exposed to change, which may counteract, in some inexplicable manner, the advent of those very changes which we so much dread. This is what I referred to just now when I said that to obtain the conditions of putrefaction in fluids or tissues of the body, say in any wound, we must have moisture, we must have a certain temperature; but beyond these two conditions we must have a proneness or liability to decay, to die, and to putrefy in the substances themselves. In the last of these conditions I take it that we have the one great cause why healthy persons, the subjects of injury and of wounds, progress more favourably toward recovery, have less local and general constitutional disturbances than those who, exposed, we may assume, to precisely similar injuries, are out of health at the time, or are the subjects of low, vital energy. I know it is very difficult to define exactly what we mean by vital energy or active health. It is so completely the sum or the complex resultant of so many varying conditions, that we may be deceived by its assumed presence, when all the while there exists some unobserved source of vital depression which we have overlooked. But assume that a person is the subject of accident or wound, who is in what we style, in ordinary parlance, first-rate health, first-rate condition, such a one would certainly resist the baneful effects of these disease-producing germs to a

much greater degree, and much more certainly, than his weaker confrère. No one will deny this; and when we try to determine the cause, all other things being equal, it seems to me that we must debit the vital energy of the man who escapes with the force which is the very essence of his resistance. Do we not see the same thing every day in our post-mortem wounds, and in our proneness or otherwise to contract infective disease?

Many a medical man has escaped, during many years of practice, the attack of some serious infective malady, say scarlatina or diphtheria, but at last, worn out by professional work and ceaseless toil, he absorbs the poison against which, by the resisting power of high vital action, he had heretofore appeared to be proof. Another man, who has made post-mortem examinations without number, who has had many a scratch or many a puncture, being on one occasion out of health, or depressed in spirit by the responsibility of attendance on the case he is then investigating, wounds his hand in making the examination. Nothing more than local action comes on, but on this occasion it is to a degree which he has never before experienced,—and in addition to the local change, he has considerable constitutional disturbance. For if we could study these local changes accurately, we should see that as a consequence of them, some deadly poison is developed which, absorbed into the system, induces with inevitable certainty, a serious result. Of course it may be said that it was not until this particular time that the bacteria or the bacilli which rested on the wound or the mucous surface, or which were in some way the special channel of infection, had been brought into contact with the person so soon to become the patient. This doubtless is one mode of explanation, but surely there is another. Such contact had taken place many times previously. These micro-organisms had been present, and had been in actual contact with the surfaces on which they ought to have induced their specific changes, but they failed to do so, for the vital resisting energy

of the part attacked was then too great, and the infective result did not follow. Yet on this last occasion this one condition of resistance was insufficient,—or you may take it, that from the absence of vital resistance all the needful conditions for active infection were present, and then the infection was complete. In most of the occult processes of nature, especially where we have to deal with the phenomena of life, as in health or disease, we can but rarely so modify the prevailing conditions, or so control them as to obtain distinct and positive results by direct experiment in the way so often practised in physical science. We have to watch our opportunity, to be ever on the alert to observe when nature, so to speak, makes an experiment before our eyes, or varies the normal state of things,—how, in a word, she acts. It is upon such experiments, and upon these alone, that we are often obliged unwillingly to depend.

Take, for example, not exactly the experiment, but the condition of things very much resembling it, which happens where an epidemic is prevalent. Many persons are attacked, and many escape. In the victims of attack, no doubt we may watch with interest and with advantage the natural progress of the disease. But how about those who escape? Why were not all equally subjects of the disease? In what special way were they rendered proof against the poison? Did it attack the sickly, or the most robust? Did those who, when they entered the poison-den, were faint and weary, become the speediest victims? Or was it those who, days before, had indulged in some exhausting debauch from which they had hardly emerged, that were the most readily stricken down, and in whom the virulence of the poison seemed to be manifested with most intensity? So, again, if we take putrid matter from the corpse of a person who has died recently of some rapidly fatal malady; and one only, out of two or three who have assisted at the inspection, suffers from diarrhoea, or from sickness, or some inflammatory action in

his absorbents, or in his axillary glands, while another escapes, surely we must admit the existence in the latter of a power of vital resistance which repelled the poison, or checked its absorption and development. The alternative open to us is to deny the precise value of the observation because we cannot be quite positive that each of these persons has been equally exposed to risk of the poison. Assuming, however, such to have been the case, there must have been one person at least, among those present, who possessed the power of vital resistance to the poison.

Apart from this vital resisting power to septic change which exists naturally in persons of a certain constitution, or in the same person at different periods of life, when he is able to contend against the action of contagious disease to which others succumb, this special condition may be improved, if not for a time really created, by the use of certain tonic remedies. Among these remedies quinine holds the foremost place, and arsenic in minute doses in combination with iron is very little inferior. It is well known that in malarious diseases, severe forms of ague and the like, when the patient is really suffering from the complaint, quinine is of immense service in diminishing the frequency and severity of the attacks. But if persons about to be exposed to these morbid influences, will, before entering a marshy district, take large doses of quinine, they will be protected from absorbing the poison, whatever it may be, and thereby be prevented from contracting the ague or the fever. In other words, their vital power of resistance is augmented, whereas those persons who from any cause before so travelling, have been exhausted by disease, or are recovering from other ailments, are almost sure to contract a disorder which their more vigorous companions can repel. Hence, to use a common expression in the aguish districts of England, "Ague is a cowardly disease ; it always attacks a man when he is down."

Now, septic influences, when once established, may continue to

act locally and not constitutionally, or in this latter direction only to a secondary degree. Here the metamorphosis of the chemical constituents of the putrefying elements has advanced a further stage, or beyond such complex, yet unstable chemical compounds as can be easily absorbed and infect the whole system. For it may be taken as an axiom that, with the minimum amount of chemical change locally, we have the maximum danger constitutionally; while with local chemical change and intense putrefaction, there is greater local mischief, but less constitutional infection. It is true that in the former case the micro-organisms do not travel far from the scene of their original action, and that the changes, although intense, are entirely local. Yet independently of the presence of these organisms (some of which are putrefactive and some infective), had we tests of sufficient delicacy to indicate the changes thus produced, no doubt with the presence of one or the other variety, there would be found to be some special corresponding change in the composition of the fluids which the bacteria had influenced by their presence.

And here I would wish that there be a distinct understanding of the theory I would advocate as to the order in which these changes occur. While it is the micro-organisms—say the bacteria—which originate the putrefaction, just as the *Torula* does the fermentation, in which each is the essential factor, so it is the chemical changes which are the resultants of the action with which we have to do. Even if it can be shown in regard to what are called active and infective bacteria, where the whole system suffers, that under such arrangements these bacteria are ceaselessly in action, and are present in all the fluids of the body, I would still urge that it is not these organisms themselves, whose presence we so much dread, but the mysterious changes in the composition of the fluids in which they live and to whose action the morbid effects are referable. As in the saccharine fermentation it might be said that the *Torula* causes the evolution of alcohol (which, according to the

opinion of our friends the anti-alcoholists, is the worst of all poisons) so with the bacteria in putrefaction, in the earlier stages a septic poison is developed, intensely virulent in its nature, and easily absorbable into the entire system; but in the later stages other chemical compounds are evolved which expend their influence chiefly on the tissues upon which they rest, disturbing their circulation and destroying their life. When the influences of these local changes extend through the whole body, we have disturbances in the functions of the nervous system—high temperature, rapid chemical change, confusion of intellect; and in some cases a poisonous influence on the spinal cord itself, leading to the phenomena of trismus or general tetanus.

But these constitutional effects happen far less frequently in the advanced than in the commencing stages of putrefaction; or, as some persons would say, in those slighter changes in the chemical composition of the fluids which have partially putrefied, and are possibly only in the stage of what might be called rancidity.

Let us proceed, therefore, to consider what will be the effect upon the surface of any wound, already vascular, from its efforts to repair, if the surface be exposed to irritation from ammonia, as one of the results of this advanced putrefaction. Just imagine any delicate vascular surface in which such changes could be watched to be so treated; say the conjunctiva in the eyeball, already from some cause of early inflammation, or from a slight wound, rendered for a time preternaturally vascular; and then suppose, for the sake of experiment, the part were constantly bathed, or only from time to time, with a weak solution of ammonia, and ask yourselves what would be the inevitable consequence? Would not its vascular condition be immensely increased? Would not other changes in the part most certainly follow? Should we not have ulceration more or less extensive? And should we not be in danger of sloughing of the membrane itself, with death of tissue?

This would occur even if the cornea and other constituents of the eyeball being supplied with blood from a deeper source, should escape similar disturbances in their circulation.

Now carry out the same idea in the treatment of a wound, and if the essential element of success in what is called anti-septic surgery consists in the removal of every possible source of disturbance to the reparative processes which nature is so ready to commence and to carry on; ought we not—as some would teach, if these conditions had commenced—to try to neutralize such chemical changes, and by chemical agents, such as acid lotions to combine with the ammonia, spare the part from excessive stimulation; or by the use of astringent lotions of zinc or lead, endeavour to contract the capillaries, and thus limit their vascularity?

Can we wonder, therefore, that in so many instances where the exciters of putrefaction are abundantly present, as in the crowded wards of hospitals, and with patients whose vital energies are at the lowest ebb,—if we escape the minor chemical changes in the secretions of wounds (which induce, alas! most serious constitutional risks) we should still have so constantly to deal, in inflamed and tender wounds, with ulcerating edges, or sloughing centres,—conditions absolutely opposed to healthy union and to repair? Thus we see, that in spite of the presence of these exciters of putrefaction, no bad results may follow by reason of the absence of those associated conditions under which alone they can act injuriously. The wounded part may be kept dry, it may be kept cool, and it may possess in its own innate vital activity, that special resisting power concerning which we have much to learn, and which may exist, for aught we know, in different degrees of intensity, in different regions, and in different tissues of the body. Thus, I would explain how it is that the changes which we refer to the presence of the exciter of putrefaction and its products, may be averted or only feebly developed, without any systematic or special

efforts to obtain this object. Yet, beyond these three conditions, the absence or the presence of which determines the rapidity and the amount of the chemical changes, there is another means by which we seek to prevent them, namely, the use of what have been called "germicides," agents for the direct destruction, *ab initio*, of the real excitors of putrefaction, or fermentation, as the case may be. Among the latter I might name sulphurous acid, which added in very small proportion to saccharine fluids will protect them entirely from the changes of fermentation. This, no doubt, is effected through the direct destruction of the vitality of the *Torula*, under conditions otherwise quite favourable to its growth. And so with putrefaction, for here we have a host of substances varying in degree of intensity of action, from chloride of zinc on the one side, to some of the many empyreumatic oils upon the other.

These are to some extent antiseptics, or arresters of putrefaction. They act destructively upon the excitors of putrefaction, or merely by their presence, especially those which are volatile at ordinary temperatures, create an atmosphere around the surface where putrefaction has begun, which checks the further development of the germs. Or, to imitate more completely that assumed condition of vital resistance which seems to be the way by which certain constitutions have the power to cast off and resist these morbid influences, we may use internally such remedies as quinine and salicine, or some of their allies. For these, taken into the body, so influence the vital changes through the nervous system as for a time at least to produce a certain prophylactic influence, serviceable in many cases before putrefaction has been established, in complete anticipation of such an event, truly before putrefaction, not against it.

I have heard that Dr. Livingstone, when exploring the marshy districts of the interior of Africa, fearing that his comrades might suffer from malaria, ordered them to take

quinine in large doses, some hours before such places were reached. An artificial state of high vital resistance was thereby set up, and exposed as they were to the presence of the fever-poison, whatever its true essence, they escaped its deadly effects.

It is the fondly-cherished idea of the devotee of antiseptic surgery that such changes can be averted by the means which he employs. He believes that this healthy condition is brought about by numerous causes, all contributing in some degree to the wished-for result. If he keeps the wound dry, if he keeps it cool, or if he places the patient in such a position in reference to the wound as will produce a minimum amount of pain, thereby securing healthy sleep, and with it preserving the vital powers by nourishment, and by the vital stimuli of fresh air and the like, he is really practising antiseptic surgery as correctly in its principles as any of the most ardent admirers of spray dressings and their attendant details. For what is the spray-dressing principle of treating wounds? In its origin no one can deny it is the outcome of a process of reasoning correct in principle, and thoroughly in accordance with all that science has taught us as to the putrefactive and septic changes which take place in animal fluids, even, under special circumstances in the living subject, and certainly in the fluids of animals removed from the controlling influence of contact with living tissue.

But it is not for me, before the members of the Medical Society of London, to say one word in praise of the devoted energy with which Mr. Lister has so long pursued this interesting subject; for having not long since been one of his patients, I have had personal experience of his mode of treating wounds and injured surfaces, and I can but define it as being the *beau idéal* of what to my mind such treatment ought to be. By the comfort it affords to the patient, from absence of pain at the time of the dressings, and during the

intervals; entire freedom from constitutional and intellectual disturbance, rise of temperature, loss of sleep, or interference with the digestive and nutritive functions, it is *par excellence* the mode of treatment to be desired where the circumstances are such that it can be carried out in its entirety, without the slightest deviation from the spirit of the law upon which it rests. Then it is, and only then, that we know what antiseptic surgery really is.

But, sad to tell, how few pursue it with strict exactitude. They say they do so, and no doubt they do their best, but he who looks on with practised eye will often detect some failure of detail which many men esteem of slight importance, but by which, as through a doorway, however small, the enemy may enter and spread confusion in the camp. The intentions of those who so practise Listerism are excellent, and made in all good faith: but alas! failures are frequent; and hence it is that the antiseptic question is the most debatable subject of the day, and one in which the advocates and opponents will ever be at variance. Hence it is that those who object to the antiseptic system declare that they have tried it honestly and have obtained as good results without its use. Possibly the frequent failures of antiseptic surgery, from which so much has been expected, are due to this—that the method itself, although right in principle, is difficult in practice.

Thus I have sought this evening to lay before you (though I fear but imperfectly) the conclusions to which I have arrived as to the apparent discrepancies which may be detected in the causes of the success of different methods of treating wounds, which, by those employing them, are said to be done either antiseptically or in total disregard and defiance of such treatment. Such operators have their own special methods of procedure, which they follow out with great care and in certain definite order; but then, it is not the acknowledged antiseptic method;—and, above all, there is *no spray*,

there is no attempt to purify the atmosphere which surrounds the wound, or to alter its constituents. "If there are germs in the air," say such workers, "let them do their utmost. If they wish to enter the cavity of an abscess, or the deep recesses of a wound, by all means let them do so. We will take good care that the surface or the entrance to the wound or abscess shall be free and large enough not only to allow of their ready admission but of their very free exit. We know full well the danger of tension and pressure in a wound, and the fatal consequences of pent-up secretion, especially in the early stages of a wound, and we never neglect to provide against this very frequent source of danger. But our explanation of the causes, and the effects of tension, they say, are totally different from yours. We declare, they continue, that the serum which escapes from a wound in its early stages is in its very nature intensely irritating, and whether putrid or not, should be allowed to drain away from the surface of the wound, and be got rid of with all care, for its very presence, irrespective of what are called septic changes, is a fertile source of mischief."

These are the chief arguments used by the opponents of antiseptic surgery, and their modes of treatment are often no doubt followed by good results. But where such results are constantly present, it will generally be found that the conditions have been so disposed before-hand, that the avoidance of putridity in the secretions of the wound is secured indirectly by negative processes. Great care has been observed in drying the wound, where from its nature and the absence of hæmorrhage this can be done; and by allowing free exit, from the first, for secretions, whether or not they have become irritating and poisonous from chemical change.

True antiseptic surgery is in its nature an attempt to avert such changes. Those who oppose it do not deny, cannot deny, that such changes really occur; but they try to neutralize them after their occurrence, whilst antiseptic surgeons try to prevent the earliest advent of such changes. However

much it may still be true that those who reject and even ridicule what is called antiseptic surgery, are all the while practising on lines very nearly parallel to its principles—there can be no doubt that the profession is now thoroughly alive to the fact that morbid changes in a wound and failure of the healing processes arise far more frequently from causes external to the subject of them, than from any peculiarity of his constitution, as was commonly taught until the triumphs of antiseptic surgery became known to the profession.

Our object, in the management of wounds and injured surfaces, should be to trust completely to the healing processes of Nature herself, and while doing this, to see that she is trammelled and interfered with as little as possible by external causes of irritation. These external causes, as I have tried to show,—the chemical changes produced in the otherwise bland and innocuous secretions of a wound—are first produced by contact with organic germs, which start the putrefaction and carry it on (if the conditions are favourable to such advance) to the stages whence arise in succession excessive vascularity, suppuration, ulceration, sloughing, and complete absence of repair; or, short of these changes in the wound, the development of septic matter, which is liable to act as a constitutional poison, ending frequently in fatal consequences.

And now let me say a few words in reference to the efforts made by the Medical Society of London, within the last few years, to extend its influence even beyond the limits of this great Metropolis, where it is one of the oldest institutions of its kind. If we review the history of this Society from the time of its foundation—from the age of Fothergill, of Lettsom, and of Hunter—we may almost take its progress as typical of the progress of the medical art itself. In its earlier days, no doubt, the discussions were conducted on the principle of close adhesion to the dicta of the fathers of medicine; and for the younger members of our profession to presume to

differ from the accepted aphorisms then prevalent was a heresy not lightly to be dealt with. Now-a-days, happily, things are changed, and we find that true scepticism in medicine is the forerunner of truth, and that to doubt is often to inquire anew, and in that way to elicit truth.

You have now in your ranks the youth and energy of our profession, drawn from all its branches; and the communications made at your weekly meetings abound in original thought, and infuse that life into your discussions which gives zest and interest to your proceedings. That your policy is a liberal one I can myself affirm; for while your Society rejoices in the special designation of The Medical Society of London, I, who live so far away from this great centre of all work, both social and intellectual, was elected fifteen years since as one of your Provincial Fellows, and have this evening the pleasure to appear before you as your orator for the year.

In the session just passed, the one in which you appointed me, Mr. Mason was your President, and he could not have bequeathed to your Society a higher testimony of the success of his presidency than is to be found on the roll of your members, to which I am informed he added no fewer than forty-seven during his term of office. He is too well known to you by his courteous and generous nature, coupled with his professional distinctions, to need further reference by myself; so I pass on to congratulate you that for the present year you have selected for his successor a gentleman who can boast of professional reputation not only European but Asiatic in its extent, for to Sir Joseph Fayrer we owe that intimate knowledge of many of the diseases of India which must be of incalculable service to all who go to reside in that country. To Sir Joseph Fayrer is also due the production of a great work on the nature and habits of the poisonous snakes of India, a work which has already proved of the greatest benefit not only to strangers but to the natives of that vast empire, and which will do much to promote that intermingling

of races whereby the mighty agents of civilization shall ultimately triumph.

But, on another ground, you have reason to-night to be proud of your President. Let us remember that he is the man who, by ceaseless vigilance and watchful care, brought back in safety to his native shores the future hope of England, unscathed by pestilence, and uninjured by disease. And, if I might venture to interpret the motive by which His Royal Highness has been influenced, in so kindly consenting to be here to-night, I doubt not he has done so in order to show his personal regard for Sir Joseph Fayrer, as well as to afford another instance, among many, of the interest His Royal Highness has always taken in the progress of our profession, which, with all its shortcomings, is growing year by year more positive in its theories and more exact in its practice; and let us remember also that His Royal Highness will be here to-night as the worthy descendant of "Albert the Good,"—the first to teach the mind of Englishmen the true value of knowledge, and to remind them that in the commonwealth of science, the knowledge gained by one is the common property of all.

Lastly, let me thank you for your patient hearing to-night. I know the subject of my address has lacked more in originality than in interest, but I trust that the few words I have uttered may excite discussions at your future meetings, inducing many of my hearers to review their opinions with thoughtful care, and leading them to watch more minutely the processes of nature, so as to advance the utility of your Society, and justify the words—"*Floreat in perpetuo; Societas Medica Londinensis.*"



