

Address.

THE RELATION OF LABORATORY RESEARCH TO THE GENERAL PRACTITIONER OF MEDICINE.¹

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THE recent passing of the century mark has given medical addresses of the past few years a retrospective aspect. It has been an appropriate and opportune time to review the progress of Medicine. As viewed in the large perspective of a century, that progress has been truly wonderful. The advance in one hundred years, or even in fifty years, was greater than that of the whole previous history of Medicine. Toward the end of the century the rate of progress increased until it was well-nigh impossible for a single mind to keep in touch with even the important advances being made along the whole line of medical investigation.

The improvements in the microscope in this period made possible a study of the minute structure of the tissues of the body. About the middle of the century originated the conception of the cell as the unit in the structure of each organ, and hence the unit of organic life itself.

Anatomy advanced by the development of microscopical anatomy, or histology. Pathology advanced by bounds with the study of the changes in the individual cells and groups of cells in disease. The discovery of bacteria and their relation to disease became possible. We not only developed a new branch of medical science,—bacteriology,—but the application of the knowledge thus obtained made possible the remarkable advances in modern surgery, and threw new light on and profoundly modified our conceptions of infectious diseases.

The study of the functions of the individual cells has added much to physiology. Even more is due to animal experimentation. But the problems of physiology and of disease have also shown the need of study of the chemical changes occurring in the body. Many important advances have already been made along this line, and much more important developments are to be looked for in the near future, based on the researches of the chemical laboratory.

I have briefly rehearsed some of these well-known facts, that we may clearly appreciate that the advance in Medicine of which we are all so justly proud is chiefly due to laboratory research—using the term in a broad sense. The debt which the medical profession and which humanity owes to these skilled and tireless workers in the laboratory can never be fully repaid. They are the leaders in the advance which is being made in our warfare against disease, and as such we should give them due meed of honor.

What I wish to particularly consider to-day,

however, is not the extent of the advances thus made in Medicine, but the question of how far the general practitioner is applying these improvements in his battle with disease. Medical advance is to be measured not alone by the attainments of the generals of the medical army, but by the efficiency of the rank and file. As we found in our recent war, the "man behind the gun" is a very important factor.

Is our medical private—the general practitioner—equipped with the best form of rifle? Is he using the modern smokeless powder? Or does he obscure his view of the enemy with an opaque cloud from his obsolete ammunition? Has he had sufficient drill in the use of his arms and ammunition to make his aim reliable and accurate? Better give us a sharp-shooter armed with a muzzle loader and black powder, than a man who has an up-to-date equipment but has no skill in its use!

My answer is that the medical army is a motley assemblage; that it is lacking in organization and consequently lacking in the most effective coöperation of the different branches of the service; that the equipment of the individual (both in arms and ammunition) varies from the most modern to the very obsolete; and that the training of the individual in the use of his equipment varies widely and generally needs improvement.

The personnel of this medical army is, however, excellent. The individual soldier is courageous, animated by high motives, self-sacrificing and earnest in his work. Often, by the intelligent and resourceful application of available means to the problem in hand, he does much to make up for the deficiencies in his equipment and training. The results obtained by the profession are on the whole good. The essential point I wish to make is that the results might be better.

We may improve by a wider application in general practice of the knowledge furnished by the laboratory worker; by adopting his more scientific methods of investigation in the clinical study of disease; and by a more cordial coöperation between the laboratory worker and the practicing physician in the study and cure of disease.

Some, perhaps much, progress has already been made in this direction. It is because this progress must depend on the effort of the individual physician that this question is worthy of our consideration on such an occasion as this, when by common consent a body of general practitioners pause at the end of a year's work as a society to cast a broad look over the whole field of medical progress.

That the advances made by the laboratory workers have not been fully utilized is not entirely the fault of the medical practitioners. The fault lies partly with the laboratory workers themselves. Having frankly acknowledged our deep indebtedness to these investigators, it is our right to criticize them and to point out how their discoveries may, by better coöperation with us, be made more available for the benefit of humanity. For after all, the benefit of humanity

¹ Annual Oration before the Norfolk District Society of the Massachusetts Medical Society, delivered May 12, 1903.

is the ultimate goal at which the medical profession aims, and it is right to measure the work of any member of the profession by the degree to which he attains this goal, directly or indirectly.

It is always well to look facts squarely in the face, and not to ignore their existence because their contemplation is not entirely pleasant. In this connection it is an unpleasant fact that there is too often a lack of sympathy and frequently, even, a feeling of hostility between the laboratory worker and the general practitioner. The latter criticizes the laboratory worker as being "too scientific," as carried away by the pure spirit of investigation and not caring for the practical result of his work. He considers the laboratory worker impractical because so much of his investigation has no immediate application in the treatment of disease.

The laboratory worker replies that his work cannot be judged by any such standard; that science should be pursued for itself, being a search after truth, and must not be judged by its utility. He further points properly to the fact that many important advances in medicine have been based on scientific facts thus discovered which at first seemed to have absolutely no bearing on the practical problems of Medicine. The great need of Medicine has been and still is, a scientific foundation. To the taunt that he is unpractical he retorts that the medical practitioner is unscientific; that his observations are carelessly made; and that the practice of medicine based on such observations is empirical and unreliable.

Both sides in this controversy are partly right and partly wrong. We must admit that the condemnation by the laboratory investigator applies justly to many of us who are practicing medicine. Perhaps it is as well for our self-esteem and for the reputation of the profession that we should not try to learn too accurately to how many it does apply. But, admitting this, it is equally true that many of the laboratory workers are so lost in the scientific side of their investigation that they apparently forget any question of its practical value. Some even glory in the fact that it has no apparent practical value. These are impatient of any questions as to the utility of these very interesting observations, and are annoyed by the efforts of physicians who try to garner from these riches something which they may carry as a gift to the sick. Such extreme instances are few, but they make a bad impression.

I know that in general the laboratory worker is more willing to welcome the practitioner in his realm than the physician generally supposes, and is more patient and courteous in such reception than we have just reason to expect. It is hard for him, however, not to show a certain feeling of toleration rather than interest, when the utility of a given point is examined.

Notwithstanding appearances, the laboratory workers are at heart just as earnest in their desire to benefit humanity as any members of the profession. The more the pity, then, if they

become so engrossed in their studies that they forget the necessity of occasionally summarizing their work, and of interpreting it so that the average medical mind can grasp its significance. This they certainly neglect to do.

It is not enough to make the studies. It is not enough to publish the results in their technical form. If the general practitioner is to make use of this information, somebody must translate it into terms which he can thoroughly understand, and this process of interpretation should be begun by the laboratory workers themselves. Such action on their part will not only bring their work to better fruition, but will remove from the mind of the general practitioner the unjust feeling that the laboratory worker is indifferent to the ultimate practical application of his discoveries.

The first step, then, toward the better utilization of scientific medical facts is for the discoverers of those facts to put them in a form in which they may be digested and assimilated by the medical body as a whole, and let them remember that its digestive powers are weak and that it needs simple nutriment.

But if some of the blame for the present condition of medical practice lies with the laboratory workers, much more — and the greater part — lies at our own door. Granted that much of the output of the laboratories has no immediate application in the practice of Medicine; granted that much of it needs interpretation before we can comprehend its utility, we, medical practitioners, are not yet using our best endeavors to apply that part of the scientific discoveries which has a manifest application in the diagnosis and treatment of disease. Until we do this we fully deserve the criticism of the scientific investigators, and we, the greater sinners, have little right to criticize them.

We have criticized them as too little interested in the benefit of humanity. Are we true to this aim? Alas, many are not! How many, I dare not estimate. And the worst of it is that it is not the zealous pursuit of truth that distracts our attention, but the zealous pursuit of the dollar!

Commercialism, the pursuit of medicine as a trade, explains altogether too much of the indifference of a large number of medical practitioners to the scientific advances of medicine. So long as these traders are a little ahead of the laity and can impress upon them an acknowledgment of their superiority and thus get a good financial return, they care nothing for the advance of medical science. You cannot reach such men by appeals based on the ideals of the profession. The only practical way to reach them is to educate the public. When the public knows enough to see that they are poorly equipped, they will be driven in self-defence to increase their equipment.

To you, members of the Massachusetts Medical Society, this does not apply. You are actuated by higher motives than the pursuit of medicine as a trade. And yet even with us the question

of the financial return to be made from scientific medicine must be considered.

We cannot, then, dismiss this aspect of the application of scientific medicine with a condemnation of commercialism. Actuated, as we are, by high ideals of the profession, we are yet dependent on the practice of Medicine for our financial support. Whatever our duty to humanity, I believe we have an equal or higher duty to our own families, and perhaps to ourselves. We have a right to consider how this question affects our pocket books without being accused of having a sordid aim in so doing. I shall devote some time to the consideration of this topic, because it has a very practical bearing, and because I believe there is a general hesitancy among physicians about adopting such methods because they think they cannot afford the time or money for it.

I have heard the objection urged that the people cannot or will not pay more for this extra work, and that the doctor cannot afford the time for it without recompense. Both assertions are, I believe, wrong.

If our patients actually cannot afford to pay us for this work, it is still our duty to perform it when it will be an essential aid to the diagnosis or treatment of the disease. In treating a needy patient, our only right question should be, Is it necessary? If so, it is our duty to do it. If we are unwilling to give a charity case the essential treatment, we should withdraw from the case. There are in our neighborhood charitable institutions, if not charitable doctors, who will do it.

If the case is not one of absolute charity, but one that can make only a poor return for whatever we do, still the same rule applies. Only we are even more culpable if we take from such patients the best they can afford to give, and do not in return do our best in treating them.

But the important class of patients are those who pay their bills, who make no objection to paying the customary fees for the ordinary medical attendance, but do object to paying more for extra investigations made by their regular attendant. The doctor, knowing their feelings, is reluctant to charge for such work, fearing they may take offence and that he may lose good-paying patients. On the other hand, he objects to doing this extra work free of charge for patients who ought to pay.

If the examination is essential in these cases, it should be made. The doctor should make a reasonable charge for such work, and I believe it can be done not only without losing these patients, but with added respect for his reputation. The necessity or utility of the examination must be explained to the patient, and the fact that it takes time and requires skill. Then he will understand that it is service of value to him and will be willing to pay.

In other words, many doctors are afraid to do the work and charge for it in the present mental attitude of the public. The remedy lies in educating the public to know that such researches

are valuable. Then they will not only pay for them, but will demand them.

Some care is necessary, however, in deciding when to recommend such measures. If such investigation is really essential, we should not hesitate to urge it. It is, of course, the patient's privilege to refuse to follow our advice in this respect as in all others, but that should not affect the nature of the advice given. But if the investigation is not essential, but only desirable, then we should take the patient's pocket book into consideration. We should not cause him extra expense merely because the investigation would be of interest to us. In many such cases we would perform the tests and count the resulting satisfaction a sufficient recompense.

I am very far from urging that laboratory investigations ought to be inaugurated in all our cases. That is very well in the hospital, which is, as it were, a laboratory for the complete study of disease; and the more complete the investigation, the more reliable are the results. Such investigations as do not injure the patients are only a fair return for the benefits gratuitously received by them from the institution. Moreover, they are directly benefited by the results of these investigations.

In private practice, however, the relation of the patient to the physician is an entirely voluntary one. His wishes must be consulted. We may offer him certain opportunities, but he may decline them if he chooses. It is not fair to criticize the work of the general practitioner because it is not always done with all the thoroughness of hospital work. For he is handicapped by the fact that the public often fails to appreciate the necessity or the advisability of such measures.

Suppose a patient comes to us with an apparently slight gastric disturbance. We could perhaps prescribe with more certainty if we investigated the exact condition of his gastric juice and his power of digestion. Perchance the investigation of the stomach contents might reveal the existence of trouble of unsuspected gravity. But can you blame the patient if he prefers first to try such remedies as your skill would suggest, even if the diagnosis is not perfectly clear? Would not you, in his place, try the remedies first, instead of at once embracing the opportunity to swallow the stomach tube? If the symptoms are grave, if serious trouble is suspected, or if the remedies fail to relieve, that is another matter. But the routine use of the stomach tube is not practicable for the treatment of every case of gastric disturbance, whatever may be the scientific aspect of such cases.

This is but an illustration of the general principle that in private practice the patient has the right to determine how far he cares to avail himself of the opportunities offered by medical science. Provided the investigation we have in mind is not absolutely assential for his welfare, we should do the best we can with the limited means he puts at our disposal. It is part of the art of the practice of medicine to decide when it

is wise to urge, and when it is wise not to mention the measures that the theory of scientific medicine suggests. Except where such measures are essential, the successful physician is properly a practitioner of the art of medicine first, and secondly a scientific investigator.

Before leaving the consideration of the financial aspect of laboratory investigation, I wish to say a word about the indirect benefit that may be derived from such work, even though it may bring no immediate money return. It is not so unusual to find the ordinary practitioner contrasting his lot with that of the more successful man who has hospital or other large clinical opportunities. Not that these men are always the most successful financially in practice, but in general the experience gained by such work is a valuable asset in winning financial success. The less successful man is apt to overlook the fact that such experience is gained only by the expenditure of much time and energy in gratuitous service. Is he willing to make the same sacrifice? Does he make the best use of similar opportunities that lie at his hand? If, instead of refusing to do scientific work in his practice when it cannot be paid for, he accepts all such opportunities for the sake of the experience he may gain, — I do not say that he can equal the improvement gained at the hospital, with its greater opportunities, but at the expenditure of much less time he may add materially to his own experience and ability, and he can to an important degree acquire that asset for successful practice which he envies in the hospital physician. Thus not only consideration of our duty, but self-interest, should lead the general practitioner to a much wider application of laboratory methods than is now the case.

An indirect benefit, but one of great importance, attends the use of the laboratory methods of examination, in that it tends to make our clinical examination of the patient more careful and accurate. The mere consideration of whether such a test is desirable means a careful analysis of the symptoms of the case. We cannot do this laboratory work successfully without methods of precision and intelligent thought, and we return to the clinical side of the case with keener mental faculties as well as with facts that aid in diagnosis. Thus the thoroughness and accuracy necessary in laboratory technique lead to better methods in the ordinary clinical examination and study of cases.

- What may we reasonably expect of the general practitioner in the way of laboratory work in connection with his practice? Certainly not a fully equipped laboratory, nor the ability or time for exhaustive researches. But we may expect the possession of a suitable microscope, and those simpler forms of laboratory apparatus and the reagents that are required for the practical clinical tests, and the ability to apply these tests with sufficient accuracy to be of value as an aid to diagnosis. The equipment is not prohibitive in cost, and if properly utilized will bring fully as good a financial return as many

forms of equipment that the general practitioner willingly makes. The skill required in making these examinations is within the reach of any medical man of average ability.

One reason why the general practitioners have not more generally adopted these methods is, I believe, that the teaching of these subjects in medical schools has been unnecessarily complicated from the physician's point of view. In teaching medical students we must aim not only at showing them these practical tests, but at giving them at the same time a thorough scientific training in methods of investigation. Much that is thus valuable for training is of little or no value in its practical application. Now the men in general practice may need this training in method fully as much as the students, but few of them feel that they can spare the time for a course based on such lines. It is better to put within their reach a course which will teach them just the practical points they can apply, than to offer only courses which are theoretically more complete but which they will not avail themselves of. If such courses are inconsistent with the thorough scientific spirit of the medical school, they could be given by competent men outside, especially at the hospitals. There are plenty of opportunities for such work, but generally they have not been properly utilized for our object. As a rule, such courses have either been modeled too much after the exhaustive school course or they have been clinical courses in which the laboratory work has held too subordinate a place. The untrained physician needs for laboratory work more time and patience from the instructor than is given in the ordinary clinical course. He gets an unsatisfactory amount of laboratory instruction only at the expense of a lot of time on other clinical work, which, though most excellent in itself, is not exactly what he desires at the time.

Post-graduate medical work is different from undergraduate work. The physician who takes post-graduate work has a pretty definite object in view. I think we should be more willing than we are to meet just that object in the individual case with the least possible waste of time. We should not treat him as an undergraduate, to whom we properly say that in studying a given subject he must learn at least so much and in just such a manner. If the general practitioners want such courses, they have but to ask for them. If the demand is made, some of the many competent men who have clinical facilities can easily arrange such courses and would do so. That such courses are not more common is due chiefly to the indifference of the general practitioner.

There is yet another means for the busy practitioner to acquire this skill. We are sending out from the medical schools every year many graduates who have had excellent training in these methods of investigation. They are thoroughly "up-to-date" in methods, but lacking in clinical experience. The general practitioner has the clinical experience, but is rusty or behind

the times in methods. Here are two sets of men who have much to teach each other, but the opportunity for mutual benefit is seldom made use of. In the coöperation of the man of large clinical experience with too little time for laboratory work, and the present graduate with plenty of time for such work and too little practical experience, is a most promising field for the benefit of both these practitioners as well as the patients.

Such coöperative work in private practice is an excellent substitute for the school or hospital courses I have spoken of. The time can be arranged more conveniently for the practitioner than in a clinic, which usually comes at the busiest time of his day, and thus one of the greatest obstacles to his study of such subjects is removed. Nor is the benefit all on his side. He can provide the equipment for their common use, which the young practitioner can perhaps ill afford to buy. And an intelligent discussion of the clinical, as well as the laboratory, aspects of the case cannot but be full of benefit to the young graduate.

Indeed, one of the faults of our medical education at the present time is an exaggerated view in the mind of the medical student as to the importance of laboratory work in general practice. His view is commonly as one-sided as that of the general practitioner who undervalues such methods. In these days of the triumphs of laboratory research and of our zealous pursuit of "scientific medicine," it requires some courage to say that this side of medical education is overdone in the schools; but a careful observation of students and recent graduates has convinced me that such is the case.

The student to-day shows too great a tendency not to think about a case until he has it in some way under the microscope, and then his diagnosis must fit his microscopic findings. Is our technique so perfect that this is always the crucial test? Are we to make a diagnosis of tuberculosis only after the tubercle bacilli have been found?—or of typhoid fever only after the Widal reaction is positive? And especially are we to decide that the patients cannot have these diseases because the laboratory investigation is negative? If we determine our treatment on this basis, we shall make grave mistakes. I have often seen the man whose accurate technique I have envied fail to recognize a case of tuberculosis when "phthisis" was written on the patient's aspect in indelible lines. His view of the case, as a whole, was as limited in extent as the field of his microscope.

I have seen the wise general practitioner (who, however, could not use an oil immersion lens) and the thoroughly trained recent graduate on the same case. The former said the case "looked like typhoid," and insisted on treating it as such. The latter was all at sea because the Widal reaction was delayed, and he didn't know what to do for the case. In a few days his doubts were removed by the appearance of the Widal reaction, but in the meantime the patient

had had the best treatment from the old family physician.

Indeed, the young laboratory expert has much to learn from the general practitioner about clinical medicine. He has a better foundation, to be sure, but to-day when we turn him loose with a degree of M.D. to practice, he has laboratory astigmatism and needs glasses to correct his vision. The proper material for these glasses is "common sense," and the glasses should be ground on the stone of experience. For correcting this form of astigmatism the general practitioner is an excellent oculist.

Of course there is the other side. For example, how many times does the general practitioner saturate his patient with quinine for the supposed chills of malaria, when an examination of the blood, showing the absence of plasmodia and the presence of leucocytosis, would demonstrate a septic or suppurative process hidden somewhere in the body. Knowing that it is present, though hidden, it may be sought out and properly treated. Examples might be multiplied on either side to show what may be accomplished by the coöperation of the older and the younger practitioners.

Naturally we must look to the older practitioners to take the initiative in establishing such coöperation. To some extent the services of the younger men are already utilized in this way, but it is not done enough, and it is not usually done in the right way. Generally the younger man is given a specimen and merely asked for a report. He thus gets no opportunity to know the clinical bearing of his work, while the older man holds himself aloof from the investigation and its technique, a better knowledge of which would enable him to better understand both the advantages and the limitations of such work. This complete separation of the clinical and the laboratory side of the investigation is undesirable. It is too prevalent even in our best equipped hospitals. Neither the clinician nor the pathologist gets the best results from his work unless both sides are considered together.

Let us then coöperate. Let us drop our prejudice against the young man who settles in our midst. We cannot justly look down on him as an inexperienced youth, for in many respects his experience and equipment are superior to ours. Nor yet need we view him as a dangerous rival who is likely soon to usurp the professional position we have established. Rather is he a useful aid, from whose enthusiasm, as well as knowledge, we may gather the stimulus which will preserve the vitality of our medical work. Unless by our own initiative or by such outside stimulus we keep our medical work vital and fresh and abreast of medical advance, it stagnates and then retrogrades. In these days when the strenuous struggle for existence is more and more apparent in our crowded profession, the consideration of self-interest, if no higher motive, should lead us to make a better use of the opportunity offered by contact with the recently trained

medical graduate. The man is not unknown in our profession whose best work was done in the few years following his graduation, when he was perforce "up-to-date." We must keep up with the procession or fall by the wayside. There are plenty to fill our places, and the public, on whom we depend for our livelihood, are getting more exacting in expecting of the doctor the best skill attainable.

Let us ask once more: What may be reasonably expected to-day of the general practitioner in the way of laboratory investigation? This work is not concerned with the examination of the patient as a whole; that is clinical. It is concerned only with such parts of the patient or such products as may be safely and conveniently carried away for more careful examination than is furnished by our unaided senses. Specimens of tissue which may have undergone pathological change belong generally to the pathologist as a specialist. Few of us may hope to deal successfully with such matters.

One tissue, however, easily comes within the range of the general practitioner, and for our purposes it is a very important one, namely, the blood. The counting of the red and the white corpuscles is not difficult, and often gives most valuable information. The microscopical examination of the character of both kinds of corpuscles, both in the fresh and the stained dry specimens, is often of even greater importance. Neither this nor the examination for the plasmodia of malaria are beyond the reach of the general practitioner. The estimation of the hemoglobin by means of the Tallquist paper and scale is no more difficult than taking the temperature. By it we get most valuable information as to the degree and progress of a case of anemia, yet how few physicians make use of this simple measure!

The Widal test for typhoid fever, necessitating the use of a fresh culture of the typhoid bacilli, is hardly within our reach, but we have access in this vicinity to the aid of public laboratories, and our part in furnishing the material is easily performed but frequently neglected. The examination of the blood for bacteria is seldom necessary and involves too intricate a technique for the general practitioner.

Of the products of health or disease the physician may to advantage examine the urine, sometimes the feces, the sputum, pus, vomitus, and the gastric contents. All of these may in suitable cases give most valuable information. And yet too many of us make none of these examinations but the testing of the urine for albumen, and some even neglect that when it should be done.

Another laboratory test is the bacterial diagnosis of diphtheria. This is more advantageously done by the aid of the public laboratory. It is of the utmost importance in any suspicious case. Fortunately the utility of this aid to diagnosis has been so clear that it has been generally adopted by the profession. Yet even this test is not always resorted to as early as it

should be. If we cultivated what I may call the laboratory habit of mind we should neglect fewer cases and thereby prevent suffering and save some more lives.

In our vicinity easy access is had to the public laboratory, not only for aid in the diagnosis of diphtheria and typhoid fever, but for tuberculosis and malaria. There can be no excuse for the physician who does not have these tests made when they would benefit the patient.

I may sum up my argument as follows: What may be called the laboratory method in clinical medicine is of acknowledged value as an aid to accurate diagnosis and hence to the successful treatment of disease.

Such measures are not employed by the general practitioner as fully as they should be.

The wider application of these measures is desirable, and is our duty, first, because it will be of benefit to our patients. Secondly, the ability to perform such work is becoming more and more a necessity for the successful practice of medicine, and motives of self-interest should urge the general practitioner to catch up with the line of progress.

Of the man who has plenty of time and does not choose to thus equip himself little need be said, save that he is short-sighted and will sooner or later suffer in competition with his better-equipped fellow practitioners.

To the man who thinks he is too busy to enter upon this work, it should be said that the requisite skill may be acquired (if not already possessed) at a less expenditure of time than is usually supposed, and that, if necessary, a little sacrifice of time for this object would be one of the best investments he could make.

To the practitioner who is really too busy with routine practice to do such work himself, it should be said that nevertheless this work should be done where necessary. The services of the public laboratories and of less busy but thoroughly equipped practitioners should be utilized.

We should all remember that a wider application of these methods is our duty as enlightened physicians.

Original Articles.

PNEUMOTHORAX ASSOCIATED WITH FRACTURE OF THE RIBS. REPORT OF TWO CASES.

BY FRED T. MURPHY, M.D., BOSTON.

THE two cases which I have to report illustrate the extreme degree of that common complication of fracture of the ribs, pneumothorax. Stabs and gunshot wounds of the thorax, perforation of the lung or pleura by malignant disease or suppurative process may lead to a similar condition; also gas formation by the *Bacillus aerogenes capsulatus*¹ or *coli communis*.² Concerning the great classes of pneumothorax, namely, those secondary to the removal of the chest wall with the parietal pleura as in operations, and the