An Address

ON THE

CORRELATION OF SYMPTOMS AND SIGNS IN SOME ABDOMINAL DISEASES.

DELIVERED BEFORE THE MANCHESTER PATHOLOGICAL
SOCIETY.

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WHEN Dr. Craven Moore invited me to deliver an address before the Manchester Pathological Society, I felt at first, and perhaps not unnaturally, certain qualms as to accepting. In the recent wide advances made by pure pathology I have played no part and could speak with no authority. But it might successfully be argued that no pathology can be pure which does not attach itself in some degree to those clinical manifestations to which morbid processes in any part may give rise. And it may be in the recollection of some of you that I ventured a few years ago to coin the phrase, the "pathology of the living," to assert my belief in the importance of a knowledge of the morbid changes in the abdominal viscera during the life of the patient.¹ The final changes occurring as the result of a long-sustained disease in any organ are no doubt of interest; but that interest is, in my view, bereft of its chief title to importance if an intimate acquaintance with it does not confer the power of relieving the suffering or prolonging the life of the one who has fallen a victim to this particular malady. My own investigations into this form of pathology have been largely concerned with the abdominal organs. In connexion with some of these new discoveries have been made—for example, in respect of duodenal ulcer, and of the many forms of chronic inflammatory troubles in the large intestine; whereas in others the firmly established views and the opinions tenaciously held by generations of physicians have been shown to be founded on fancy rather than on fact, the most excellent example of this being, of course, in connexion with the various disorders classified under the term "dyspepsia." In his investigations the surgeon has not always worked in the same medium nor with the same weapons. Speaking figuratively, he has had to use the hatchet and the crowbar as well as the trowel; he has had to destroy as well as to design.

Take, for example, the condition recognized by the term "gastric ulcer." Among the many diseases which the physician has felt most competence and confidence in recognizing there are probably few or none whose symptoms would appear to be more definite or more characteristic than is the case with gastric ulcer. The description given of this disease in the ordinary textbooks of medicine are such that its recognition would seem to be a matter of ease and certainty; and the unequivocal diagnosis is made with quiet assurance and with astounding frequency, if the records of any of the larger hospitals can be accepted as evidence. There can, however, be no doubt whatever that in the majority of the cases the opinion has been wrong, and the treatment based upon it futile and ill-directed. For when a diagnosis of ulcer of the stomach has been made with every circumstance of care, and with every aspect of reason and probability, in a series of cases which are examined upon the operation table, it is found that in a large proportion of them no slightest evidence of structural disease can be discovered in that organ. It does not need a long experience of the operation room to convince any one that the "gastric ulcers" have more often than not their seat in other organs than the stomach.

The surgeon in his inquiry into this matter has passed through three phases of activity. In the first, fortified by his early experience of the dramatic results of gastro-enterostomy performed in cases of pyloric stenosis (three of my patients doubled their weight and one almost trebled it), he was led to apply this operation in cases in which, upon every ground of inquiry and experience, a gastric ulcer was assumed to be present. He acted upon the medical diagnosis, and it was for a time his firm belief that inveterate and rebellious cases of

gastric ulcer could be most satisfactorily treated by this method of short-circuiting, or of "draining the stomach," as it was said. Inspection of the stomach and the verification of the real existence of an ulcer were slurred over and the operator made haste to perform his intended procedure. The results of operations so conducted were not gratifying. In many cases the results were bad, and in some disastrous. It was at this time that we began to assert, to the surprise of many and the consternation of some, that before the surgeon proceeded to the performance of an anastomosis between the stomach and the jejunum he must be satisfied of the undoubted existence of an ulcer, which was held to be a "visible, tangible, or demonstrable lesion." One of great culture and experience wrote to ask me if it was "really true that an ulcer which has been long present, exciting severe symptoms in many attacks, could be seen or felt," and asking whether when of small size and of slight depth, like a "chap" on the hand, it could not be hidden away by a fold of the mucosa of the stomach. I held it then, and hold it now as firmly as ever, to be true that, except perhaps in the rarest possible circumstances (I have only one case in evidence), an ulcer which has been the cause of prolonged and recurrent "attacks" is an ulcer which has engaged all the coats of the stomach in its ravages, and can therefore be seen from the outside of the viscus, and can be felt and made plain to the onlooker. This view seemed one that was hard to accept, and to this day it is perhaps not appreciated at its value, with the result that purposeless operations are still performed upon the stomach. It seemed, then, to me that in the event of failure to discover any lesion in the stomach no operation involving that organ should be done. In the second stage we were accordingly content to investigate cases of supposed gastric ulcer and to treat them in accordance with the disclosures made at the time the parts were laid bare for inspection. If an ulcer was found it was excised, or if causing obstruction a short-circuit was made; if no ulcer was found, admission of an incorrect diagnosis was frankly made and the abdomen was closed. To some it seemed a painful and bitter experience to acknowledge an error of diagnosis—to discover nothing where much had been expected. But consolations were speedily forthcoming. It is not often that the end of any inquiry can be foreseen when only the first developments are being made. The old alchemists laboured to discover the transmutation of the baser metals into gold; in that they failed, but they built up the science of chemistry. Saul went in search of his father's she-asses, and found a kingdom. This stage of simple inquiry was happily very brief, for it soon became a matter of certainty that patients who gave the history of incoercible dyspepsia must be suffering from a real disease, from an organic lesion somewhere, and not from any real or fictitious vice in the action or secretion of the stomach.

It was therefore in the third and present stage that we began to widen the scope of our inquiry, to enlarge, as we could do with safety, the area of investigation within the abdomen, until we were able to discover some gross lesion which might perhaps be associated with the symptoms we were called upon to relieve. And here a remarkable discovery awaited us—a discovery for which all the experience of *post-mortem* pathology or the teachings of the textbooks had left us wholly unprepared. We found, and we still find, that in more than one-half of the cases in which an operation for gastric ulcer was deemed expedient by reason of the wearisome persistence of pain, vomiting, and occasional haematemesis, their stubbornness or open rebellion against the most assiduous and approved treatment, the stomach showed no evidence of textural change. A lesion could be found quite different from that expected—an adherent or obstructed appendix; a tuberculous ulceration of the ileum or the caecum, a prolapsed and perhaps obstructed stomach, or a calculous cholecystitis. Arbuthnot Lane lays, I believe, the chief responsibility in many of these cases upon the ileum, in which he describes a "kink" a few inches above the caecum. The world would be an easier place to live in, and our lot would be lighter, if only the hypothesis of Lane were capable of proof. But for my part I am sorry to have to say that in spite of a search, as capable as I can make it, in the last two years, I discover only very infrequently the "kink" in the ileum; and I have as yet never found it without the plain evidence of an

appendicitis, to which I believe it to be secondary. In my own experience the commonest site of a "gastric ulcer" is the right iliac fossa, and I have no doubt whatever that in a majority of the cases which form the basis or the text of the very careful and elaborate treatises by the physicians of all lands upon "gastric ulcer," no morbid process of this kind was present. If this be true many questions at once arise, of which two are of the greatest importance.

The first is this: If in cases of so-called "gastric ulcer" there is no evidence of structural disease in the stomach, but an obvious morbid condition in another part the removal of which relieves the patients of all the symptoms ascribed to an ulcer, what is the explanation of the gastric manifestations? And especially what is the reason for the severe and sometimes recurrent haematemesis?

The second is: If a "gastric ulcer" is so frequently not a lesion in the stomach, but in another part, what is the value of the great variety of "cures" that are so much vaunted?

With regard to haematemesis. This is, of course, a very striking phenomenon, and when it suddenly occurs in considerable quantities it is a symptom which naturally causes great alarm. By the German physicians especially, I believe, great reliance is placed upon the occurrence of haematemesis as a means of recognizing the presence of a gastric ulcer. But it is common knowledge, I suppose, that patients have died of haematemesis in whom no lesion of any kind was discovered in the mucosa of the oesophagus or stomach. I say "was discovered," but that, of course, does not strictly imply that it was not present. For Dr. Bolton has shown with what sedulous care the mucous membrane, properly stretched out, must be examined, with the aid of a magnifying glass, before any crack or fissure, from which blood may have flown freely, can be discovered. No one, I imagine, supposes that a mucous membrane sweats blood, without any lesion of the surface, in the way the skin sweats. The old beliefs in that kind of "vicarious menstruation" are not heard of nowadays. For blood to come in gross quantities there must be a real and a deep lesion of the surface of the stomach. That must, I think, be conceded. But this does not imply that such a lesion is an old one; indeed, all the information we possess with regard to the local destructions, erosions, fissures, or acute ulcers of the alimentary canal, in cases of typhoid fever (in the stomach or duodenum), in erysipelas, in cases of burn, in albuminuria and many other acute febrile disorders, suffices to show that these things are toxicæmic in character, abrupt in onset, quick in development, and probably rapid in their disappearance. It does not seem difficult to me to suppose that in the presence of a continuing septic process in, say, the appendix, or of a more acute form of infection may from time to time occur, in each of which a toxicæmic result in the stomach or duodenum may be expressed by gastric symptoms, among which haematemesis is the most prominent. In this connexion recent inquiries conducted at the London Hospital are of the greatest interest. They show more clearly than any other pathological records of which I have knowledge how dependent a severe haematemesis may be upon lesions which are primarily unconnected with the stomach. Hutchison records 24 cases of fatal hæmorrhage from the stomach after operations of various kinds upon the abdominal viscera. Of these 24 no less than 21 were cases of appendicitis with septic complications, localized abscess, or diffuse peritonitis. In three cases recent acute ulcers were found in the stomach (twice) and in the duodenum (once); in the remaining cases only "hæmorrhagic erosions" were found. The origin of this serious and profuse bleeding is ascribed to a profound alteration in the blood due in most cases to toxins of septic origin. The experiments of Wilkie would make it appear probable that a retrograde venous embolism from the original septic focus may be responsible for the development of acute ulceration in the stomach or duodenum.

It is well for the purposes of one's work to have some sort of mental picture of the diseases with which one is called upon to deal. The view I take of "gastric ulcer" as described in the textbooks of to-day is that in the majority of cases it is not primarily or chiefly a lesion in the stomach, but consists of a persisting chronic infective lesion in, as a rule, some abdominal organ, and that in this focus more acute infections from time to time

arise which cause those transient exacerbations in, or additions to, the symptoms which are sustained more quietly throughout the whole course of events. Whether the more quiescent symptoms are due to a secondary infective gastritis, to an enhanced or erratic activity in the secretion of the gastric juice, or to those irregular muscular conditions which are known as "pylorospasm," or to any combination of these, seems to be quite uncertain. That this hypothesis is not altogether fanciful may be firmly asserted in view of the undoubted fact that in cases of chronic gastric and duodenal ulcer a primary focus of infection is discovered very frequently in the abdomen. Its most common site is the appendix. Every appendix that was taken away has been drawn, but in a few cases the organ was not examined, for it was believed that in some the safety of the patient would be best considered by a rapid operation in which no more was done than was essential to the saving of life. Where time safely allowed it the appendix was always removed. It will be seen upon scrutiny of the drawings that in almost all the plain evidences of advanced and ancient disease can be recognized. Infection, therefore, would appear to be the essential original condition responsible for the later, strictly secondary, and dependent lesions which we recognize as acute ulceration, erosion, fissure, and finally chronic ulceration in the stomach and duodenum. Is this lesson not one which has been entirely learnt from a study of the "pathology of the living"?

For the second question, as to the value of the Lenhartz and other modes of treatment, the answer I think is plain. If in the majority of the cases of "gastric ulcer" the stomach is not primarily affected, these dietetic cures being surely dependent for their reason upon an accurate recognition of the morbid conditions they are intended to relieve, can be of little value. The surgeon, of course, sees the medical failures; the successes never reach him, and his view therefore, though not prejudiced, is, no doubt, deflected by the greater weight of evidence coming from the one direction. And, of course, it must be admitted that even if the real "gastric ulcer" is an infective condition low down in the bowel, the rest and starvation may well permit of its subsidence for a time. This is the view of "gastric ulcer" which the work of the surgeon compels him now to take. In giving his experience as it is formed in the operation theatre, he has no desire to change true rules for odd inventions, but only to disclose those things which are revealed by his different mode of study.

One very remarkable contrast is found in the experience derived respectively from the operation theatre and the *post-mortem* room. In all the textbooks of medicine the far greater frequency of occurrence of gastric ulcer as compared with duodenal ulcer is mentioned. The ratio is variously stated as between 9 to 1 (Trier) and 40 to 1 (Andral). Probably a proportion of 10 to 1 (that given by Fenwick) is accepted by most authorities. The experience of surgeons in recent years has shown, as stated above, that most cases of "gastric ulcer" do not affect the stomach, and the disclosures upon the operation table prove that duodenal ulcer is decidedly commoner than gastric ulcer. The ratio is probably about 5 to 1.

What, then, it may be asked, are the symptoms which allow a diagnosis of chronic gastric ulcer to be made with reasonable probability? When the ulcer is situated on the lesser curvature, extending down one or both surfaces of the stomach—a very common condition—the symptoms are in the very great majority of cases marked out chiefly by their order and precision. Pain follows upon the ingestion of food after a definite interval, which is consistent throughout the whole history of the case. As a rule the interval of comfort after a meal varies from half an hour to one hour. The pain is felt chiefly in the middle line and to the left, and tenderness also is more marked in these positions. If the hand is placed vertically with the fingers towards the chest, immediately below the costal margin and to the left of the mid-line, and the patient takes a deep breath at a moment when the pressure of the hand is increased, a sharp pain will be felt by the patient. Occasionally the pain radiates along the left costal margin, or upwards to the left breast, and this appears more especially to be the case when adhesions exist between the ulcer and the liver or the diaphragm. If the ulcer

should be on the posterior surface of the stomach, and deeply erode the pancreas, pain in the back is very severe, and may be constant. So far as my own experience goes, a deep, gnawing, persisting pain in the back is the invariable accompaniment of the ulceration, which burrows in the pancreas. Pain in the back it will be remembered is a very significant feature in cases of acute pancreatitis. The pain in cases of gastric ulcer, then, is regular in the time of its appearance, and in some cases it is marked by the seasonal variations so very definitely noticed in cases of ulceration in the duodenum. The summer months, in such examples, are those in which there is most freedom from suffering. Vomiting, which brings relief from pain, and haematemesis are both at times present, but are no help in the diagnosis unless the methodical repetition of the attacks of pain is also noticed. On *x-ray* examination of the stomach after the ingestion of a bismuth meal two conditions may be found. The appearances of an hour-glass stomach may be portrayed, or delay in the emptying of the stomach may be noticed. Both are probably due to spasm of the muscles of the stomach, affecting, in the one, the zone of the gastric wall in which the ulcer lies, and in the other the pyloric antrum, producing the condition described as "pylorospasm."

In a few cases a prepyloric ulcer may give rise to symptoms which mimic with remarkable accuracy those produced by a duodenal ulcer. These cases are very rare, but of their existence there is no doubt. In such cases a differential diagnosis may be made by observing that when an *x-ray* examination is made the "hypertonic" condition of the stomach is present in duodenal but not in gastric cases, and by examination of the stomach contents for free HCl. If an excess of acid is discovered to be constant (three examinations at intervals are necessary, according to Craven Moore) the ulcer is probably in the duodenum. If the acidity is low, then the ulcer is probably in the stomach. In one of my cases, in which a history suggesting very strongly the presence of a duodenal ulcer was given by a patient whose gastric contents showed a very low acidity, we found a large saddle-shaped ulcer about 3 in. proximal to the pylorus. The duodenum was intact.

A diagnosis, then, of chronic gastric ulcer depends for its accuracy upon a history the details of which are repeated from day to day with very definite and sustained regularity, upon certain signs given on physical examination, upon an *x-ray* examination of the stomach, and upon the results of a series of chemical investigations of the gastric contents. But even when every care is exercised, the most rigid inquiry made, and the most painstaking examination conducted, a greater number of errors in diagnosis will be found to have crept in than in cases of duodenal ulcer. In this latter disease mistakes in diagnosis are rare.

Among the more firmly accepted beliefs inculcated in the past by *post-mortem* experience, and chiefly by those statements of the textbooks which are loyally copied from one generation to another, is this: that in the majority of the cases—the usual estimate is 90 per cent.—gall stones exist in the gall bladder without giving rise to any symptoms. If it is necessary to substantiate this statement I might quote from several authorities. The best textbook of medicine in the English language contains this sentence:

In the majority of cases gall stones cause no symptoms. The gall bladder will tolerate the presence of large numbers for an indefinite period of time.

The most authoritative work in the German language states:

Cholelithiasis is, as *post-mortem* observations show, an extraordinarily common malady. On an average every tenth human being, and of elderly women perhaps every fourth, has gall stones. This does not, of course, express the frequency with which biliary calculi give rise to morbid phenomena, for one often enough finds *post-mortem* the gall bladder and bile ducts completely packed with calculi, although these have never caused any inconvenience or produced any ill effects.

The distinguished surgeon who contributes the chapter on gall stones to *Allbutt's System of Medicine* says that:

Gall stones may be found after death without having produced any symptoms during life.

There is no need to add to the list, which would include almost every authority, living or dead. In opposition to

these opinions I desire to state as positively as I can that gall stones almost never exist in any circumstances without the production of quite characteristic symptoms—symptoms which allow of the recognition of their cause with great accuracy. In all my experience I have only twice operated upon patients for gall stones without being able to elicit a previous history of "gall-bladder dyspepsia" of months' or years' duration. The textbooks tell us that the majority of cases of dyspepsia, especially flatulent dyspepsia, are "functional" in origin; and, again, that in many cases gall stones exist within the gall bladder without exhibiting their presence. The two statements require correlation; each explains the error of the other. For without doubt many of the so-called "functional" forms of dyspepsia are organic, and chief among them all is that connected with cholelithiasis. Of the inaugural symptoms aroused by the formation and the presence of stones in the gall-bladder I have written fully elsewhere, and can now add nothing to that description.³ A greatly enlarged experience has confirmed the accuracy of the picture I have there drawn. It is remarkable to note with what frequency many stones may be present in the common duct without any notable obstruction to the passage of bile resulting from their presence. In the large number of "secondary" operations that I perform upon the biliary tract the condition most commonly disclosed is the lodgement in the common duct, at any point, including the ampulla, of a stone or stones whose presence has escaped recognition at the first operation. The technical difficulties of these secondary interventions are so considerable (they are greater, I believe, than in any other operations) that any one who begins an operation for cholelithiasis should make it his business to search and search again all the possible channels in which a stone may have been arrested. The reason for the so frequent overlooking of these stones is that jaundice has not been present, and accordingly a search for a calculus in the main bile passage has been thought unnecessary. When I look through my cases of recent years I find that in no less than 25 per cent. of the patients from whose common ducts or hepatic ducts I have extracted calculi there is not at the moment, nor has there ever been in any period of the history, the remotest suspicion of a tinge of jaundice. Jaundice is not, as Courvoisier supposed, the "cardinal symptom" of stone in the common duct. It cannot be so if it is absent in this large proportion of cases. But if the staining by bile of the skin or conjunctiva has never been observed, is it possible to forecast the discovery of stones in the duct during an operation? In the large majority of cases the diagnosis can be made. I have found that in patients who are undoubtedly suffering from cholelithiasis the occurrence of attacks of colic, rather milder in intensity than usual but of far greater frequency—say, four or six attacks in two weeks—especially if the attacks are associated with a mild form of chill, a "goose-flesh" sensation in the skin and a slight shiver, and if there is continuous loss of weight, the presence of a stone may with reasonable confidence be predicted.

An organ which seemed very successfully to elude the vigilance of the pathologists of all times before the present was the pancreas. The grosser forms of disease in it—calculi, cysts, or neoplasms—were from time to time recorded, but of the frequency and importance of the symptoms which resulted from a derangement of the organ there seemed to be no knowledge. For example, Wilks and Moxon say of chronic inflammation of the pancreas that "the anatomical evidence of such occurrence is not very satisfactory." Malignant disease of the pancreas even now has proved, with the rarest exceptions, to be beyond the reach of the most intrepid operators. It is true that a very few cases of pancreatotomy have been performed with results which have been more satisfactory than could have been hoped. But the experience gained from these does not seem to hold out a favourable prospect for future attacks. It is curious to see how small a growth in the head of the pancreas needs to be to evoke long and bitter suffering, and the maddening torture of the itching which deep jaundice will often cause. I have seen a growth no bigger than a hazel nut prove fatal.

In respect of the treatment of these patients, I think we have all feared to advise operation because of the early ghastly mortality, computed by so fine a surgeon as Murphy some years ago at 80 per cent. A record of operations was

indeed a martyrology. In the last few years I have operated in almost all cases that have come to me, for I have felt that it was well worth the while of any patient to face the risk of operation rather than to suffer the agony which must otherwise be his lot. In all cases I have joined the gall bladder to some part of the alimentary canal—to the duodenum if I could do so with ease; to the stomach if it could be reached with less difficulty; in one case only I have taken the colon. The immediate results have been surprisingly good, for no patient yet has died, and the relief has been in all very considerable. I was at first a little apprehensive when the fistula was made into the stomach, but such cases seem to differ in no recognizable particular from those in which the duodenum has been available. Bile flowing freely into the stomach does not seem to impede the full activities of gastric digestion.⁴ In two of these cases it is certain that a mistake in diagnosis was made, for after a lapse of two and a half and three years the patients are quite well, have lost all tinge of jaundice, have gained weight and are in active work. They were doubtless examples of that most interesting and remarkable condition, chronic pancreatitis. I am not sure whether in these later days the pancreas is not sometimes accused of inflammatory transgressions when innocent. But it is quite certain that it may be accused of malignancy when it does not deserve the reproach. The older writers tell us nothing of chronic pancreatitis—the recognition of it is due to the investigations carried out upon the common bile duct in the search for stones impacted therein. When, as sometimes happened, a large hard mass was discovered, malignancy was imputed and a bad prognosis given, which the patient made haste to falsify. Riedel and chiefly Mayo Robson are entitled to the credit of this highly important advance in our knowledge. We are now fully aware of the fact that chronic pancreatitis depends very often for its development upon an infection from the common duct, which is set going by stones in transit or in arrest there. The danger of the condition lies in its continued development long after the original cause has been removed. In a few of my cases, after the lapse of years, glycosuria has developed and the patient has died comatose, no doubt from an implication of the islands of Langerhans in an interacinar inflammation. Glycosuria can be found from time to time in the urine of patients who suffer from cholelithiasis, and it may perhaps rightly be considered as the most urgent of all indications for early operation. In a very large proportion of the cases the pancreatic complication does not need to be specially considered; the removal of the cause, nearly always a calculus, with the subsequent drainage of the bile to the surface, is quite enough to ensure a subsidence of the inflammation. The fact that when a certain limit is overstepped the process of chronic induration will continue unchecked, and that the death of the patient from diabetes may thereby be caused, should, however, urge upon us the necessity of early operative rescue in all these patients.

REFERENCES.

¹ BRITISH MEDICAL JOURNAL, November 16th, 1907. ² *Proc. Roy. Soc. Med.*, 1911, vol. iv, No. 3, p. 61. ³ BRITISH MEDICAL JOURNAL, November 28th, 1908. ⁴ *Ibid.*, 1901, vol. i, p. 1136.

DURING the year 1911, we learn from the New York *Medical Record*, there were 2,145 deaths among medical practitioners in the United States and Canada. On an estimate of 140,000 physicians the rate was 15.32 per 1,000. For the nine previous years the death-rates were as follows: 1910, 16.96; 1909, 16.2; 1908, 17.39; 1907, 16.01; 1906, 17.0; 1905, 16.36; 1904, 17.14; 1903, 13.7; and 1902, 14.74. The average annual mortality was 16.11 per 1,000. The age of death varied from 23 to 99, with an average of 59 years and 10 months. The chief causes of death in the order named were cerebral haemorrhage, "heart disease," senility, pneumonia, external causes, and kidney disease.

In connexion with his visit to India, the King has been pleased to confer the following promotions and appointments in the Royal Victorian Order upon members of the medical profession: Lieutenant-Colonel Sir Richard Havelock Charles, K.C.V.O., Serjeant-Surgeon to His Majesty, is promoted to be Knight Grand Cross; Fleet Surgeon Robert Hill, M.V.O., R.N., H.M.S. *Medina*, is appointed a Commander, and Lieutenant-Colonel Robert Bird, C.I.E., Professor of Surgery, Medical College, Calcutta, and Dr. William Turner, Surgeon, Colonial Hospital, Gibraltar, are created Members of the Fourth Class.

An Address

ON

COMPRESSED AIR ILLNESS AND EXPERIMENTAL RESEARCH.

DELIVERED BEFORE THE DUBLIN BRANCH OF THE MEDICAL RESEARCH SOCIETY, JANUARY 25TH, 1912.

BY

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I COME before the Society this evening at a time when there is great hope for the progress of medicine—a time when we look forward to discoveries which will eventually result in an enormous amount of relief to suffering mankind, and a time when this society ought to have very little difficulty in defending itself from the attacks of those who wish to suppress medical research. Within the last year or so we have seen the discovery of a synthetic drug which has given us the means of curing one of the worst diseases that afflict humanity. Ehrlich's great discovery has opened up before us a new field of work, and, further, has inspired us with the belief that similar discoveries may shortly be forthcoming in other departments of medicine. The hope as to the imminence of such discoveries has recently been strengthened by a communication from Morgenroth to the effect that in his laboratory he has succeeded in curing 50 per cent. of the mice infected with the pneumococcus, a septicaemia which kills 100 per cent. Morgenroth has synthesized a drug and standardized the dose, by means of which he has been able to cure half the animals thus infected. We now look forward with some anticipation to see whether the same drug can be used in cases of pneumonia in man; the problem is not only to determine the dosage of the drug which will be effectual in man, but also to prove that the same drug which acts upon the pneumococcal infection in a mouse will also succeed in the human organism. Within the last few weeks also we have learned from Wassermann that he has synthesized a compound of selenium with eosin, and with this he has succeeded in curing cases of cancer in mice. The discovery is only just at its beginning, and in many cases the drug has destroyed the mouse, while in others it has destroyed the cancer and cured the mouse. But from this discovery we entertain the hope that something ultimately will come which will help to alleviate one of the greatest scourges of mankind.

All the great advances have been gained by experiments on animals, and I bring before you to-night a branch of inquiry in which I have been engaged for some fifteen years, hoping to demonstrate to you, again by experiments on animals, that it has been made safe for man, with suitable precautions, to work in compressed air. These precautions have been established by scientific methods and by the methods of research which this society helps to maintain.

Work in compressed air has accounted for a vast amount of sickness, suffering, and loss of life. Ladies who wear ropes of pearls, or pearl ornaments of any kind, are generally unaware of the mortality which follows those engaged in the pursuit of these gems. In the pearl fisheries off Broome in Western Australia, where Japanese are engaged as divers, I understand that the loss of life is something like 7 per cent., and the cemetery at Broome contains scores upon scores of graves of those who have lost their lives in the search for the pearls which decorate the woman of fashion. All this loss of life can be entirely prevented if the scientific methods which have been worked out upon animals are followed; and not only so, but the pearl fisheries can be safely extended with great economic advantage. The same thing holds good for many other branches of industry in which divers or workers in compressed air are employed. Compressed air enters into all great subterranean undertakings of to-day—tunnelling, harbour building, shaft sinking, drainage, pier and bridge constructing, and salvage work, as well as in diving for pearls and sponges. The means of