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Original Articles

REMARKS ON DISEASES OF THE BILIARY PASSAGES, WITH SPECIAL REFERENCE TO SURGICAL TREATMENT.*

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In the present communication I wish to consider, first, gall-stones; secondly, cholecystitis; and thirdly, those affections of the pancreas dependent upon gall-stones.

The diseases of the biliary passages which are directly or indirectly dependent upon gall-stones, and which are amenable to medical treatment, are few; but the diversity of their manifestation is great. The condition is a mechanical one. In the very beginning gall-stones probably owe their existence to the presence of a mechanical irritant, usually in the gall-bladder, though possibly elsewhere—generally in the form of micro-organisms. In some of my cases the bacillus typhosus has been found in the very centre of a gall-stone, after an existence of many years. In others the infection of the gall-bladder has been owing to the colon bacillus; in others, to the pneumococcus; in still others, to other forms of micro-organisms. Gall-stones, by their presence in the gall-bladder, make that viscus peculiarly susceptible to infection, either through erosions of the mucous membrane by pressure, or in some other indirect and little understood way.

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Infection situated elsewhere in biliary passages than the gall-bladder—in the hepatic, cystic, or common ducts, as well as many infections in the pancreas—are doubtless due indirectly to the presence of gall-stones. Much more common, however, than the symptoms owing to infections, are those owing to impactions of stones. A small stone engaged in the cystic duct, passing thence into the common, and thence into the duodenum, gives rise to the ordinary form of biliary colic. Permanent impactions in the cystic, hepatic, or common duct give rise to symptoms of long duration with exacerbations and with remissions, with irregularities of pain, jaundice, and fever, and manifestations of sepsis. In many cases gall-stones are latent in the gall-bladder, no symptoms whatever being noticed by the patient attributable to their presence. I find, however, that in cases of gall-stones in the gall-bladder which ordinarily would be regarded as latent, careful inquiry, after the establishment of the diagnosis by surgical exploration for other lesions, has shown that there are symptoms which can be explained best by the presence of stones in the gall-bladder.

Chronic inflammations of the pancreas dependent upon gall-stones afford a very interesting chapter in connection with this subject. The cases of pancreatitis, acute and chronic, have been thus far infrequent; yet I have no doubt that in very many instances the pancreas shares in the general derangement of the biliary system. To my mind an exact demonstration of the exact lesion of the pancreas known as *chronic pancreatitis* has not been made; and, in the nature of things, it will be made only with great difficulty. In many cases I have found an enlargement of the pancreas, a thickening and induration, and sometimes an irregularity strongly suggestive of cancer. In such conditions I used to close the abdomen on the supposition that the disease was cancer, and hopeless. The prompt recovery, not only from the exploration, but from the symptoms which called for that exploration, with permanent restoration of health, was to me very astonishing. I have regarded these cases as cases of chronic pancreatitis, and though infrequent, I have had of them a very considerable number.

There is, therefore, in the diseases to be considered a great diversity; and this diversity is almost wholly owing to the various mechanical ways in which the gall-stones affect the biliary passages.

A very important consideration in this paper, and one which

influences me perhaps more than any other, is that of bringing to the attention of the medical profession as vividly as possible my experience in the disastrous effects, direct or indirect, of gall-stones when left to themselves, compared with the brilliant results of early surgical treatment.

The material upon which this paper is based consists of my private cases and of the cases treated at the Massachusetts General Hospital. I have not been able to go through the records of the hospital with thoroughness, or to collect from my own records the full number of the cases which have been under my direct observation. The number, however, has been very considerable. At the Massachusetts General Hospital the number of operations upon the biliary passages has been three hundred, more or less. Besides these operative cases there have been a large number of patients treated medically. Some of these patients have been advised against operation, while others have declined surgical intervention even when operation has been strongly recommended. In my private cases there have been many in which no operation has been thought justifiable. Many of these patients, I saw early in my practice—long before gall-bladder surgery had reached its present perfection; in similar cases I now have some of my best results. There have been many cases in which gall-stones have been discovered in the course of other abdominal operations. In the latter cases I have had an unusual opportunity, after the exact demonstration of the physical attributes of biliary passages containing stones, to ascertain accurately the symptoms possibly dependent upon these abnormal conditions. The material upon which my remarks are based seems to me, therefore, abundant.

Up to recent years the pathology of gall-stone disease was dependent wholly upon the autopsy table. In cases of gall-stone disease fatal of itself the pathological changes were necessarily of the most chronic and extensive character. It was possible to learn very little of the anatomical conditions present early in the disease. Even to-day the demonstration at autopsy of changes dependent upon gall-stones is necessarily imperfect. Abnormalities which during an operation on the living would lead the surgeon perhaps directly to the seat of the lesions—variations in color, consistency, friability, and the like—are not noticeable in the dead, these variations from the normal having either entirely disappeared after death, or having been lost in rapid post-mortem changes. Unfortunately, however, the pathological conditions of gall-stones to-day in a great many cases—happily growing

fewer year by year—are those long since demonstrated at autopsy of advanced and practically untreated mechanical disease. It happens frequently enough to excite remark that in operations upon the very earliest known manifestations of gall-stones, ancient, serious, and extensive conditions are found which have taken place gradually in the course of many years without causing any unusual or even noticeable symptoms. I have seen, for instance, a gall-stone completely obstructing the small intestine in a patient of sixty-five, who had never in his life a moment's pain. This stone must have formed in the gall-bladder and ulcerated into the intestine, where it became lodged. That this could have happened without causing pain seems to me extraordinary. It illustrates very well the remark just made—that the condition may be severe without previously existing symptoms. In many cases the gall-bladder will be found thickened, contracted, everywhere adherent, filled with pus or muco-pus, with here and there a gall-stone ulcerated into its surface; and this after a history in which perhaps the most remarkable symptom has been a slight dyspepsia, or an occasional discomfort in the right upper quadrant. Sometimes one finds a single stone or chain of stones hopelessly impacted in the cystic duct, the only manifestations of disease being occasional pain with tenderness over the gall-bladder. A stone impacted in the comon duct, or in the hepatic duct, would seem necessarily to cause a permanent jaundice. I have seen not a few cases, however, in which the jaundice has been transitory, even when the stone has been hopelessly impacted. The stone acts as a ball valve, becoming at one time tightly impacted and causing jaundice, at others loosened enough to permit bile to pass, relieving jaundice. In the beginning I looked upon a stone in the common duct, or in the hepatic duct, as necessarily causing jaundice. On the other hand, the absence of permanent jaundice seemed to me to prove beyond a doubt that there could be no stone in these ducts. Numerous cases have shown the error of such observations; and the surgeon who argues, from the disappearance of jaundice, that the stone has made its way into the duodenum, will often find himself mistaken.

Although far-reaching and lethal changes are now occasionally found when there have been no previous symptoms of severity, yet in the great majority of cases the changes in the biliary passages are of a trivial nature, when the diagnosis is made early. It follows from the general remarks that I have just made as to the great variation in appearances, that one found

in the early surgery of gall-stone disease a great diversity of results. Many early cases were of the most formidable nature; operations for relief were difficult; dissections were deep and tedious; shock was great; the patient's ability to withstand shock was impaired by suffering as well as by disease; and the operator had not had opportunities of acquiring skill. The mortality, therefore, of the early cases of gall-bladder surgery was excessive. The surgery of the past fifteen years— and especially of the last ten years—has shown that the mortality, even in the severest cases, is not excessive; and that in the easy cases there is practically none.

The burden of my communication is, therefore, to show the great frequency of gall-stone disease, the great variety of its manifestations, and the brilliant results of surgical treatment.

I have referred to cases in which gall-stones have been found during abdominal operations for other diseases. For a long time it has been remarked, especially by those opposed to frequent operations for gall-stones, that in many cases autopsy shows the existence of gall-stones that have never been suspected. And this argument has been used in opposition to the rule that gall-stones should be removed as soon as they begin to offend. I have already spoken of the frequency with which I have found gall-stones during operations for other lesions, but I am not ready to admit that gall-stones can exist in the gall-bladder without causing any symptoms whatsoever. After the demonstration of gall-stones, I am sure that one will find symptoms dependent upon those stones. Nothing is, I suppose, more common than an occasional disagreeable sensation. These symptoms are always attributed to dyspepsia. When we think how common the symptoms of dyspepsia are, how few people go through life without having at one time or another some form of what is called indigestion, we find at once in gastric symptoms alone a possible refutation of the statement that gall-stones may exist without causing symptoms. Up to very recently it would have been the height of absurdity to say that a transitory discomfort in the region of the stomach was caused by gall-stones. The physician who would make a diagnosis of gall-stones from sensations which the layman has for many years called dyspepsia would be ridiculed. I have not the least doubt, however, that many—even most—of the cases of dyspepsia are owing to mechanical interferences either with the stomach itself, or the pylorus, the duodenum, or the biliary passages. I have seen too many cases of chronic dyspepsia completely cured by surgical operations upon

an organ even so far remote from the stomach as the vermiform appendix, to regard with surprise the possible dependence of trivial gastric symptoms upon gall-stones. In the cases which I now have under observation and in which I know that gall-stones are present, I am watching with great interest the development of all symptoms connected with the epigastrium. It is in the consideration of cases of this kind that the future of gall-bladder surgery lies; for it is in the cases in which gall-stones are removed at a time when they cause so little trouble that their presence can hardly, even now, be suspected, that the most brilliant results follow. Gall-stones in the gall-bladder are a constant menace to health. No man can say when the first stone will become impacted in the cystic duct. Once impacted there, it is the source of a long train of severe symptoms. No one can tell where it will end; all that the surgeon can be sure of is that the removal of gall-stones from the unaffected or but slightly affected gall-bladder is as certain to be immediately and permanently successful as any operation in surgery. It is to the consideration of cases at this period that surgeons urge the attention of the medical profession. It is at this time that surgeons call upon physicians to make their diagnosis. To make a diagnosis of gall-stones when the attention is called to them by so conspicuous a symptom as jaundice, requires little either in experience or in skill.

Numerous observations upon the living, not only in cases of gall-stone disease, but in the course of other abdominal operations, have convinced me of the futility of any but surgical measures in the radical treatment not only of gall-stones themselves but of their effects. Although variations from the normal may be excessive, even if there have been no symptoms whatever pointing to the biliary passages; yet, on the other hand, the gall-bladder may be packed with gall-stones without any apparent changes either in its walls or upon its peritoneal surface. In some instances it is possible to predict very considerable changes from the normal, especially when there have been many and frequent attacks of pain, with fever and local tenderness. Simple attacks of biliary colic, without fever, are not likely to be followed by changes in the gall-bladder. The relation between cause and effect, as shown by frequent explorations after attacks of gall-stone symptoms, is interesting and important. One can often predict a difficult and dangerous operation from the changes likely to be found after certain histories. On the other hand, he

can often with confidence predict a slight deviation from the normal, and an easy and successful operation.

The importance of frequent observations upon the living cannot be overestimated in considering the subject of gall-stone diseases; for opportunities for post-mortem examinations are, from the nature of things, infrequent, and when patients die of gall-stone disease one is likely to find only the old and the extensive changes. Only those cases of trivial gall-stone lesions are observed post-mortem which accompany deaths from other and more serious diseases. In all post-mortem observations delicate attributes are lost. One can get on the post-mortem table no information whatever as to color or consistency, for the changes that take place after death are so great that one can infer but little from appearances. The mechanical lesions of gall-stones can be demonstrated after death as well as before, and perhaps in some instances better: but the greater part of the knowledge regarding the anatomical appearances in gall-stone diseases, and the relation between these appearances and the histories, both before and after operation, has been gained almost wholly by observations made during surgical operations.

Time does not permit me to consider my subject from the pathological and anatomical standpoint. The changes vary between the widest limits in the appearances, both of the gall-bladder and of the contiguous viscera.

I have described in other papers the changes that take place in the gall-bladder, in the ducts, in the duodenum, in the hepatic flexure of the colon, in the bile, and in the liver. Some of these changes I shall refer to later in connection with operative procedures. I should say that the anatomical appearances are almost wholly mechanical, the changes are mechanical, the causes of symptoms are mechanical, and the remedies must be mechanical.

Symptoms.—The symptoms of gall-stone disease are

I. Mechanical symptoms caused by gall-stones directly:

II. Symptoms caused indirectly by gall-stones through infections.

The Symptoms of Gall-stones Themselves.

1. I have little to say as to the symptoms of gall-stones in this communication. I assume that the conventional signs of gall-stones are very generally understood. A typical gall-stone attack consists of sudden and severe pain, returning in parox-

ysms, beginning with the engagement of the stone in the cystic duct, and lasting until its expulsion into the duodenum. The onset of the attack is sharp; its course violent; its duration variable; its end sudden. The attack is, as a rule, brief. The pain can be controlled only by large doses of morphia or by general anesthesia. When a stone obstructs for any length of time the flow of bile, there will be either a visible jaundice or sufficient absorption of bile to appear in the urine. After subsidence of symptoms and disappearance of jaundice careful search may show one or more gall-stones in the stools. Such an attack, even if never repeated, is indicative of gall-stones. Although a single gall-stone may be formed in the gall-bladder and thus be expelled, the chances are very great that in most cases more than one gall-stone remain in the gall-bladder.

A simple biliary colic, caused by the successful passage of a stone, is frequent. One who has seen many such cases can make the diagnosis with such accuracy that the proving of the diagnosis by the discovery of the stone in the stools is hardly necessary.

2. The second class of gall-stone symptoms is much less characteristic. This class comprises the cases in which gall-stones exist either in the gall-bladder or in the ducts. The gall-stones, however, escape neither from the gall-bladder nor from the ducts. By far the greater proportion of the cases with which gall-bladder surgery deals belong to this class. The calculi are not expelled: they remain in the position in which they were when they began to cause symptoms. One may find a large number of stones confined to the gall-bladder. In these cases the history will be that of pain or distress either in the right upper quadrant or in the epigastrium. If the stones are confined to the gall-bladder there will, of course, be no jaundice. The cause of the pain is a matter of speculation, and one guess is perhaps as good as another. The cause of pain in the successful passage of a stone is probably spasm—like the pain in the passage of a renal stone through the ureter. It is hard to understand the cause of paroxysmal pain when stones are confined to the gall-bladder, and when none of them are engaged in the cystic duct; but, as I have said, in the majority of cases of gall-stone colic no stone can pass into the ducts, for the entrance to the duct is so obstructed by a single stone of large calibre that no small stone can possibly get by it. The same thing is true in many cases of stone in the common duct. In many instances the symptoms are owing to infection. The gall-bladder will be found thickened

and contracted upon one or more stones, with ulceration of the mucous membrane, and it will contain either pus or pus mixed with bile. I have seen a large number of such cases, and I am at a loss to explain the pain. In many cases the only discomforts complained of are nausea and distress; in some there is excruciating pain; in some simple dyspepsia. The chief symptom in this form of gall-stone disease is pain, in some form or other, recurring at irregular intervals, with fever and with local tenderness. The history is that of the mechanical effects of gall-stones themselves upon the gall-bladder, with those of more or less septic absorption.

3. A third class of gall-stone symptoms comprises those cases in which there is a tight impaction. These impactions are usually in the cystic duct or in the common duct—very rarely in the hepatic duct. In impactions of the cystic duct the one symptom of importance is the dilatation of the gall-bladder with pain, and usually with a tender tumor (distended gall-bladder). There is no jaundice when the cystic duct is impacted. There is pain, either at irregular intervals, or constant, with a tender tumor in the region of the gall-bladder. Occasionally the impaction is overcome; bile escapes from the gall-bladder around the stone, and the case becomes quiescent. If an infection takes place when a stone is impacted in the cystic duct, this infection may go on to gangrene and perforation, the symptoms of which are either the symptoms of localized peritonitis in the right upper quadrant, or a rapidly-spreading general infection from the escape throughout the peritoneal cavity of infected bile. In some cases, under appropriate treatment—rest, local applications, and anodynes—the gall-bladder empties itself around the calculus, or the calculus slips back from its seat of impaction into the gall-bladder. In such cases the infection disappears, and the symptoms subside. The gall-bladder, however, does not recover its normal condition: it is, by the attack, thickened in its coats, and its distensibility is somewhat lessened. With repeated attacks like this, the gall-bladder becomes in the course of time contracted tightly upon the stones which it contains. In this way, after many attacks, the gall-bladder will be found as a thickened, resistant, adherent knob on the under surface of the liver, near the foramen of Winslow.

When a stone is permanently and tightly impacted in the duct, and when there is, therefore, no possibility of the escape of fluid through the cystic duct, the gall-bladder may become permanently distended. I have seen such a gall-bladder enormously

distended with colorless fluid—chiefly ropy, transparent mucus from its own mucous membrane. Whatever bile it may contain in the beginning becomes decolorized. In this class of cases the gall-bladder presents a more or less definite tumor. When a stone becomes impacted in the common duct in its passage from the gall-bladder to the duodenum, the symptoms are first those of ordinary biliary colic. If the stone is hopelessly impacted the jaundice becomes marked; then severe; then extreme: the stone not budging at all and not permitting the escape of bile around it, and not yielding in the least to the *vis a tergo*. Pain gradually ceases. An attack of this kind, beginning with the most violent and unbearable paroxysms of pain, may end in a painless jaundice. Few, if any, cases of impaction in the common duct—all these remarks apply, too, to the hepatic—are unattended by pain. Pain in some form or other, from simply an uneasy sensation in the epigastrium to the violent and unbearable paroxysms of biliary colic, is the rule in all cases if gall-stones offend at all. On the other hand, that gall-stones do exist without causing any pain, cannot be denied; but even in these cases there is some interference with digestion. When, after very careful questioning, no such symptoms can be elicited, grave doubt is thrown upon a gall-stone cause for the history, whatever it may be.

Symptoms Caused Indirectly by Gall-Stones, through Infection.

The symptoms of infection of the biliary passages may be very obscure. I do not intend to discuss in this paper the subject of infections of the bile ducts through the liver. Cholangitis, —typhoidal, catarrhal, suppurative, infectious—although a subject of great interest, does not come within the scope of this communication. Doubtless more or less infection exists in many cases of gall-stone impaction in the common duct; but diffused infections, although they exist, are beyond the powers of surgery to remedy. Trivial infections, affecting perhaps one of the larger radicles of the hepatic duct, easily amenable to drainage, doubtless exist, without causing any especial symptoms. These infections rapidly subside with the free drainage of cholecystotomy or choledochotomy. Infections of the gall-bladder are an important branch of biliary surgery, for these diseases permit the most brilliant successes after drainage. They present in their history and in their symptomatology one of the gravest and one of the most urgent lesions of the abdominal cavity. The history of an acute cholecystitis is very characteristic. In many cases the acute

attack is preceded by a history of gall-stones. Careful inquiry will show that there has been either a well-defined history of recurring attacks of biliary colic, or that there have been in the region of the gall-bladder the symptoms of gall-stones already described. In some cases, however, infection of the gall-bladder may take place without the presence of gall-stones at all. One of the most familiar infections is that occurring in the course of typhoid fever. Doubtless in many cases the subsequent formation of numerous gall-stones follows the original appearance of the bacillus typhosus in the gall-bladder during the course of typhoid fever, but in a very considerable number of gall-bladder infections no gall-stones whatever are found. In a paper on this subject that I read some years ago before the Philadelphia Academy of Surgery, I reported a number of cases of cholecystitis in which no gall-stones were found. I am inclined now to think —from what I have seen of this disease since, and from the subsequent history in one or two cases then reported—that gall-stones existed, but were overlooked. I now fully expect to find, in a case of infection of the gall-bladder, one or more gall-stones, either in the gall-bladder itself or in the cystic duct. A history then, even if very obscure, of gall-stones, preceding an attack of sudden pain in the region of the gall-bladder, with tenderness there, with fever, usually with a well-defined, resistant, tender tumor, points almost invariably to a cholecystitis. In some cases the symptoms of acute gall-bladder infection, which constitutionally are like those of any other form of localized peritoneal infection, become suddenly aggravated by a general peritonitis. In some of these cases there is a complete gangrene of the gall-bladder, with the escape of its infected contents. I have seen a few instances of complete gangrene of the gall-bladder, but never one of perforation of a gangrenous gall-bladder. One reason is that in my cases I have been called before rupture has had time to take place, and when the symptoms have been so imperative that I have operated. An acute infection of the gall-bladder, as I have already remarked, does not necessarily result in gangrene or in perforation. In the majority of cases the acuteness of the symptoms subsides, and the gall-bladder manages to drain itself, either because the stone has become detached from its impaction and has fallen back into the gall-bladder, or, in case there is no stone, because the swelling of the mucous membrane has subsided and permitted the escape of gall-bladder contents into the duodenum. With the confidence born of inexperience and ignorance, I stated some years ago that acute cholecystitis always de-

manded operation; that it always went on to suppuration, with or without gangrene, and with perforation. My experience has become so much larger of recent years that I have seen the folly, in this instance at least, of basing a strong opinion upon a limited number of cases. I think it is safe to say that, in the majority of cases of acute gall-bladder infection, that this infection will, under palliative measures, subside. I have found not a few in which it was possible to wait for the period of quiescence before opening the gall-bladder. The analogy between the infected gall-bladder and the infected appendix is strong. In both organs, even under the most threatening conditions, the acute symptoms may subside, and an operation may be permitted in the period of comparative health, when the dangers of spreading the localized infection are reduced to a minimum, and when the patient is in a good condition to undergo safely a severe operation. On the other hand, in many cases of cholecystitis, as in many cases of appendicitis, the danger of waiting for the subsidence of the symptoms is too great to permit palliation. The symptoms in these cases are so imperative that immediate drainage is demanded. A little experience in the surgery of acute cholecystitis will show, I think, the best course to pursue in the different classes of cases. My own rule is to drain the gall-bladder in all acute infections, unless I see the patient at a time when the symptoms have already begun to subside. As time goes by, the reasons which to my mind justify delay in infectious processes of the biliary passages must be stronger and stronger, just as in appendicitis. Symptoms increasing in severity, or at a standstill, are extremely grave, and make the outlook serious and the responsibilities of deferring drainage too heavy to be borne with equanimity. If a patient is rapidly improving, if constitutional signs are subsiding, if the localized tenderness is diminishing, if the tumor is growing smaller, then the advantages of an operation in the period of quiescence are so great, and risk of a sudden exacerbation of local signs so slight, that in my opinion one is justified in waiting for the most favorable local and constitutional condition for intervention.

The symptoms of acute cholecystitis are, as a rule, clear.

Diagnosis.—The diagnosis of the lesion caused by gall-stones has been considered in the foregoing remarks. The diagnosis is generally easy and sure. There are many cases, however, in which the symptoms themselves, though not pointing directly to gall-stones or to any other definite lesion, demand operation.

In some cases these symptoms merely justify operation; in others they demand intervention in the strongest terms. When we come to the indications for operation, it is well to consider those cases in which the diagnosis is positive, and those in which the diagnosis is obscure. In the positive cases operation is, in my judgment, indicated, unless there are contraindications in the patient's general condition or in the condition of other viscera. In certain cases an exploration is indicated because, if gall-stones do not exist, other lesions may be found which are quite as disabling and sometimes much more serious than gall-stones.

To me the diagnosis of lesions of the biliary passages is one of the most interesting topics connected with the subject. In former days, when the diagnosis was always speculative, never verified except by autopsy, or in those rare instances in which the gall-stone was found in the stools, the matter of diagnosis necessarily was attended by much less interest. At the present time when, in almost all cases, operation is or should be performed, surgery is the control of diagnosis. In considering the history, the existing symptoms, the physical signs, the physician knows that the correctness or the falsity of his opinion will soon be established. The effect of this is to make him extremely careful in his observation of the case, and in the formation of his opinion, and moreover modest in expressing it. One may be ever so positive in expressing an opinion when there can be no chance of demonstrating the truth of that opinion; but when the surgeon stands over the patient, knife in hand, even the most positive and confident consultant may hesitate. It is by the demonstrations of surgery that the skill of the diagnostician is determined, just as it is by the same demonstration that the connection between cause and effect, between histories, symptoms, physical signs and actual lesions, is demonstrated. The diagnosis, therefore, of disease of the biliary passages has, in the present era of extraordinary surgery, a surpassing interest.

The great frequency of explorations in the right upper quadrant has given the surgeon unusual skill in the diagnosis of lesions in this area, just as the frequent explorations in the right lower quadrant has given him skill in that region of the abdomen.

In the beginning I felt convinced of the presence of gall-stones only when they were demonstrated in the stools. It seemed then essential to discover a gall-stone in the stools after a typical attack of biliary colic. It soon appeared, however, that the number of cases of gall-stones in which this positive demonstration could be made was comparatively small. To make a

diagnosis required repeated attacks of colic and prolonged examination of the stools. In many cases the gall-stone would escape observation, even if the movements were carefully sifted. In other cases the stones were soft, and were broken up and the fragments lost. The history of an ordinary gall-stone attack was proved so frequently to be pathognomonic of gall-stones, that I long ago gave up the tedious search for gall-stones in the stools. I now myself recommend this search if patients are particularly anxious to be convinced of the presence of stones; but I regard it as unnecessary.

The diagnosis of gall stones, single or multiple, lying in the gall-bladder, too large to escape, is a very interesting problem. The history in cases of this kind is extremely obscure. It is evident that there can be no symptoms dependent upon the passage of a stone if it is impossible for one to escape. One will not have, therefore, the history of a small calculus passing through the cystic duct and the common duct into the duodenum. There will be absence of that paroxysmal and characteristic pain. There will be no jaundice. The attack will neither begin suddenly nor end suddenly. The symptoms which the stones in the gall-bladder produce will be the first sign of what I have called *offending*. Under the pathology of gall-stones in the gall-bladder I have considered some of the lesions which gall-stones confined to the gall-bladder may produce. These symptoms of offence are in the beginning those of discomfort or distress, sometimes of actual pain. This pain may be paroxysmal like the pain of a passing stone, probably from the violent efforts of the gall-bladder to expel them. The stones cause these obscure symptoms of discomfort and uneasiness in some not understood way. Tenderness after the attack may or may not be present. Stones are, of course, never found in the stools. The gall-bladder may be distended and palpable, especially if its contractions force a stone tightly into the beginning of the cystic duct or into the narrow, pear-shaped depths of the gall-bladder. I have seen not a few instances in which a stone has been tightly grasped, not by the fibres of the cystic duct, but by the fibres of the gall-bladder itself. The diagnosis of gall-stones thus offending in the gall-bladder may be extremely difficult. One must distinguish between the grumbling of a gall-bladder and of the stomach itself —a gastralgia, a dyspepsia; between the grumbling of a gall-bladder and lesions of the right kidney, duodenal ulcer, chronic infection of the pancreas. The most important diagnostic points of gall-stones in the gall-bladder are the irregularity of the onset

of distress, the lack of association with errors of diet, the irregularity in the duration, in the method of onset, in the method of subsistence, and the general similarity between the successive attacks.

I have had a chance to observe the symptoms of this form of gall-stone disease when the diagnosis was made at operative exploration, before there had ever been any conscious discomfort in that region. One patient had a gall-bladder perfectly filled either with one large or many small stones simulating a large one. The patient had never the least trouble from her gall-stones. The diagnosis was, of course, sure; for I saw and felt the gall-bladder. The operation during which I examined this gall-bladder was an abdominal hysterectomy. During convalescence the patient had an attack of what she would have called *acute indigestion;* but there was tenderness over the gall-bladder. I have no doubt that the acute indigestion was simply a manifestation of gall-stone irritation. I have under observation several patients upon whom I have performed abdominal hysterectomy, and upon whom I have demonstrated the exact condition of the biliary passages with reference to gall-stones. Some of them have as yet had no symptoms whatever. Others had had, at irregular intervals before the operation, some indefinite discomforts usually regarded as dypepsias. The diagnosis, then, of gall-stones in the gall-bladder, without special anatomical changes in the gall-bladder and without infections or cystic duct impactions, rests entirely upon these obscure pains, discomforts, and so-called dyspepsias. They give rise to no other symptoms whatsoever in the beginning.

When the gall-bladder can be felt by palpation through the abdominal walls, it is always abnormal; and this abnormality is usually a distention caused by a gall-stone impaction of the cystic duct. A gall-bladder filled with stones may be felt in very thin patients, if it is much enlarged. I have never met with such a case, however. The diagnosis may then be made without any subjective symptoms, for the objective ones will be conspicuous and unmistakable.

What the very earliest signs of gall-stones may be, it is hard to say. Obscure, indefinite pains in the epigastrium, the hypochondrium, the back; dyspepsia, gastralgia, or any other functional disturbances connected with digestion. These gastric symptoms, so obstinate, so disabling, are the commonest met with in medical practice. They are present in many cases of undoubted gall-stones, as in many if not most of chronic appendi-

citis. If they are not dependent upon a physical lesion, why do they disappear after removal of, say, an inflamed appendix? Why do the patients recover entirely and permanently after the removal of gall-stones?

The very first symptom of gall-stones in the gall-bladder, except that of a biliary colic, is, I am convinced, some form of pain or discomfort either in the immediate region of the gall-bladder or in the epigastrium. The attack may begin suddenly, or it may begin and end gradually. It may begin gradually and end suddenly, or begin suddenly and end gradually. It is sometimes noticeable, though it may not be mentioned. It may even be recalled with difficulty. The pain, distress, discomfort, or whatever the sensation may be, has in gall-stones a great significance. Just what these symptoms may be, just how frequent, invariable, and convincing, can be told only after sufficient observations upon those patients in whom gall-stones have been found in the course of abdominal explorations for other causes. I repeat that many causes of so-called dyspepsia, gastralgia, and other functional disturbances of the stomach, the pylorus, and the duodenum, are simply the earliest manifestations of gall-stones. The demonstration of the truth of this conviction is at present impossible. A systematic demonstration of the condition of the gall-bladder in all abdominal operations which permit the short time necessary to make them, will, I am sure, show the truth of this remark.

The diagnosis of gall-stones in the cystic duct and in the common duct is usually easy. A history of gall-stones, followed by a dilatation and tenderness of the gall-bladder, points to impaction of a stone in the cystic duct. The only error will occur from the dilatation of the gall-bladder from obstructive disease of the pancreas. Dilatation of the gall-bladder in cancer of the pancreas is very common; but this is always attended by jaundice. A dilated gall-bladder, following a more or less definite history of gall-stones, means always a stone impacted in the cystic duct. There is, however, a chance of mistaking a cystic duct impaction for a new growth of the gall-bladder; but in neoplasms of the gall-bladder the patient's age, the emaciation, the cachexia, usually point with more or less certainty to the truth.

The diagnosis of gall-stones in the common duct used to seem as easy as the diagnosis of biliary colic, but I have been in this matter confounded by finding myself entirely mistaken in several particulars. A gall-stone impacted in the common duct must, it

would seem at first thought, cause invariably a permanent jaundice. As a matter of fact, however, though rarely, a gall-stone may remain for a long time in the common duct without causing either a permanent or a transitory jaundice. A transitory jaundice is, however, the rule in transitory infections; a permanent one in permanent infections. There may, however, be a brief transitory jaundice with the stone still confined to the duct. This phenomenon I have explained, the stone acting as a ball-valve, and moving freely up and down in the dilated duct. The lesions to be distinguished from common duct impaction are cancer of the pancreas, and chronic pancreatitis. Gall stone impactions are always preceded at some time or other by pain. The pain in the initial impaction is a typical biliary colic. That pain, however, after a time subsides, the duct becomes dilated, the spasm ceases, and a painless, permanent jaundice or a painless intermittent jaundice follows.

In cancer of the head of the pancreas, jaundice comes on slowly and is permanent. Though in its development it may show remissions, once the closure is complete it is permanent. There is no pain at any time. This absence of pain is the most characteristic sign of a neoplasm of the pancreas. Though a cachexia is often present in prolonged gall-stone jaundice, the cachexia of cancer is, as a rule, more characteristic than the cachexia of gall-stones. One must not, however, in making a diagnosis, give too great weight to the cachexia. I have seen just as marked a cachexia in gall-stone impaction, in patients of suitable age, as I have seen in cancer of the head of the pancreas. Indeed, I have been surprised, after making a diagnosis of cancer of the head of the pancreas, to find gall-stones, just as, in exceptional cases, I have been surprised to find gall-stones after making a positive diagnosis of cancer of the head of the pancreas. An absolutely positive distinction between these two lesions cannot be made. It is the duty of the surgeon, therefore, to explore in every case, no matter how strongly he may be inclined to the diagnosis of cancer.

Between a gall-stone impaction and a chronic pancreatitis with pressure on the common duct, distinction cannot be made. A chronic pancreatitis is almost always accompanied by gall-stones, so that even if the diagnosis of gall-stone in the common duct or in the cystic duct or in the gall-bladder is positive, one must not be surprised to feel an enlargenment of the head of the pancreas, sometimes presenting to the touch features so suggestive of cancer that it is hard to convince one's self that cancer is

not present. I have seen now some twenty or thirty cases of chronic pancreatitis accompanying lesions of the biliary passages dependent upon gall-stones. Every patient has recovered. Some of the cases seemed to the touch so much like cancer that it is hard to realize that permanent recovery has followed.

The diagnosis of infections of the gall-bladder is easy. A year ago I should have said that it was almost impossible to make a mistake. In the beginning of my experience with acute cholecystitis I made the mistake of calling the disease appendicitis. I observed the same mistake in the experience of some of my colleagues. Operating, in the early days, for appendicitis only when there was clear evidence of the pus, we would find a tumor, with resistance, higher than usual. The diagnosis of acute appendicitis, with abscess, would be made. We began to find that occasionally the tumor was an excessively dilated, inflamed, and gangrenous gall-bladder. I have reported a good many of these cases. When our attention had been drawn to the gall-bladder as an organ, the lesions of which frequently simulated appendicitis, the history, the constitutional signs, the local signs, and especially the tender tumor at the exact site of the gall-bladder, made a diagnosis apparently impregnable. In operating recently, however, upon such a case, in which I made the diagnosis with the utmost confidence, having a history not incompatible with the existence of gall-stones, and feeling a tender tumor at the exact site of the gall-bladder, after incising the abdominal wall, I was amazed to be greeted by a spurt of fecal-smelling pus which at once suggested appendicitis. I found a gangrenous appendix resting upon the gall-bladder and kidney. The time will undoubtedly come when such a mistake in diagnosis will not be made. I should very likely in this case have made a correct diagnosis if the symptoms demanding operation had not been so clear and so urgent. The case was an emergency. There had been pain, fever, tenderness, and there was a tumor presenting which, whatever its nature, demanded drainage.

Some of the milder infections of the gall-bladder are harder to make out. As I have already remarked, a gall-bladder containing gall-stones may, through successive infections, gradually contract upon the contained stones. A gall-bladder thus contracted disappears entirely from the possibility of palpation. It retracts, and in many cases will be found as a mere knob on the under surface of the liver. It is this tendency of the gall-bladder to contract after repeated infections which justified Courvoisier's law in this regard. A gall-bladder which has never become

thickened will, with impactions of gall-stones in the cystic duct, the common duct, or with obstruction of bile from enlargement of the pancreas or from any other cause, always become dilated. A gall-bladder which is the seat of repeated infections will in time always become contracted. The active cause is the infection, and the diagnosis of infection will in extreme cases depend entirely upon the history.

The diagnosis between an acute infection of the gall-bladder and a pyonephrosis is usually easy, though sometimes difficult. The history of pus in the urine, either continuously or intermittently, in combination with a tumor in the region of the gall-bladder, indicates with sufficient clearness a renal origin, even if the tumor occupies the position usually taken by a distended gall-bladder. The chief difficulty in diagnosis arises when the pyonephrosis is chronic and intermittent, the urine being unaffected during the period of observation—necessarily brief in urgent cases—and the history obscure. I have operated on one patient, expecting to find an acute cholecystitis, and have found an acute pyonephrosis.

When the gall-bladder is fixed by adhesions to the stomach, the duodenum, or the colon, the mobility by which one is able to recognize the gall-bladder is lost. Acutely infected gall-bladders, however, are almost always fixed; they move but little even with the movements of the liver. I have seen sometimes symptoms of acute intestinal obstruction accompanying acute cholecystitis. This acute obstruction is not a real one, but is simply a temporary paralysis of the hepatic flexure of the colon. It disappears after drainage of the gall-bladder.

The diagnosis of impaction of the hepatic duct cannot be made. It is an extremtly rare lesion, in my experience. Gall-stones in the hepatic duct have almost always retreated there after escape from the cystic duct. When, for instance, a stone is impacted in the common duct below the opening of the cystic, the common duct and the hepatic duct become dilated, and additional stones may then be forced from the gall-bladder through the cystic duct into the hepatic, or many stones may thus be forced. The diagnosis of stones here, however, as I have just said, cannot be made except at operation. I have removed a stone impacted in the hepatic duct, and I have removed many stones from a dilated hepatic duct which were not impacted. In one case all within reach were removed, and a hundred and fifty were subsequently discharged through the drainage-tube.

The diagnosis of chronic pancreatitis, as I have already said,

cannot be made, even with probability before operation. It is an operative diagnosis. If chronic pancreatitis is an infection of the pancreas caused by the irritation of gall-stones, then whenever the diagnosis of gall-stones is made one must not be surprised to find an enlargement of the pancreas.

Indications for Operation.—It would perhaps be an easier task, and it would certainly be a briefer one, to say what the contra-indications are to the removal of gall-stones after the diagnosis has been made. In my opinion gall-stones should be removed just as soon as they make their presence known—just as soon as they begin to offend. Assuming as true what I believe to be proved—that in the great majority of cases gall-stones are formed in the gall-bladder—the best time and the safest time for their removal is when they are all confined to the gall-bladder. A review of the pathological conditions in gall-stone lesions, and a candid presentation of the causes of death after operation, are so convincing that reasons against surgical intervention in the earliest stages seem hardly worthy of mention. When gall-stones are in an unaffected gall-bladder, they are separated from easy removal only by the thickness of the abdominal wall. The gall-bladder is soft, distensible, large, and accessible. It has no adhesions. If necessary, it can be removed almost as easily as the loose vermiform appendix. The moment infection is begun, the gall-bladder is changed: it becomes adherent; that adherence becomes in time firm. The gall-bladder becomes thickened; it gradually contracts. Its walls cannot be easily manipulated: they are friable; stitches tear out. Moreover, the removal of gall-stones, in spite of everything, necessarily infects the field. Nevertheless, even from a gall-bladder thus changed and thus infected the removal of gall-stones is easy and safe as compared with the removal of stones from the cystic duct, the hepatic duct, or the common duct. The further along a stone goes, the more inaccessible it becomes, the more vital are the structures which it involves, the deeper must be the dissection, the longer the abdominal incision, the greater the soiling of the field. It is absurd to say that a stone can be removed even from the comparatively accessible cystic duct with as little risk as from the gall-bladder. It is the height of folly to maintain that choledochotomy is as easy and as safe an operation as cholecystotomy or cholecystectomy. Stones in the hepatic duct may retreat even beyond all possibility of their removal.

In reviewing the causes of death in the cases at the Massachusetts General Hospital and in my own cases, they have been,

without exception, the result of delay. Fortunately, at the present time attention has been so repeatedly called to the importance of early operation that the ancient gall-stone case—with all that that adjective implies—has become as rare as the old adherent ovarian tumor or the gangrenous and perforated vermiform appendix with general peritonitis.

I agree most heartily with what has been said by Robson, that when gall-stones are removed in the beginning, when they are confined to the gall-bladder, there is practically no mortality. The mortality begins when the cases begin to show the later and severer lesions. When patients are jaundiced, when their powers of resistance are enfeebled, then the mortality begins to increase. The older the case, the greater the constitutional impairment, the more severe the local signs, the greater the mortality. It seems absurd that we are obliged at the present time to urge early operations in gall-stones. Some years ago, in Atlantic City, at a meeting of the American Medical Association, I presented the following proposition, which I endeavored to prove: *That gall-stones should be removed as soon as they begin to offend, unless there are contra-indications in the patient's general condition or in the condition of other viscera.* That proposition met with general approval, although some men of great experience said that it was too radical a position to take. The truth of that proposition has been demonstrated since then; and the men of the largest experience in gall-bladder surgery in this country and in England advocate it. At the recent Congress of American Physicians and Surgeons at Washington that proposition met with no opposition whatsoever.

In gall-stones, then, the only indication for operation is the diagnosis of gall-stones. As soon as the diagnosis of gall-stones has been made, the gall-stones should be removed. This rule, like all other rules, has certain exceptions. When the patient's general condition is bad, when locally an operation will be attended by unusual risk, it may be well to use palliative measures until a time favorable enough for operation has arrived. Kehr recommends palliation in such cases, and sends the patients to Carlsbad.

Jaundice, though a strong indication for operation, may be also a contra-indication. If the patient has the jaundice of a biliary colic, a reasonable time—three or four weeks, perhaps—should elapse before operation, in the hope that the stone causing jaundice will make its way successfully into the duodenum, and

that the removal of remaining stones may be accomplished in the period of comparative health.

The rule which I have made admits, as I have said, of certain exceptions. The exception, however, is when the patient's general condition is such that the operation is especially hazardous. When the gall-stones are presumably in the gall-bladder, and are causing no other disturbance than disturbances to the gall-bladder itself, I should regard any serious constitutional or any local affection as sufficient contra-indication to operation. When the gall-stone symptoms are more severe and dangerous to the patient than the "other constitutional signs or affections of other viscera" the gall-stones should be removed, the best time being selected for operation, and the patient being treated medically as long as his local and general condition improve.

Take, for example, the demonstration of gall-stones in the gall-bladder during such an operation as an abdominal hysterectomy. When that operation has been an especially severe one that has taken perhaps half an hour to an hour, when it is clear that the patient has a heavy burden to bear in convalescing successfully from that operation, I regard the removal of gall-stones from the gall-bladder at that time as entirely unjustifiable. I should, however, advise an operation for removal some months after a successful convalescence. On the other hand, if the hysterectomy is a brief one and bloodless, and if the patient's pulse is unimpaired, I remove the gall-stones at the same time, even if they have never caused any symptoms whatsoever. As in appendicitis, so in gall-stones, the question is not whether to remove them, but when.

The chief considerations in this paper are those relating to diagnosis and indications for operation. Operative methods are too technical for a general representative body. There would not, perhaps, be much to say on this subject even to a purely surgical association, for the methods thus far used have been carried, I think, to great mechanical perfection. My own methods have become gradually simplified until they are quick, safe and effectual.

The first point to be decided in connection with removing stones from the gall-bladder is that of retaining or of removing the gall-bladder itself. If the gall-bladder is to be removed, it is a good plan to perform the operation without opening it. If the gall-bladder is to be retained, its fluid contents should first be removed by aspiration.

Cholecystectomy is a very satisfactory and effectual opera-

tion. The chief objection to this operation, in my experience, is that drainage of the biliary passages is thereby prevented, unless the surgeon, after removing the gall-bladder, resorts to that very objectionable procedure, hepatic drainage. The gall-bladder must have had some function in the designs of nature. That function, apparently one of simple biliary storage, can be safely and permanently dispensed with, however, as numerous cases have already shown.

In comparing the end results of cholecystotomy and cholecystectomy, much time must elapse. My extirpations of the gall-bladder have been rapidly increasing in the past two or three years, and yet time is too short to justify positive deductions as to the lasting value of the operation.

I have always regarded drainage of bile through the wound of the greatest value in these operations. If gall-stones are formed upon micro-organisms, drainage of three or four weeks clears the field absolutely of these offending bodies, not only in the gall-bladder, but in the ducts and possibly in the pancreas.

The effect of this unobstructed drainage—this more than unobstructed drainage, for bile is sucked out of the liver by the weight of bile in the drainage-tube—is seen quickly in the marked changes that take place in the color and consistency of the bile. In the course of natural closure of the fistula—which requires usually two or three weeks— every biliary passage is thoroughly cleansed of all abnormal material. When the patients are well, they are permanently well. I know of no more favorable reports in any class of abdominal operations than in that of cholecystotomy and drainage. The replies from patients to my inquiries have been of the most gratifying nature.

Cholecystotomy is a quick operation, and it is a safe one. It is perfectly simple, for it is applicable only when the gall-bladder is normal, distensible and easily accessible. The immediate results are almost invariably successful. Adhesions alone are likely to cause subsequent trouble, and by the method that I use this sequel is very unusual.

When the gall-bladder is changed enough to make restoration to the normal doubtful, I remove it. The changes unlikely to be fully repaired are thickenings, infections and contractions. I remove the gall-bladder, too, whenever there is an impaction in the cystic duct. A single stone in the cystic duct justifies cholecystectomy. I have been obliged too many times to remove the gall-bladder by a second operation to take any chances at the first.

Cholecystectomy removes the gall-bladder and all its contents. Gall-stones are found in the gall-bladder so invariably that I do not regard the possibility of their formation in the hepatic or in the common duct as of any practical importance. Re-formation of gall-stones is extremely infrequent anywhere. My feeling is, without any positive proof, however, that a gall-bladder is always liable to produce gall-stones, even after drainage; and that the patient is much more likely to suffer a second time than if the gall-bladder has been entirely removed. The advantages of drainage must be given up after this operation; for, as I have said, the placing of a drainage-tube in the hepatic duct is, in my opinion, except after a choledochotomy or incision into the hepatic duct, foolish and unjustifiable. It is often in itself an operation of great difficulty and of greatly increased risk: it imposes upon the patient a burden much harder to bear than that of the original cholecystotomy or cholecystectomy; moreover, it imposes this extra burden upon him for the very doubtful advantage of draining the hepatic radicles, which, in cases of simple gall-stones in the gall-bladder with free drainage of bile into the duodenum, are presumably in perfectly normal condition.

In the removal of gall-stones from the healthy gall-bladder, or the comparatively healthy gall-bladder, a short incision either through the outer border of the rectus or parallel with it is necessary. The gall-bladder, being unaffected, can easily be brought into full view, or even out of the abdominal wound. The incision should be long enough to permit digital examination of the region about the foramen of Winslow and the course of the common duct back of the duodenum and through the pancreas.

Even after the most painstaking digital examination of the whole field, a stone in the common, the hepatic, or the cystic duct may escape detection. The surgeon is unlikely, however, to overlook a stone in the cystic duct, because his attention will be called to the absence of biliary discharge in the course of his operation. Moreover, his attention will be called to the possibility of a stone in the cystic duct by changes in the appearance of the bile. If the gall-bladder contains fluid which is light-colored, or which is very thick and dark-colored, the surgeon will consider the possibility of an obstruction in the cystic duct. One is not justified in assuming that there are no stones in the common or in the hepatic duct because of the absence of jaundice. As I have already said, a stone may be in the common duct for a long time without causing jaundice. Furthermore, if the im-

pacted stone causes jaundice, that jaundice may disappear, the duct becoming sufficiently dilated to permit free escape of bile around the stone. Hence this false inference that the stone has escaped into the duodenum. I have successfully removed large numbers of stones from the gall-bladder by an operation of celerity and safety, only to find, moving up and down in the hepatic duct, a single stone, the removal of which was an operation of the greatest difficulty and hazard—proving, in fact, quickly fatal. If I had not removed the stone from the hepatic duct, however, I should have subjected the patient to an operation which could never have relieved her symptoms, for the stones in the gall-bladder were doing no harm whatever, the symptoms—those of repeated attacks of pain and jaundice—being entirely owing to the occasionally impactions of the stone in the hepatic duct.

When one is satisfied that there are no stones in the ducts, the gall-bladder should be aspirated and the fluids removed. Before aspiration the field about the gall-bladder, is protected by means of gauze. After the fluids have been removed from the gall-bladder, one can tell exactly about the number and situation of the stones. In some cases it is impossible to feel gall-stones in the gall-bladder until the fluid has been removed. I was surprised once to find some hundred gall-stones in the gall-bladder in which not a single stone could be felt before removal of the bile.

The fundus of the gall-bladder is next incised, and the stones removed. In removing the stones I use a scoop which was devised by Dr. Jones, one of my assistants. By means of this instrument stones are quickly and safely removed. The opening in the fundus should be large enough to admit the finger; for the scoop may fail to detect a single remaining stone—the finger never.

A drainage-tube about the size of the forefinger is then tied into the gall-bladder by means of a silk suture, the ends of which are left long. A single strand of gauze, wrapped in rubber pellicle—which we call a cigarette drain—is passed down to the foramen of Winslow. The rest of the wound is tightly closed by through and through interrupted sutures, re-inforced with interrupted buried sutures of silk.

In cholecystectomy, having demonstrated the necessity for operation and the seat of the stones, the first thing to do is to provide for grasping the gall-bladder. This may be done with long hæmostatic forceps or other grasping forceps which are

not too powerful. Strong grasping instruments are likely to cut through gall-bladders suitable for cholecystectomy, for they are generally friable. If the fundus permits, it may be seized with the fingers, between gauze, which prevents slipping; or it may be secured by means of tape in a clove hitch. It aids very much to have a sure grasp by means of which the gall-bladder may be pulled in any direction, or rotated. The next step consists in separating the gall-bladder from the under surface of the liver. In doing this one should go close to the gall-bladder, if necessary leaving the outer layer of the gall-bladder in contact with the liver. If the dissection is made through liver substance there will be much oozing,—sometimes hard to control. As the operation approaches the cystic duct, the arteries and veins should be successively tied. They will come into prominence and may be easily seen. Just before reaching the cystic duct, the gall-bladder in many instances presents a pouch, a sacculation, which generally contains one or more gall-stones. The pouch is usually toward the duodenum. It can easily be separated. That is best done with scissors or with a knife, if the operator can see exactly what he is doing. This part of the dissection must be made with the greatest care, and with absolute knowledge of every structure cut. If this care is not taken, the surgeon may go directly into the portal vein, or even into the inferior cava. The depths of the gall-bladder having been separated, the cystic duct comes into view, and is easily separated with the fingers or with blunt instruments to a sufficient depth. One must be careful when he ties the cystic duct that he does not pull the common duct and hepatic duct out enough to be caught with the ligature. The ligated duct is then divided by means of the actual cautery. The cigarette drain is placed in contact with the stump of the cystic duct.

In my various cholecystectomies I have occasionally observed, after ligation of the cystic duct, a free discharge of bile. This discharge has lasted a day or two; it has not been abundant; it has quickly diminished. This always has been to me a rather inexplicable phenomenon. The duct must have given way—there is no other explanation for it. It does no harm, however. The patient makes a rapid convalescence, and the wound is solid.

Operations upon the common duct and upon the hepatic duct require a long incision. In many cases extensive adhesions have to be separated, for often the infections have been numerous, and the normal anatomy is much obscured. As a rule, one is unable even to feel the foramen of Winslow. The presence of

a gall-stone is detected with difficulty. Adhesions are separated usually with ease. Care must be taken not to wound the duodenum, the pylorus, or the colon. One should go straight for the bodies of the lumbar vertebræ on the right side, for there is the area to be dissected. Dissections must be extremely careful, for the parts are so changed that it is often impossible to tell what is vein, what is intestine, and what is duct. Nothing should be cut until the surgeon is sure as to its nature. He generally will be able to get the stone between the thumb and the forefinger of the left hand. Then, by carefully exposing the tissues over the stone, he will, after sufficient experience, be able to tell what is duct and what is not. The danger is that he will have, between his knife and the stone, the edge of the portal vein, which the pressure of the thumb and finger has emptied temporarily of its blood, so that its venous look is lost. Before cutting, one should let up, then, with the fingers, to allow the portal vein, if it has been grasped, to fill and to come into prominence. No matter how careful a man may be in his dissection, the moment of cutting into the duct is always an exciting one. There are doubtless many instances in which the surgeon, instead of getting a burst of pent-up bile, will find the depths of his field flooded with blood; and he must get out of this fearful difficulty the best way he can. He is usually contented to give up all idea of accomplishing his operation, and is thankful if he can get the patient to bed alive; and yet this is an operation which is recommended by Kehr as a routine procedure after cholecystectomy, except that the hepatic duct is drained instead of the common.

The stone having been removed, the duct must be searched above and below with suitable instruments. In the very beginning I used in such cases as this hepatic drainage. I passed through the opening in the common duct as large a tube as the hepatic duct would admit. This tube I fastened in by means of a single suture through the walls of the duct. In a few cases I have closed immediately the common duct, and have drained through the gall-bladder and the cystic duct. Many years ago—in fact, in the early papers which I wrote—I advocated leaving the common duct open, saying that it would close just as the urethra closed in perineal section. The truth of this assertion has been repeatedly demonstrated.

When the pancreas is enlarged, even if the appearances are strongly suggestive of cancer, one must not be discouraged, but

must employ drainage. This can be done sufficiently well through the gall-bladder.

The rarer conditions of the biliary passages which require surgical treatment, I do not intend to discuss. I have never yet seen a case requiring cholecystenterostomy. Operations upon the ducts through the duodenum, as suggested by McBurney, have a very limited application. Other conditions must be met with as they arise. The scope of the present paper does not include the consideration of them.

The prognosis in diseases of the biliary passages is sufficiently well established to be spoken of with some positiveness. The accumulated evidence of the past ten or fifteen years enables us to predict almost with scientific accuracy the course of diseases of the biliary passages when treated surgically. When treated medically, the course of these diseases is, as it always has been, mere guesswork. If a patient has an attack of biliary colic, one can guess that she will never have another, or he can guess that the next one will result in a solid impaction in the common duct with permanent jaundice. Unrelieved by surgery, this lesion will result, in the course of months or years, in death from cholemia or from the clumsy and unsuccessful efforts at natural expulsion. The only hope of cure is from spontaneous escape of the stone—which means ulceration into the duodenum or into the large intestine after being months or years in close proximity with vital structures, ulceration into which may be immediately fatal. If the case is treated surgically, after the diagnosis of gall-stones has been made and before the almost inevitable impaction has taken place, it can be predicted with the greatest confidence, first, that the patient will recover from the operation; and secondly, that there will be no recurrence of the symptoms; and finally, that there will be no annoying sequalæ. If the case is not treated until after impaction has taken place, it can be stated with almost equal positiveness that four cases out of five will recover; one in five will die. In the four that recover there will be a slightly increased risk of uncomfortable or even of dangerous sequelæ.

Diseases of the biliary passages present one of the most brilliant fields for modern surgery. The sufferings and dangers are incalculable. We see but a small proportion of the patients affected with this disease; and in those whom we do see we fail in many cases to recognize the lesion. The more we study the diseases of the biliary passages, the larger the number of cases that we find; the more we see of medical treatment, the less con-

fidence we have in it; the more we see of the surgical treatment, the greater confidence we have in it.

The analogy between the surgery of the gall-bladder and the surgery of the vermiform appendix is striking in many particulars; but in none is it more striking than in the brilliancy of the results. Operations upon the diseased appendix have become so frequent that our knowledge of that organ is, it seems to me, well-nigh perfect. The operation of appendectomy is very safe. I have now had more than six hundred and fifty consecutive recoveries after appendectomy in the interval of health. So it is in infections of the gall-bladder. From a mortality of 20, 30, or even 50 per cent. in certain diseases of the biliary passages—in the old, severe and complicated cases—we have come to practically no mortality after operation performed at the most favorable time upon patients in the most favorable condition.

The chief line of improvement to be suggested is in the early recognition of gall-stones, and perhaps in some technical details of operation. It seems to me that operations in the most favorable period have been perfected as much as they can be; and yet I have no doubt that many improvements will be made in the methods of the removal of gall-stones. In the old, severe, complicated cases much remains to be learned, not only as to the diagnosis, but as to the operative technique. Diseases which at certain stages have a mortality of from 20 to 50 per cent. after operation, surely present an opportunity for improvement in treatment. We surgeons maintain that the improvement in such cases is a matter of prevention, rather than a matter of operation. If the physicians will give us the cases at a time when the operation will be rapid, safe and effectual we will then, in practically every instance, return to them the patient cured. If the physicians allow the patient to wait until his constitution is weakened, until other organs are involved, until the operation is difficult, tedious and dangerous, they cannot expect the low mortality and the brilliant results seen in the early stages of the disease. In the meantime, the surgeons themselves should employ their great opportunities for studying the relations between cause and effect. In all abdominal explorations which permit, the conditions of the biliary passages should be ascertained as accurately as possible; and these observations should be recorded. The attending physician, who is usually present at the operation, should have his attention called to the lesions found, and he should be asked to observe all symptoms which could possibly

be accounted for by the biliary conditions demonstrated at operation.

If these recommendations are carried out, I believe that in the near future we shall be able to make a diagnosis in the early stages of gall-stone disease with an almost scientific accuracy. The removal of the stones at this period will almost invariably prove immediately and permanently successful.—*Maritime Medical News,* October, 1903.

CARDIAC COMPLICATIONS OF INFLUENZA.*

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In the number and protean character of its complications and sequelæ, influenza probably ranks second only to typhoid fever. The frequency of formidable and dangerous pulmonary complications during the febrile stage of the disease is well known, but it is not so well recognized that the heart often suffers serious damage from which it may never entirely recover. Only a want of recognition of the cardiac dangers in influenza can account for the common practice of administering such large and frequently repeated doses of the coal-tar preparations; drugs, which, in a man over forty are probably as dangerous in influenza as in pneumonia. Months after an attack of grippe a man still complains of unusual weakness, he is short-winded and sweats on slight exertion, his pulse rate is easily disturbed, perhaps irregular; physical examination reveals no sign of organic disease, yet he is suffering from cardiac weakness, either functional, in which case complete recovery is probable, or due to muscular change with a loss of cardiac power that may be permanent. The cardiac complications of influenza may be divided into: (1) Organic changes in the heart, and (2) Functional disturbances of the heart.

I.—ORGANIC CHANGES IN THE HEART.

1. *Pericarditis.*—Grippal pericarditis is either primary, when it complicates influenza without other organs being affected, or secondary, where it occurs in association with pneumonia, or

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pleurisy, the latter form being much more frequent than the former. Like other forms of pericarditis it occurs with or without effusion; the former may be sero-fibrinous or purulent, or even hemorrhagic; the latter dry.

The anatomical changes are similar to those found in other forms of the disease. It must be noted, however, that in grippal pericarditis purulent effusion is relatively frequent, and that myocarditis is commonly associated with it. De Batz, of Bordeaux, in eight autopsies, found the liquid purulent in four, hemorrhagic in one. Bacteriological examination of the pus revealed the specific diplo-bacillus of influenza; also the pneumococcus, streptococcus, and staphylococcus in the various cases.

Clinically the cases may be divided into two classes: (1) Those in which the symptoms are similar to those presented by pericarditis due to other causes; and (2) the latent type, in which no symptoms of the disease are manifest. Menetoier affirms that pericarditis is so frequent in the pneumonia of influenza that it is probably often latent, and refers to six cases, in all of which there was found at the autopsy abundant evidence of pericarditis, without a single symptom during life. Grippal pericarditis is especially grave owing to its frequent complication with myocarditis and its tendency to take on a purulent character.

2. *Endocarditis.*—Endocarditis is generally considered to be a rare complication of influenza. From the number of cases reported, and the frequency with which an attack of grippe is the sole antecedent history in cases of recently discovered valvular lesion, one is inclined to think that influenza is by no means so rare a cause of this condition. Grippal endocarditis is rarely primary. In the great majority of cases, as pointed out by De Batz, it is secondary (15 out of 20 cases), and in nearly every instance secondary to pneumonia. Anatomically, the changes are similar to those met with in endocarditis of rheumatic origin; the left side of the heart is most frequently involved, and the mitral more often than the aortic valves. The infective agents are the pneumococcus, streptococcus, staphylococcus, and the bacillus of Pfeiffer. Austin, of Baltimore, has reported three cases of endocarditis in which micro-organisms with the characteristics of the influenza bacillus were found on the cardiac valves.

The endocarditis of influenza may be, (1) simple, or ulcerative or malignant. Simple endocarditis may present the usual symptoms of endocarditis from other causes, and may be easily recognized. On the other hand the subjective symptoms may be so slight and unobtrusive that the diagnosis is very diffi-

cult. A man of 35, was examined by his physician for insurance in October, 1901, and his heart found normal. In January, 1902, he passed through a severe attack of influenza, characterized by chills at the onset, high fever (104 to 105), severe headache and general pains, rapid pulse, harassing cough, and marked prostration. On the fourth day his temperature was 99, and he was comparatively comfortable, but was extremely weak. His pulse was 110, quick and irritable, and unduly accelerated by sitting up in bed. The first sound of the heart was impure and muffled. Two days later a soft blowing systolic murmur was heard at the apex. His recovery was slow, and characterized by exhaustion with dyspnoea on exertion and rapid pulse. To-day he is apparently well, but his heart apex beat is in the fifth space, just inside the mammary line; the cardiac dulness is increased; there is a blowing systolic murmur at the apex, transmitted to the axilla, and the pulmonary second sound is sharply accentuated.

Huchard states that primary, simple, grippal endocarditis may give rise to permanent valvular lesions, but he thinks this is rare. He considers that cases of simple endocarditis occur generally in persons subject to old valvular disease. It is well known that the victims of chronic valvular disease bear grippe badly, and in many the recovery is incomplete. A chronic, latent heart lesion may be so influenced by influenza as to produce most serious symptoms, and thus for the first time reveal itself during or after the grippal attack.

Malignant endocarditis as a complication of influenza has been observed by many writers. It occurred in four of De Batz's twenty cases, and a most interesting example has been recorded by Tickell. In this case symptoms first appeared during convalescence from an attack of influenza, the patient dying after an illness of two months. The autopsy showed extensive vegetations on both the aortic and mitral cusps with superficial ulceration dilatation of the cavities, infarcts in the spleen, and puriform emboli in the kidneys, several branches of the mesenteric artery and both brachials. During his illness the patient suffered from sudden abdominal pain with vomiting and diarrhoea, which Tickell explains as the result of the mesenteric emboli.

Ulcerative endocarditis has been observed during the course of the influenzal attack, but most frequently in the convalescing period. According to Huchard it is usually secondary to pneumonia, and most generally comes on about the defervescence of the latter, or within a few days after.

3. *Myocardial Changes.*—Degenerative changes in the myocardium are common in the acute infections generally, and especially so in diphtheria, influenza and pneumonia. The bacil-

lus of influenza elaborates a poison, which, when circulating in the blood in sufficient quantities, acts as a powerful heart depressant and modifier of the nutrition of the heart muscle. By the constant irritation of this poison there will develop gradually degenerative changes in the muscle fibres, impairing their vitality and tonicity (myocarditis or degeneration, with usually dilatation). So long as these patients remain in bed they may suffer from their influenzal symptoms only, and the complete rest which they maintain enables the heart to perform its work. But when convalescence has set in, and the patient rises and begins to take exercise, the heart muscle, already enfeebled by the action of the influenzal poison, is no longer able under the increased stress to perform its functions without unusual, and often conscious effort. The myocardial lesion is now manifested by palpitation, dyspnoea, extreme weakness, and perhaps collapse and syncope. Hence, though the heart may be attacked during the acute stage of the influenzal attack, it is not until a later period that the cardiac complication becomes manifest.

Huchard thinks that the fatal cases of myocarditis are usually due to obliterating endarteritis of the coronary vessels, and records such a case. Hay reports an interesting case of fatty degeneration in a young man of 23, who died of cardiac failure three months after the onset of an attack of influenza. At the autopsy the heart showed both macroscopically and microscopically the characteristic fatty changes in its muscle fibres, with healthy coronary vessels. Such an example of true fatty degeneration in so young a subject must be very rare. On the other hand I believe that toxic myocardial degenerations in varying degrees of intensity are quite common in influenza, and are responsible for the profund cardiac weakness shown by so many patients, and followed in some instances by fatal syncope. On January 10th, 1903, a vigorous, healthy lady of 38 was seized with chilliness, headache, general pains and nausea. Her temperature at no time exceeded 101; her pulse ranged from 84 to 100, was soft, regular and compressible. Her case appeared to be a mild attack of influenza. On the third day her temperature was normal and pulse 80, but weak. She attempted to rise to the floor and fainted. Her pulse fell to 50, was regular, but very weak, and continued slow and feeble for several days. Twice during the following week she fainted on attempting to assume the sitting posture in bed. The cardiac dulness during this time extended to the left of the nipple, the impulse was feeble and diffuse, and the first sound short and weak; there was no murmur. She has apparently completely recovered after a very prolonged convalescence. Another case seen during the same epidemic, in

a physician of 54, ran almost the same course, with the exception that his pulse was rapid and irritable, and for three months was irregular and unduly accelerated by ordinary exertion. These cases I take to be examples of toxic degeneration of the myocardium, with resulting loss of vitality and acute dilatation. Fortunately, both individuals were healthy before the attack, and neither had taken any cold-tar preparation. Had they been debilitated before this illness, or had depressant drugs been administered, I fear the result might have been fatal in both cases. The case of the lady shows that there is no definite relation between the intensity of the influenzal attack as shown by the temperature and general symptoms, and the development or severity of the cardiac lesion.

The disastrous results which we have all seen follow the cardiac complications of this disease should enjoin us to exercise the same watchful care over the heart in influenza, in mild as well as severe cases, as we do in rheumatism or pneumonia. Sternal oppression or pain, palpitation, dyspnoea or sense of faintness, especially with pallor, should call for a careful examination of the heart.

A small, feeble pulse, unusually slow or rapid, with a short feeble first sound and later weakening of the second, a weak cardiac impulse with increased deep dulness should make us think of beginning myocarditis with dilatation. Muffling of the heart sounds with the later appearance of a blowing murmur announce a commencing endocarditis. A rare complication is cardiac thrombosis, of which two cases are reported by De Batz, and one by Reynolds. In all three cases a large, firm, pale clot was found firmly adherent in the right auricle, extending from the auricular appendix into the pulmonary artery. All three patients died suddenly with extreme dyspnoea; one in addition complained of intense sternal pain. Huchard has shown that in patients suffering from angina pectoris the attacks are aggravated by influenza, indeed, the influenza may precipitate the first seizure.

II. Functional Disturbances.

The changes already referred to are, no doubt, the result of the direct action of the influenza bacillus, or its toxins, on the endocardium, or on the muscular fibres of the heart wall. In the second class of heart affections in influenza are included those functional disturbances in the cardiac rhythm so commonly met with after this disease in patients who present absolutely no signs of organic disease in the heart. These symptoms must be attributed to the action of the influenzal poison on the cardiac nervous mechanism, either on the vagus or the cardiac ganglia.

Indeed, Sansom holds that in nearly all the heart disturbances of influenza the primary cause is an affection of the nervous apparatus. Probably in no other acute infectious disease are nervous phenomena so prominent as in influenza, and of these nervous disturbances none is more important or alarming than those of the circulatory system.

Among the functional cardiac disturbances following influenza are palpitation, irregularity, bradycardia and tachycardia. Post-grippal palpitation is very common, and may for months be so severe on the slightest exertion as to render the patient totally unfit for business. Irregular action of the heart may occur during the influenzal attack or may not appear until convalescence is established. The irregularity may be constant or appear only on exertion. In some cases there is an intermission which may occur at regular intervals. Bradycardia and tachycardia are not infrequent complications of influenza, the latter being more common than the former in my experience. Both may occur in young and robust individuals without the slightest sign of endocarditis or myocarditis, and may appear during the attack or not for a considerable period afterward. Unduly rapid action on exertion may continue for weeks after convalescence has set in. According to Sansom, symptoms of Graves' disease are often associated with the tachycardia.

Of the four disturbances mentioned bradycardia is the most dangerous, as it sometimes leads to fatal syncope. Oppenheimer observed that it is usually accompanied by a subnormal temperature though there is no necessary relation between the range of the temperature and the pulse rate. Prostration is very marked, and according to the same writer is inversely proportionate to the frequency of the heart beats.

Fortunately the functional disturbances uually disappear in a few weeks, but in some instances they have persisted even for years. To differentiate a functional from an organic case may be extremely difficult. Well marked examples of myocarditis have been discovered at autopsy on cases which presented no symptoms or even signs of cardiac disease during life.

As a rule. however, in addition to significant subjective symptoms, physical examination will show a feeble, diffuse cardiac impulse with a weak first sound, and in many cases an increased area of dullness. The strength and character of the cardiac impulse and sounds are of much greater importance than the presence of a murmur or an irregularity in rhythm.

Personal observation and study of the subject lead me to the conclusion that influenza is a potent, and by no means an uncom-

mon factor in the production of serious cardiac disease. Degenerative changes in the heart wall are probably present to some extent in many cases of influenza, and in debilitated subjects, or in men past middle life whose cardiac muscles may be badly nourished, owing to changes in the coronary arteries, these changes may rapidly lead to grave symptoms.

Though I do not propose to take up the treatment of influenza I feel that in consideration of the dangers of cardiac complications, the routine treatment of the disease with such drugs as phenacetin, acetanilid, etc., cannot be too strongly condemned. Certainly in patients past middle life the use of such drugs must be considered dangerous.

REFERENCES.

1. DeBatz, Bordeaux Theses. 1895-96, No. 93.
2. Menetoire; Huchard, *Le Bulletin Medical*, Paris, 1892, 6, 107.
3. Austin, Johns Hopkins Hospital Bulletin, Oct. 1899.
4. Huchard, *Le Bulletin Medica*, Paris, 1892, 6, 107.
5. Tickell, *Clinical Journal*, London, 1897, 9, 251.
6. Hay, *Tri-State Med. Journa'*, 1898, 5, 57.
7. Reynolds, *Lancet*, London, 1893, 2, 1616.
8. Sansom, *Lancet*, Oct. 21, 1899.
9. Oppenheimer, *Lancet*, London, 1899, 1, 689.

CEREMONIES IN CONNECTION WITH THE OPENING OF THE NEW LABORATORIES, ERECTED FOR THE FACULTY OF MEDICINE OF THE UNIVERSITY OF TORONTO.

The formal opening of the Laboratories, which have recently been erected by the University of Toronto in the Queen's Park, took place on October 1st, when Professor Sherrington, of the University of Liverpool, England, delivered an inaugural address, and the buildings were formally declared opened by President Loudon.

There were other distinguished guests present, of whom may be mentioned His Honour, the Lieut.-Governor, the Hon. Mr. Harcourt, Minister of Education of Ontario; Professors Welch and Osler of Johns Hopkins University, Professor Keen of Philadelphia, Professor Porter of Harvard, Professor Chittenden, of Yale, Professors Roddick and Adami of McGill, Professor Barker of Chicago, Professor McMurrich of the Univer-

sity of Michigan, Professor Abbott of Philadelphia, Professor Goldwin Smith, Mr. Alfred Mosely, and the Hon Dr. Sullivan.

The various functions connected with the opening ceremonies included, in addition to the inaugural address by Professor Sherrington, addresses by the other guests of the University. Professor Sherrington's address was delivered on the afternoon of October 1st, the Dean of the Faculty of Medicine, Dr. Reeve, having previously entertained the visitors to luncheon. On the evening of the same day, Professor Osler delivered the opening lecture of the session to the students. On the morning of October 2nd, addresses were delivered to the students in the new lecture theatres; in the afternoon a special University Convocation was held for the purpose of conferring honorary degrees, and at this function the degree of LL.D. was conferred upon Professor Keen, Professor Welch, Professor Osler, Professor Chittenden, Professor Sherrington, and, *in absentia*, upon Professor Bowditch of Harvard. In the evening a dinner was tendered by the Dean and members of the Faculty of Medicine to their guests.

The new laboratories have been built for the Departments of Physiology and Pathology, and are the first to exemplify the unit system of laboratory construction proposed by Professor Minot of Harvard University. The following brief description of the new buildings has been obtained from the article published in *Science* by Professor A. B. Macallum, Professor of Physiology in the University of Toronto:

"The main features of the unit system, as outlined by Professor Minot, are all comprehended in the character of the laboratory 'unit' room. This must, first of all, be no longer than is required to accommodate readily the maximum number of students whose practical instruction a single demonstrator can efficiently guide and control. It must be of such dimensions that it can, at need, be made to serve as a museum, a library or reading room, or a small lecture room. The units, further, must be so placed with respect to one another, preferably in pairs or series, that, by removal of the partitions separating them, rooms of larger dimensions may, when desired, be obtained at a minimum cost and in short time. The dimensions of such a unit, as determined by Professor Minot, are 23 by 30 feet, and this room will accommodate twenty-four working students, which number, experience shows, is the largest that should be under the supervision of a single class demonstrator.

"The system, as may be seen, offers the great advantage of elasticity, for a laboratory director may enlarge or contract, at will, or according to the needs of the occasion, the accommodation required for a class, a feature that does not obtain in any other system of laboratory construction. It has also other and not less important advantages. The cost of construction is less than in any other system, it adequately provides for the all-important question of light, and it permits of subsequent extensions and additions without disturbance of the original arrangements. It is also to be noted that the system provides for the formation of smaller rooms through the division of the unit.

"All these points were thoroughly canvassed when, nearly two years ago, the Medical Faculty of the University of Toronto took up the question of erecting new laboratory quarters for physiology, physiological chemistry, pathology and public health, and discussed the various plans of construction offered. The result was that the Faculty unanimously recommended the adoption of the unit system for the proposed laboratories. The University Trustees accepted the recommendation, and construction, begun in August last year, has progressed so rapidly that the buildings are completed, and the equipment is now being put in. The whole is, therefore, at the moment in such a stage as to permit one to say to what extent the object sought has been obtained.

"Architecturally, so far as the exterior is concerned, the utmost has been done, considering the difficulties that the enormous window space interposed. The appearance of the buildings, however, is, on the whole, very acceptable.

"The interior, on the other hand, is very satisfactory. The accommodation it furnishes, as well as the conveniences of arrangement it offers, is sufficient to demonstrate the great advantage of the unit system over the common, more or less haphazard, system of laboratory construction everywhere illustrated.

"The buildings are to house physiology, physiological chemistry, pathology and public health. The wing to the right accommodates physiology and physiological chemistry, and contains, in addition to the lecture theatres, twelve units and eight half units. The other departments occupy the main portion and the left wing, which contains sixteen units and fourteen half units.

"In the construction of these buildings, according to the unit system, special local conditions had to be considered, and, further,

the possibility of their extension in a few years, was a factor in determining the arrangement as a whole. This necessitated important modifications in the disposition of the units as suggested in Professor Minot's later paper.

"What these modifications are may be gathered from examination of the copies of the plans of the various floors of the buildings. The latter are in the form of the figure —, the lecture theatres forming wing-like extensions at the angles of the figure. This latter arrangement was adopted in order to permit the lecture rooms to be lighted from their roofs, and at the same time to avoid interfering with the light for the units. An additional advantage resulted from the arrangement, in that the corridors, which are centrally placed, permit ready access to the lecture theatres and units from the entrances and from the students' quarters.

"The units are, for the most part, grouped in pairs on each side of the corridors on the various floors. The walls of the corridors are of brick, but those which separate the units from each other are of wood and plaster only, and they can consequently be removed in a few hours without leaving traces of their disturbance other than those on the line of the fresh plaster added. Each unit communicates directly with its neighbor by a door, and, further, has two doors opening into the corridors. It is thus possible at any time to form two rooms out of a unit, each of which will communicate directly with the corridor.

"The window space devoted to each unit is ample. It is, in fact, as large absolutely as the supporting capacity of the outer wall will safely permit. The window area is 242 square feet, while the other wall of each unit measures 420 square feet. The window area is, therefore, nearly three-fifths that of the outer wall. The terminal units of the wings have additional window space in their second outer wall, and of course in those the lighting is brilliant. In all the other units, however, the lighting is, as already said, ample.

"The corridors are lighted from the hall doors, from the large windows at the ends of the wings, and from the wells over the stairway. An examination of the building itself shows that this provides sufficient illumination with diffuse daylight, and even on very dull days it is enough for all except, perhaps, the main corridor extending between the two lecture theatres on the ground floor, and then resort may be had to electric lighting.

"The two stairways are lighted from the roof, and are so placed as to permit the student reaching any floor directly from

the basement, where the reading and writing rooms are situated. The locker rooms and lavatories, on the other hand, are in the sub-basement, and can only be reached from the basement corridor.

"The wings are, including the basement and sub-basement, five stories in height. The main portion is only three stories, if we leave out of account the boiler room. This arrangement is due to the fact that the rear part of the building is placed in a shallow ravine. White brick, with stone facings here and there, is the material; the roof is flat and bordered all round with a brick parapet. The building is heated by air forced over heated coils by large fans driven by steam, and the ventilation is thus, in part, provided for, and also by the exhaust currents in the ventilation turrets which rise over the entrances.

"A feature of special interest is presented by the small research rooms. The half units are intended to be used for various purposes, but chiefly for small groups of students pursuing advanced work or, for special lines of research, but each of the fifteen small rooms is reserved for individual workers carrying on selected investigations. These, with the other arrangements described, have been designed with the view of making the buildings a home for research."

John Hoskin, Esq., K.C., LL.D., Chairman of the Board of Trustees of the University, addressed the audience which had assembled in the north lecture theatre on the occasion of the formal opening. He spoke of the building and equipment, emphasizing in a very pronounced way the very great progress which had been made in medical research. He remarked that the work of construction had been completed in the short space of fourteen months from the time that the decision to build was arrived at. He also referred to the happy circumstance that the increased and efficient accommodation was provided at the very moment when two medical schools, namely, Trinity and Toronto, had amalgamated, and when these increased facilities were so urgently required. Dr. Hoskin considered that we had to thank the Government of Ontario for the financial aid which they have provided, not only in connection with these new buildings, but also for the convocation hall, which is in prospect. He then formally handed over the keys of the new buildings to the President of the University on behalf of the Board of Trustees, and in doing so he paid a tribute to the untiring energy of the Dean of the Medical Faculty, Dr. Reeve, to whose persistent efforts the completion of these new buildings is largely due.

President Loudon accepted the care of the buildings from the hands of the Chairman of the Board of Trustees, and assured him that the Medical Faculty would use the buildings for the advancement of medical science in a manner that will enhance the reputation of the University and redound to the benefit of the public. He acknowledged with gratitude the prompt action of the Trustees, the Government and the Legislature. He would not forget the handsome way in which they had made provision for the Medical Faculty and for the Department of Physiology. He then proceeded to recall for the benefit of his audience some facts regarding the progress of medical education in Ontario, and spoke as follows:

"From the year 1788 onwards machinery has existed for the licensing of practitioners. At that time little or no teaching was available. Regular medical courses were begun in 1844, when on the 15th of January, the inaugural lecture of the Medical Faculty of King's College, the then Provincial University, was delivered. The Faculty had been established after much controversy and negotiations, and it is to be noted that the Faculty of Medicine was then on a par with those of Arts and Law in the University, and was equally with them a charge on the endowment, drawing eventually between eight and nine thousand dollars annually from this source.

"Within ten years after the establishment of medical instruction on an apparently permanent basis, the University actually in 1853 abolished the Medical Faculty of the University of Toronto. From 1853 to 1887 we have the era of Proprietary Medical Schools.

"The alleged ground for the abolition of the Medical Faculty was the alleged popular sentiment against State aid for a lucrative profession. Whether this was the real ground is still a matter of dispute. If it was the real ground, the legislators of succeeding years manifested great inconsistency in the application of the principle, for from 1852 to 1871 no less a sum than $65,000 was granted by Parliament to the various medical schools, aid being given in fact to all who applied. After 1871, all these grants were cut off, just as had been the grants to Arts Colleges a few years before.

"Looking back over the past hardly anybody will venture now to assert that the era of Proprietary Schools was an unqualified success. Nobody will say that they provided an ideal medical education. But, on the other hand, nobody will deny that much good and honest work was done, and that the educa-

tion of our medical men, in spite of difficulties, reached a high standing.

"Efforts were made by the University of Toronto to raise the standard examination from time to time. That standard was raised, in 1882, for instance, and the numbers of the graduating cl[illegible] in medicine dropped at once from thirty-two to fifteen, and eventually to ten. The schools were in fact unable to cope with the situation. Their teaching was weak on the scientific side, and it was bound to be so. It was impossible for them to provide the expensive equipment and elaborate supervision necessary under modern conditions for thorough work on the scientific side.

"Through the establishment of a teaching faculty of medicine in 1887, medical education in Ontario entered upon a new era. Under the new organization, the expensive equipment of the University in biology, physiology, chemistry and physics was put at the service of the Medical Faculty, and moreover the Medical Faculty has been self-sustaining, and has been, in fact, an element of strength to the resources of the University.

"The Medical Faculty has done a great work in the interests of the public, by sending forth a great body of young men to alleviate the ills of humanity. We are now entering upon an important forward movement in the work. The federation of Trinity with the University of Toronto is practically assured—(applause)—and on the strength of this the amalgamated medical faculties begin to-day their work in this building. (Loud applause.)

"Medical education through this step enters upon a new and higher stage of development, and the future is full of hope. (Applause.)

"There is just one point further to which I wish to refer very briefly—*the question of State aid to the teaching of medicine.* Old prejudices die hard. The old doctrine of prejudice, of no aid to the students of a lucrative profession, has been reiterated so often since the middle of the last century in Ontario that it may seem almost like heresy to dispute it. But, is the profession, after all, so very lucrative? (Applause.) There are some prizes, it is true; but is the average of wealth in the profession above that of a comfortable living?

"To see the matter in its proper light, we should take into account the enormous importance of public health even from a financial standpoint. Large sums of public money—I am looking around for the Principal of the Ontario College of Agricul-

ture—are spent annually upon the teaching of agriculture, engineering, and pedagogy, in view of their general importance, but not one cent for any branch of medical science.

"It is my view that this doctrine of non-support should be revised. I do not advocate indiscriminate grants, but the subjects to which the whole time of a professor is given, such as pathology, might be given aid.

"Is the physical condition of the student of less importance than his mental development?

"The material prosperity of the country is advanced by the engineering profession, which profession is at least as lucrative as that of medicine; and, after all, of what advantage is material prosperity without the health to enjoy it. It is said that Rockefeller would give millions to be able to digest beefsteak.

"The pathology and hygiene of domestic animals are taught in the agricultural colleges, and does it not seem strange that the claims in the same branches in connection with human beings should be ignored. I merely put forward the idea as one which I hope to see realized when public opinion becomes a little more enlightened, and some unreasonable prejudices are eradicated. I shall not detain you longer but give way at once to the different gentlemen who have now to address you.

"We have recently had the pleasure of welcoming to Canada many of the representatives of commerce and legislation from the Motherland, but I may say that it affords us particular pleasure to-day to have with us, upon this occasion, so distinguished a representative of British science as Professor Sherrington, of the University of Liverpool. His work in physiology has won a high place in the world of science. We owe Professor Sherrington our very special thanks for responding to the invitation of the University to be present, and for his readiness to undertake a long and tiresome journey to be with us on this occasion, and I take this opportunity of expressing the indebtedness of the University to him for his great kindness." (Applause.)

The President then called upon Professor Sherrington to deliver the inaugural address.

Professor Sherrington, in a very able address, discussed the growth of Medicine as a science, and showed how the great advances in this field of knowledge had only been rendered possible by the discoveries in biology, chemistry, and physics. As an adjuvant science now comes physical chemistry, which will promote discoveries the most valuable that medicine has received from any source. He pointed out that the scientific side of medi-

cine has developed so much that it has placed a heavy burden on the teaching resources of every Faculty of Medicine worthy of the name. The equipment for this purpose is very costly, and yet laboratories and experts to teach in them are an absolute necessity. There is the further demand that the laboratories must be schools of thought and homes of research. The best preparation for a career in medicine is one that is based on a thorough training in the sciences which are adjuvant to medicine, and this training, above all things, a University should give. The laboratories which were now formally opened were admirably adapted in every way to promote the study of physiology, pathology and hygiene, to cultivate in the highest degree the spirit of research and they would, adequately supported, be of inestimable service to this young nation.

The President stated that he had received three congratulatory telegrams: one from the Vice-Chancellor of the University of Liverpool; another from Professor Minot of Harvard University, and one also from the veteran teacher of physiology in the same university, Professor Bowditch.

The President then called upon Professor Welch, Professor of Pathology in Johns Hopkins University, to address the audience. Professor Welch spoke as follows:

"Mr. President, Mr. Dean, Ladies and Gentlemen: After hearing the last excellent address you will not expect any lengthy remarks from any one of us, although I do not wish to forestall what my colleagues may have to say. I esteem it a very great privilege to bring to this university of this city, of this province, my congratulations upon the opening of these laboratories, which certainly are destined to increase very greatly the usefulness of this University. I consider it also especially gratifying that, as a representative of the Johns Hopkins University, this privilege belongs to me. There are unusually close ties, I think, between the Johns Hopkins University and the University of Toronto. (Applause.) We owe very much to you. You have sent us some of the very strongest of our supports in the University. I hardly need mention the names of your fellow townsmen, Dr. Osler, Professor Barker, Dr. Futcher, Ferris, and others, who have come there admirably trained for our work.

"This university has stood for high ideals in medical education. I was particularly interested, Mr. President, in hearing from you as President of the University your attitude with reference to the position of medical education in the University,

and the necessity of its support by public benefaction and State aid. It is very curious as you indicated, as regards the conditions here, and they were just the same through the United States, that medical departments should have begun in many instances as far back as the eighteenth century, as integral parts of the university co-ordinate with other faculties of the university, and then, for some reason or other—this is not the occasion to discuss that, although I think it is an interesting question—they lapsed into proprietary institutions, and lost nearly all connection with the university. Perhaps that may have been due in a large part to the rapid development of the country, and the necessity of supplying physicians to pioneer localities, although it is not clear why they should have been half-educated physicians.

"Up to about the beginning of the eighth decade of this century, medical education was at a very low ebb on this continent. But since that time conditions have changed, and the time has come when universities recognize medicine as a worthy object of support, and fully worthy of university ideals. It is only going back to the very beginning of the university, as those who are familiar with its history know, that medicine occupied at the beginning a very interesting position in the development of universities. I need only speak of the school at Salereno, and how in the middle ages the medical departments of universities were often their greatest glory, and how that department was often the home of all there was of sciences in those days, and of physics and natural science.

"Medicine fell away and became less worthy of affiliation with universities. But one of the most interesting features of modern times is the recognition on the part of the universities that medicine is worthy of their support. There is no direction in which a university can do more for itself, or more for the advancement of mankind, than in the advancement of medical education. It is equally true, I think, that medicine needs the support of a university for its highest development. Fortunate, therefore, you are that you have this close union here.

"And I also consider that it is almost a matter of equal congratulation that you have brought together the two schools of medicine, Trinity and Toronto. That must make a much stronger school than otherwise you could have. As Prof. Sherrington has indicated, the practice of medicine is only in part a science. To this day it is largely empirical, but it is recognized that it must become an applied science to a larger extent; and in order

to become an applied science, it must be based upon the fundamental sciences which are to be cultivated in these laboratories, and these sciences again, as he has already indicated, must rest upon chemistry, physics, and general biology. So that these laboratories are to be dedicated to the kind of work which shall have the greatest influence, not only upon scientific medicine, but also upon practical medicine.

"Very interesting also, Mr. President, were your remarks with reference to the influence which medicine has in these days upon public health, and the interest which the public in general takes in medical things. I do not know a more impressive illustration of that than what is taking place in the municpial campaign in the city of New York at this moment, where one of the chief arguments and main supports for the retention of the present administration there, is the excellent work that is being done in the Health Department, the low death rate, the influence which the administration has had upon the death rate from contagious diseases.

"I have perhaps said enough, but I wish also to say that I have the fullest confidence in the future of these laboratories. It is not the building, but it is what is done within them, and the men who work within, that really count; and I close with the hope and expectation that these laboratories will be the home of sound scholarship, and be productive of important investigations in medicine, and that they will attract students from far and near, and that they and your University may prosper. (Applause.)

The President then asked Professor Townsend Porter to read a paper which had been prepared for the occasion by Professor Bowditch, of the Department of Physiology in Harvard. The address read as follows:

"'I desire, in the first place, to extend my heartiest congratulations to the University of Toronto on the acquirement of the enlarged educational facilities which it has been our privilege to inspect, for these beautiful buildings will not only enable the University to play an important part in the advancement of medical education in America, but they afford a substantial guarantee that the part will be played with distinguished succcess by this enterprising and well-equipped institution of learning. The importance of this movement for the advancement of medical education in America cannot easily be exaggerated, for if the momentum of the past quarter of a century be sustained, it may easily result in shifting the centre of medical teaching and research to the Western

hemisphere, so that, though our grandfathers sought medical inspiration in London and Edinburgh, our fathers in Paris, and we ourselves have studied in Berlin, Leipzig and Vienna, future generations of physicians may find their Mecca on the banks of the Hudson, the Schuylkill, the Patapsco, the St. Lawrence, the Charles, or the Great Lakes.

Nor is it in medicine alone that we find evidence of abounding activity in the laboratories of the new world. Chemists and physicists have not been idle, but this is a theme upon which lack of time forbids me to dilate, and it will suffice if I merely allude to the important work recently done in Montreal, which has contributed so effectively to produce in our conceptions of the nature of matter, the revolution which now seems imminent.

"It will be found, I think, interesting to enquire whether the American movement in medical education is characterized by any special features which distinguish it from those which have taken place elsewhere. Now, no one who has studied the work done in American medical schools during the last ten or fifteen years, can fail to be impressed by the enormous expansion of the laboratory method of instruction which has there taken place. Whereas thirty years ago anatomy and chemistry were the only departments of medicine in which laboratory methods were in use, we have now laboratories of physiology, pathology, pharmacology, hygiene, bacteriology, and surgery, while anatomy has greatly extended the scope of laboratory work by including the allied sciences of histology and embryology, and chemistry has become to a large extent the handmaiden of clinical medicine. Nor is it alone for purposes of advanced instruction and original research that laboratory methods have shown their value. Experience has proved that they may be extensively used by beginners in medicine in acquiring elementary knowledge of the various medical sciences. In fact, there is practically no limit to the amount of laboratory work which first year students in medicine, with an academic training behind them, can perform under the guidance of competent instructors. A few years ago, when my colleauge, Dr. Porter, was arranging a laboratory course in nerve-muscle physiology, he announced his intention of supplying the first year students with capillary electrometers. I was inclined to doubt the wisdom of the plan, for I knew the delicacy of the instrument and the care needed for its manipulation, but, nothing daunted, Dr. Porter proceeded to construct capillary electrometers by the hundred, and placed them in the hands of the students. To my surprise the experiment was a

complete success, and the students acquired a practical knowledge of the electrical phenomena of nerves and muscles which they could have got in no other way.

"We need not therefore hesitate to employ laboratory methods of instruction from any doubt about the ability of the students to profit by them, but there is a distinct limitation to their use imposed by the fact that they are much more costly, both in time and money, than any other means of teaching, and that, if employed exclusively, it would be quite impossible to impart to the student even a small fraction of the medical information which every educated physician must possess. It is doubtless true that contact with the phenomena themselves, and not with descriptions of them, has a highly stimulating effect upon the mind of a student, and that the 'best knowledge is that which comes from personal experience,' but we must not on this account condemn the lecture, the recitation, and the text-book as worthless methods of instruction, nor deny all value to knowledge communicated from the experience of others.

"It is, in fact, obvious that unless the student can profit by the experience of those who have gone before him, and begin where the latter have left off no important advance in human knowledge will be possible. A wisely-planned course of medical instruction will, therefore, recognize the lecture and the recitation as no less important than the laboratory, both for purposes of imparting information, and as methods of mental discipline. We must remember that it is quite as easy to abuse the laboratory as the didactic method of instruction. Indeed, this seems to be a danger which now threatens us, and I fear that we may all live to see the day when we shall feel that the pendulum of educational reform has swung too far in the direction of laboratory methods of instruction.

"The future historian of medical education in America will probably point to the early years of the present century as the time when the elective system, already extensively employed in academic instruction, secured a foothold in the professional schools. The idea of election in medical studies is not, however, altogether a new one even at the present time. In post-graduate schools, the right to choose the courses desired is the essential feature in their organization, and since the establishment of the compulsory four years' course, a portion of the instruction of the fourth year has, in some of our schools, been given in elective courses in various specialties.

"Now, no one is likely to question the desirability of every

first-class medical school furnishing the most advanced instruction in all the departments of medicine. Such a school must, in fact, offer instruction in every subject which any student may desire to pursue, and this of course necessitates the adoption of some sort of elective system, for it is obviously impossible for even the most intelligent students in the time allowed, to assimilate all the various information which such a school may be expected to impart.

"The only question is whether the choice of medical studies should be limited, as it practically is at the present time, to post-graduate schools, or whether undergraduates in medicine shall be allowed a certain freedom in determining the direction of their medical work. Now, there is probably no medical school of which it may not be said that in nearly every department many things are taught which are subsequently found to be of use to only a fraction of those receiving the instruction. Moreover, this state of things is frequently fully recognized by the students themselves who are thus encouraged to do perfunctory and superficial work. It is indeed well to know that a certain number of medical students very early make up their minds either that they will become surgeons, obstetricians, or specialists of some sort, or, on the other hand, that they have a strong aversion to certain branches of medicine, and a determination never to practise them. For such students a prescribed curriculum necessarily involves great loss of time and energy.

"Led by these and similar considerations, the Harvard Faculty of Medicine recently addressed itself to the task of revising the course of study with a view to distinguishing between the *essential* and the *desirable* in medical education. The required instruction in every department was reduced to the limit of that which was considered absolutely necessary for the mental equipment of a safe practitioner of medicine, and all the more advanced instruction was provided for in elective courses. It was thus found possible to condense the required instruction of the school into the first three years of the course, leaving the fourth year to be wholly devoted to elective work. Hence at the end of the third year, the Faculty practically says to the students, 'We now consider that you have received sufficient training in all matters of which no one who calls himself a physician can afford to be ignorant. We think you are not likely to make any serious error in the diagnosis and treatment of the ordiary diseases. We believe that you will know enough to call in the services of a specialist when your own knowledge fails. We think

that you have been so instructed in the fundamental principles of the various medical sciences that you can apply them successfully to the cases arising in your practice. We do not consider, however, that you are yet worthy of the Harvard M.D. degree. To obtain this distinction you must devote another year to medical study, and in that year a wide choice of studies is open to you. If you wish to become a general practitioner of medicine, take the elective courses in clinical medicine, and frequent the general hospitals. If you desire to be a surgeon, follow the courses in clinical surgery. If you incline toward any of the specialties, take elective course in the anatomy and physiology of the organs which interest you, and follow the cliniques in those hospitals where those special diseases are treated. If you are particularly interested in any of the medical sciences, take advanced instruction and research work in the laboratory devoted to the science of your choice.'

"It will be observed that an elective system thus arranged, while it permits, by no means compels, an early specialization of medical study. In practice it will doubtless be found that the elective courses in the various specialties offered to the fourth year students will be much the same as those of the post-graduate school. Thus it will be possible for students of medicine to take up special work at any time they may see fit. It is as yet too early to speak of the results of this method of instruction for the elective fourth year will go into operation for the first time in September, 1904. When, two years hence, Harvard invites her friends to help her inaugurate the new medical school buildings, it will be possible to report upon the subject as an accomplished fact, instead of a promising experiment.

"In alluding to the new medical school buildings, I am led to speak of an architectural contribution which Harvard is making to the cause of medical education, viz., the so-called 'Unit System of Laboratory Construction.'

"It is obvious that, if, in planning a group of laboratory buildings, it is found possible to make such laboratory consist of a series of rooms identical in size and general construction, great architectural economy can be secured. In administration also great advantages will result for, with the growth of the institution, it will be possible to accommodate one department in rooms originally planned for another, by merely changing the character of the furniture which they contain. Moreover, the enlargement of a laboratory will, under this system, consist simply in the addition of a certain number of unit rooms, and

this process can be repeated as long as the building space holds out. The detailed plans by which these important results can be reached have been carefully worked out by Dr. C. S. Minot, who, I had hoped, would be with us to-day. In his absence I venture to make this brief allusion to a plan of construction which will be illustrated in our new medical school buildings, and which has been for him a matter of very careful study.

"Such are some of the contributions which Harvard is making to the cause of medical education. Other schools are doing likewise. May the generous rivalry between the medical schools of the Western hemisphere go on, for in it is involved the welfare of the human race."

After Professor Bowditch's address, Professor Chittenden of Yale University addressed the audience, and spoke as follows:

"Mr. President, Ladies and Gentlemen: I have the honor and the great pleasure of bringing to the University of Toronto greetings from Yale University and from the American Physiological Society. We congratulate you upon all that has been accomplished in the past by this university in the domain of experimental and scientific medicine. And we look forward, sir, with hope and with pride to the future, believing that, with the increased facilities here offered, still greater achievements will be accomplished. We congratulate you especially upon what has been done here in the domain of physiology under the wise leadership of Professor Macallum. To me there is a special gratification in seeing the provision which has been made for furthering the studying of physiological chemistry in this university. In this department of the science of medicine there is much to be done. Physiology, pathology and hygiene are all reaching out their hands to physiological chemistry asking for aid.

"Many problems might be enumerated which readily suggest themselves, and which are closely connected and intimately associated with physiological chemistry. It seems to me—and I trust I do not exaggerate—that much of the immediate future advance in experimental and scientific medicine will be associated with the advance in physiological chemistry, and I feel like congratulating this university upon the provisions now being made for advanced study in physiological chemistry as a part of a study of physiology.

"If I may be allowed to say one word more in this connection it would be this, there should not be a divorce of physiological chemistry from physiology. Physiological chemistry, in my

judgment, should be considered as a part of physiology, and not an independent part. It may need a chemist to do the work, but the interpretation of the results and the value of the work certainly for medicine, lies in the physiological interpretation; and physiological chemistry, I think, should be always connected, or worked, as a part of a broad department of physiology, not as an independent department.

"The Yale University sends by me the message: 'God speed in your efforts to broaden and increase the fields of usefulness in the department of medicine in this university." (Applause.)

Professor Roddick, Dean of the Faculty of Medicine, McGill University, Montreal, then made some remarks, conveying a message of congratulation from the University of McGill in view of the increased facilities for teaching which have been recently provided in the University of Toronto. He also stated his entire approval of the recent amalgamation which had taken place between the Faculties of Toronto and Trinity, and he stated his belief that it was not impracticable or impossible for a general federation of the universities of Canada to take place. He also defined his attitude towards the scheme of Dominion registration, in which he has been very specially interested for some time. He believed that the Bill would have become law already, had it not been for the antagonism of the Province of Quebec. He trusted, however, that an amendment would be shortly forthcoming which would allow any group of Provinces to embrace the scheme.

Professor Abbott, of the University of Pennsylvania, then spoke as follows:

"Mr. President, Members of the Corporation, Ladies and Gentlemen: I have the great privilege, on this auspicious occasion, of bringing greetings from the sister school on behalf of the University of Pennsylvania. I have the honor to offer their hearty congratulations upon the completion of this addition to your already splendid equipment. We believe that the results to accrue from the plan laid down by you will more than compensate for all the energy that has been expended in preparing these beautiful laboratories. With such facilities as we see about us, and such direction as the work is sure to receive from your able instructors, it is our belief that the University of Toronto, more than ever before, will take a prominent place among the factors that are operating for the good of medical education. Again, sir, let me offer our hearty congratulations." (Applause.)

Professor J. P. McMurrich, of the University of Michigan,

as an old alumnus of the University of Toronto, expressed peculiar pleasure in being able to convey the congratulations of the sister university of Michigan, where they have recently opened a new medical building. Professor McMurrich urged the importance of insisting upon the necessity for endowment of medical study, and spoke as follows:

"There was one argument which I think the President omitted, and which seems to me the most powerful of all; and the fact that the University of Toronto is now entering into these magnificent laboratories with chances to fulfil that argument, leads me to speak of it—the argument from the enormous contributions which can be made to the material welfare of the country and otherwise by research done in medical laboratories. A single discovery will give to the country resources which cannot possibly be estimated in any terms fit to express them. A discovery such as that, for instance, which has recently been made in Harvard University by the pathologist, Professor Councilman, is one which will amply repay for all the expenditure which a Government can possibly make throughout the life of a university, in what it will give us in the way of power to prevent and exterminate a scourge which carries away from us thousands of lives of the utmost value to the State." (Applause.)

Professor Barker, of the University of Chicago, another alumnus of the University of Toronto, was then called upon. He expressed his gratification in observing that in the construction of the new laboratories ample provision had been made for research work. On behalf of the University of Chicago, he congratulated the University of Toronto upon the opening of the new laboratories.

Professor Roswell Park, of the University of Buffalo, conveyed the congratulations of that institution to the University of Toronto. He was then followed by the Honorable Senator Sullivan, of he Medical Faculty of Queen's University, Kingston, who conveyed the congratulations of the institution which he represented.

A large body of students assembled in the University Gymnasium, on the evening of October 1st, to hear the opening lecture delivered by Professor Wm. Osler, of the Johns Hopkins University, Baltimore. In addition to the students and members of the Faculty, a large number of ladies and gentlemen were present. The lecturer was introduced by President Loudon.

After Professor Osler's address the Dean of the Fac-

ulty of Medicine, Professor R. A. Reeve, addressed the students, and conveyed the thanks of the Faculty of Medicine to the lecturer of the evening. He stated that in his opinion it was very fitting that we should have endeavored to secure the presence here of some of the leading men of the larger and older institutions of learning in the United States and in the Motherland to celebrate the double consummation, the completion of our medical buildings, which embodies some principles which for the first time have found expression in a structure of this kind, and in the union of the Medical Faculties of Toronto and Trinity.

Professor J. Algernon Temple, lately Dean of the Faculty of Medicine of the University of Trinity, addressed the audience. He expressed the regret, which he said was shared by his colleagues, in abandoning the old Trinity Medical College, where he has devoted much time and energy in teaching for the past twenty-seven or twenty-eight years, and from whose halls many illustrious men have graduated. Whilst making these sacrifices, however, he believed sincerely that the step was in the interest of medical education in this Province, and in the interests of the two schools which had amalgamated.

The special convocation for conferring honorary degrees was held in the University Gymnasium on the afternoon of Friday, October 2nd, the Vice-Chancellor, the Hon. Chief Justice Moss, presiding.

Professor Cameron presented William Williams Keen, M.A., M.D., LL.D., Professor of Surgery, Jefferson Medical College, Philadelphia, for the degree of LL.D.

Professor Keen then addressed convocation, and spoke as follows:

"Mr. Vice-Chancellor, Mr. President, Students of the Medical Department of the University of Toronto, Ladies and Gentlemen: I thank you most sincerely for the unexpected honor of this degree, an honor which I shall always remember with the greatest pleasure. In doing so it gives me great pleasure to join my congratulations with those which have been so happily expressed by others of your honored guests upon the erection of your new building for physiology, physiological chemistry, pathology, and public health. These branches of medicine, with anatomy, which already has an admirable home, are fundamental, and the progress of medicine, surgery, obstetrics, and all the specialties is conditioned, first of all, upon progress in these departments.

"The laws governing the action of all forces—such as power when applied by the lever, the pulley, the inclined plane, or the screw, the forces of heat, light, electricity, magnetism, and steam —are first discovered. Then come the practical applications of these forces through machines by which we can use them. In the wake of such theoretical knowledge have come the balance, the printing press, the steam engine, the locomotive, the dynamo, the trolley, the telegraph, the telephone, etc. These are the machines which minister to civilization, and have transformed modern life. Were it not for the unwearied theoretical study in the laboratory, by which the abstruse laws governing these forces have been discovered and accurately stated, we should be groping in the dark, and wasting our time, our money, and our opportunities. In 1903, we would be as our fathers were in 1803. Just so in medicine. The same patient laboratory workers must be encouraged by the facilities which you have now provided for them to solve the problems of physiology (that is the study of the various organs in their normal condition), of the complex reactions of chemistry which, in the future, far more than in the past, will aid us both in physiology and pathology, and of public health, which will diminish the suffering, promote the well-being, and prolong the lives of the entire community.

"You have provided now the external physical conditions for successful study. The intelligent young men around you, yearning for distinguished careers in science, will be swift to take advantage of such splendid opportunities, and will be the best guarantee that the moral and intellectual conditions shall equal the physical.

"Those not wholly familiar with the progress of medicine in the last two or three decades may think, in view of the enormous and well-known progress made by medicine, surgery and bacteriology, that medical science may have reached its limits, and may wonder whether there are any other worlds to conquer.

Worlds to conquer? Aye! scores of them! The solution of each problem does but reveal two or three new ones; increase of knowledge but shows how little we really know. Prof. Welch's Huxley lecture, which disclosed the marvellous progress made in the study of immunity, showed a still larger world of the unknown which must be subdued. The surgeon longs for such an intimate knowledge of sepsis as will enable him to convert an already septic wound into an aseptic wound; and that the cause and then the cure of cancer, and other similar diseases, may be vouchsafed to him; the physician is seeking for the

germs of scarlet fever, typhus fever, chicken pox, whooping cough, measles; the pathologist is questioning the blood and slowly compelling it to disclose the secret foes and friends of health floating in its crimson tide; the physiologist is investigating the internal secretions, and the therapeutist is experimenting upon the various antitoxins and immunizing serums. The darkness of the night of ignorance is gradually fading, the dawn is lighting up the eastern sky, some day the glorious sun of complete knowedge will appear above the horizon to flood the world with its bright rays.

"But you need more than these fundamental branches, without which no progress could be made. The 'first cause,' the ultimate reason for the existence of the doctor, is to alleviate suffering and cure disease. When well grounded in the fundamental branches, for which you have now made provision, he must learn how to apply this knowledge to actual sick and suffering men, women, and children. How shall he learn to do this? It must either be from lectures and books, when he hears and reads about disease; or by coming directly in contact with disease itself in living, but suffering, men, women, and children. Which method shall be adopted?

"You have bought a fine watch, locomotive, a steam yacht, or have built a costly electrical plant. You seek a skilled watchmaker to repair your watch, or you want to engage an engineer to run one of those complicated machines. Which will you choose, the watch-maker or the engineer who has only listened to lectures and reads books on watch-making, electricity, steam, the dynamo, the locomotive and ships' engines; or the man who has not only become theoreticallly familiar with their construction, but has actually handled them till every part is as familiar as his own bed-room, who has taken them apart and put them together again scores of times, and has healed sick watches and cured sick engines? To ask the question is to answer it. Will you do better by your watches, your engines, your yacht, your electrical plant, which only cost money, than by your bodies, which are indissolubly bound up with your very lives, and the happiness of those dearer to you than your own lives?

The great daily laboratory of the medical profession is the sick room. To be equal to his task, therefore, the doctor, even when he graduates, must be familiar with actual patients, and not be compelled to learn by blunders, the penalty for which is paid by his patients in shattered health or tedious convalescence, or by ghastly mistakes, each of which has cost a life. You must,

therefore, provide a complete university hospital in which hundreds of the sick and suffering will find relief at the hands of your devoted and skilful faculty, and at the same time afford the students the occasion for study and observation, for case taking, for dressing of wounds, and for clinical and bacteriological examinations, and so learn the chameleon phases of disease, the means of cure, and the methods of operating. This hospital must have also not only its wards for those actually sick or dangerously injured, but a large out-patient department for every specialty, for those whose illness, or accident, or injury does not require them to leave their homes and their families and enter a hospital, but who can be cared for by simply visiting the hospital at suitable intervals. Here the minor accidents and ailments may be early and easily cured, and so prevented from threatening life or limb. In these out-patient departments, your students will see all the usual forms of disease, and be trained in their proper treatment.

"It is sometimes objected by those who are not familiar with the real facts, that this method of actual bedside instruction does harm to the sick. May I quote in reply what I said in an address to the Congress of American Physicians and Surgeons last May? 'I speak after an experience of nearly forty years as surgeon to half a dozen hospitals, and I can confidently say that I have never known a single patient injured, or his chances of recovery lessened, by such teaching. Moreover, who will be least slovenly and careless in his duties, he who prescribes in the solitude of the sick chamber, or operates with two or three assistants only, or he whose every movement is eagerly watched by hundreds of eyes, alert to detect every false step, the omission of an important clinical laboratory investigation, the neglect of the careful examination of the back as well as of the front of chest, the failure to detect any important physical sign or symptom? Who will be most certain to keep up with the progress of medical science, he who works alone with no one to discover his ignorance, or he who is surrounded by a lot of bright young fellows who have read the last *Lancet,* or the newest 'Annals of Surgery,' and can trip him up if he is not abreast of the times? I always feel at the Jefferson Hospital as if I were on the run with a pack of lively dogs at my heels. I cannot afford to have the youngsters familiar with operations,' the means of investigations, or the newer methods of treatment of which I am ignorant. I must perforce study, read, catalogue, and remember; or given place to others who will. Students are the best whip and spur I know.

The poorest charity patient in a hospital often has his disease more thoroughly investigated, and has a better chance of recovery than well-to-do or even rich patient, because a hospital affords the means for such complicated investigations which are not possible in private practice.

"Such a hospital and out-patient department should be under the control of the trustees and faculty, and all its beds should be wholly given up to the teaching faculty, as much friction will thus be avoided; the professor of medicine, surgery, and other branches will be the physicians, surgeons, etc., to the hospital of right and not by courtesy, and the didactic instruction in the college, and the clinical instruction in the hospital will be most advantageously corelated. College, hospital, out-patient department, and laboratory are all parts of one great medical machine. Cut off, or dislocate one, and all are crippled; the education of your own family physicians, your surgeons, your obstetricians, and your specialists is marred; and you, men and women of Toronto, and your children, and all of Canada, will suffer.

"One thing more is needed to carry out this scheme completely—large endowments. Modern medical teaching is excessively expensive, because it has become so largely individual, instead of to great classes, and so the teaching force has had to be enormously increased; and because it is chiefly in the laboratory which demands expensive buildings, costly equipment, and still more costly instructors. Has it ever occurred to you that universities are the only bodies which sell their wares below cost? Railroads, industrial plants, merchants, all sell their goods for cost plus 5, 10, or 20 per cent., which represents their profit. Universities sell theirs for 25 to 50 per cent. less than cost, which represents their actual loss in money. Hence the $10,000,000 for the Medical Department of Harvard, the $7,000,000 for the Medical Department of Chicago, the $2,000,000 given the Medical Department of Columbia University, the $7,000,000 for Johns Hopkins, the millions so freely given to McGill University. Universities and medical schools must have large endowments, either from generous friends or from the Government. The former have shown their interest in this University by large gifts. It now rests with the Government to help you either by annual grants or by additional endowments. I feel the more at liberty to urge this before a British audience, because Sir Norman Lockyer, as President of the British Association for the Advancement of Science, spoke in clarion tones but a few weeks ago in support of this same idea, and showed its urgent need in

Great Britain. It is no less urgent in Canada. Liberal aid to universities and technical schools, including pre-eminently the medical schools, is one of the wisest and most profitable investments a government can make, and will most surely meet with popular approval. The profits on the formerly wasted coal tar products alone have more than repaid Germany all her vast grants to her chemical laboratories, in which the methods of utilizing this waste were discovered; and the pre-eminence of Germany in medical research has been maintained by similar expenditures upon her medical schools. Why should not the familiar label 'Made in Germany' be replaced by 'Made in Canada?'"

Professor William Clark, of Trinity University, then presented Dr. William Henry Welch, M.A., M.D., LL.D., Professor of Pathology in Johns Hopkins University, for the degree of LL.D.

Professor Welch then addressed convocation, and spoke as follows:

"No one could be insensible to an honor conferred by this university, and I certainly appreciate most highly the distinction and decoration conferred upon me to-day. I wish I were worthy of all that has been said of me—I am sure that my colleagues must wish that some non-medical man may present them also upon such an occasion—certainly a too partial judgment of my work and of my merits. But I do, I say, appreciate most highly the honor as coming especially from this Canadian university. We do not think of you as foreign. You are certainly the closest of kin to us, and the deepest of sympathy exists, I am sure, between us. (Applause.) There is certainly no line of nation or country longer drawn between the representatives of science and of letters. They represent one great brotherhood in the world. And we think of the members of the medical profession in Canada and of the representatives of science in this country as belonging to, and forming part of, us—we are all, as I say, one brotherhood. I may say that I can only re-echo the sentiments that Dr. Keen has so ably presented to you, and especially express my sympathy with his idea of the importance of the university hospital connected with a medical school. That has been our greatest strength in the Johns Hopkins University Medical Department. What we have been able to do for the advancement of medical education in this country has been due in very large measure to the fact that Johns Hopkins left a part of his large endowment for the support of a hospital, which is, as he says, in

his will, to be a part of the medical school. In that respect we have been most fortunate, and I say I think that although the time must surely come, you will hardly reach the height of your endeavor here until that aid is secured, and you have a hospital which is directly under your control. It has been a great gratification to me, as I am sure it has been to all of my colleagues, to have been present here on this most interesting occasion during these two days. I feel most amply rewarded by the inspiration which I have received here by having come in contact with my colleagues here, and members of the faculty and others whom I have had the pleasure of meeting. I feel impressed greatly with the spirit which prevails here, and I feel the utmost confidence in the future of this institution. No one who understands the conditions here, can help feeling that great as its work has been in the past still greater is its work to be in the future. Again I thank you, sir, most heartily." (Applause.)

The Vice-President of the University, Professor R. Ramsey Wright, then presented Professor William Osler, M.D., LL.D., F.R.S., Professor of Medicine in Johns Hopkins University.

Professor Osler then addressed convocation, and spoke as follows:

"I need hardly tell you how much I appreciate the honor you have conferred upon me to-day here in the University in which I began my scientific education." After some further remarks of appreciation, Professor Osler continued: "I say, sir, it is with peculiar delight that I have been present at these exercises. It is really beyond words to express the feeling that an old student has when he sees at last this Faculty housed in such a building as that which was opened yesterday. It really is a great delight, and the building is so fine—there is nothing, I think, on the Continent, one may say, to be compared with it for the purposes for which it has been destined."

Professor McPhedran then presented Russel Henry Chittenden, Ph.D., Professor of Physiological Chemistry in Yale University.

Professor Chittenden addressed convocation and spoke as follows:

"Mr. President, Members of the Board of Trustees, Ladies and Gentlemen: I desire first of all to express my hearty appreciation of the honor which this University has seen fit to confer upon me. I am sure that I shall always hold with pride this distinction. I take it to be that this honor which has come to me to-day is probably in a large measure a recognition of physiologi-

cal chemistry, as the science I represent, than a purely personal honor, and in a measure I take pleasure that it is so because, in my mind, physiological chemistry, as one of our biological sciences, is destined to play a very important part in the development of the medicine of the future. In this science which is so young, which has been in existence as a distinct science hardly a quarter of a century, I believe at least are the germs of many things which are destined to add health, strength, wealth and prosperity to the nations of the world. That, perhaps, may sound like a very broad statement, but in biology, the science of life, there is nothing more important than a study of the functions of the body; and in physiological chemistry we have a science which is striving most zealously to open up new avenues for the betterment of mankind.

"Matters of nutrition, upon which we all depend for our very existence, matters connected with the germs which medicine is looking at now so attentively. Matters of remedies, remedies when needed exceedingly important. Every physiological action depends, we believe, upon chemical constitution, and the physiological chemist is striving with might and main to learn more about these matters for the benefit of the human kind.

"It seems to me that this University of Toronto has an unparalleled opportunity for the development of this phase of physiological work. As stated yesterday, I viewed with great pleasure the new opportunities here presented for the study of physiological chemistry, and I believe that in this direction lies an opportunity for good which, if followed up, will bring unbounded credit to this University; and just here let me say that if these opportunities are to come in physiological chemistry, in physiology and biology in general, there must be aid. It is not a question merely of money. Money is, of course, essential. We cannot have adequately fitted up laboratories. We cannot have all the essentials for work unless there is money to provide these, but in addition there must be men, there must be brains at the disposal of the University; and the plea I would like to make here—and I trust it is quite an appropriate one to make here—is that facilities be offered for the carrying on of research work by young men who may be induced to stay here and cultivate these opportunities, through research fellowship and other methods.

"That the strength of a university depends upon the strength of its men is a trite saying, but if a university is to grow we must provide young men, forceful men, men endowed with all the

opportunities which the occasion demands, to take the place of the older men, and push on the work and help to create an atmosphere which will redound to the credit of the university.

"The plea I would like to make, therefore, is that every possible effort be made in the biological sciences to draw the young men here, and keep the young men who have started here at work along advanced lines, and to offer such inducements that other men will come to you here, and thus build up a school of active investigators, and broaden the bounds of the science in which they are interested, and thereby increase the general usefulness of the University. Again I thank you for this honor which you have conferred upon me."

Professor A. B. Macallum then presented Charles S. Sherrington, M.A., M.D., F.R.S., Holt Professor of Physiology, University of Liverpool.

Professor Sherrington addressed convocation, and spoke as follows:

"Mr. President, Gentlemen, Members of the Board of Trustees of this University, Ladies and Gentlemen: It is a difficult thing to adequately express my appreciation of the distinction which your University so kindly has given me at the present moment. In fact I do not feel able for the moment to express the feelings with which I regard the honor that I have just received. I must say, in defence of myself, that some of the kind remarks that I have heard fall from the lips of Professor Macallum makes me imagine that he is thinking about somebody else, and that there is some mistake, but I consider myself fortunate, and the mistake is on the right side. (Laughter.) The visit that through the occasion of this function, which has been so interesting to all of us, which has brought me to Toronto, has, I can assure you, served as an encouragement and as a stimulus that I hope I shall, to some extent, adequately convey to my colleagues who are at work in the University of Liverpool.

"Of course I cannot yet more than suspect that, in a large measure, the honor that I have just received I owe to the benevolence of a time-honored institution here for the most infantine of universities. Our university as it shelters at the present moment some of your graduates from Toronto, you may be interested to hear, is, I think, just one month old. (Applause.) It will be with a special pride and pleasure that my fellow-students and my fellow-members in that Faculty will receive the news of the step that this University has taken. They at that

great distance will, I know, appreciate having a small piece of Toronto University among them; I am only too proud to be that little piece of Toronto University over there, and I am encouraged because from the words that Dr. Osler spoke I begin to believe that I have entered upon an ornamental stage. (Laughter.)

"It may perhaps interest you, sir, if I report the fact that our university over there has as its Chancellor at the present moment one who is well known in the Dominion, a former Governor-General, Lord Stanley that was, Lord Derby that is.

"I can only, in conclusion, hope that those finely-built laboratories, at whose inauguration I have been present, will be but the forerunner of more, and I would like to take this opportunity of joining my own testimony with those that have been offered by Professor Keen, Professor Osler, and others, as to the importance to the community of adequately supporting and adequately running what is, and must be, an expensive and not directly paying portion of the machinery of education. However, this is not the moment to dilate upon a theme with which I am afraid I have already wearied you.

"In conclusion I would add that it will be one of the dearest privileges that I shall hold to maintain, as far as a man can maintain, the honor, dignity, and prestige of the University of Toronto."

President Loudon formally announced that the Senate had decreed that the honorary degree should be conferred upon Henry Pickering Bowditch, M.A., M.D., D.Sc., LL.D., Professor of Physiology in Harvard University, and the degree of LL.D. was conferred upon him *in absentia*.

Convocation then adjourned.

In the evening a dinner was given by the Dean and members of the Faculty of Medicine to their distinguished guests in the University dining hall.

The Physician's Library

Lea's Series of Medical Epitomes—Archinard's Bacteriology. A Manual for Students and Physicians. By P. E. ARCHINARD, M.D., of Tulane University Medical Department, New Orleans. In one 12mo volume of 210 pages, with 74 illustrations. Cloth $1.00 net. Lea Brothers & Co., Publishers, Philadelphia and New York, 1903.

Dr. Archinard has furnished a compact volume, admirably arranged for teaching purposes, free from discursive matter, and giving the essentials of his subject as accepted at the present day. While intended for and especially adapted to the needs of medical and dental students, the practitioner may well use the little book to post himself on the most recent knowledge in Bacteriology and Microscopy, and upon questions of modern technique.

Uric Acid as a Factor in the Causation of Disease. By ALEXANDER HAIG, M.A., M.D., (Oxon.) F. R. C. P. Physician to the Metropolitan Hospital and the Royal for Children and Women. Sixth Edition, with 75 illustrations. Philadelphia: P. Blakiston's Son & Co. Canadian Agents: Chandler & Massey Limited, Toronto.

This work is a contribution to the pathology of high blood pressure, headache, epilepsy, nervousness, mental diseases, asthma, hay fever, paroxysmal hemoglobin uria, anemia, Bright's disease, diabetes, gout, rheumatism, Raynaud's disease, bronchitis, and others disorders. Dr. Haig has for many years devoted a great deal of time and energy to the study of the relations of uric acid to various diseases. The observations which he has made are well worth the study and scrutiny of every physician who is striving to obtain a better insight into the causation of many diseases, such as rheumatism, gout, headache, arterio-sclerosis, etc. Although we think the author, in many diseases, ascribes too much importance to uric acid as a causal factor, still his statements should be studied, as there is no doubt in our minds that defective metabolism of some form plays an important part in the etiology of nearly all the diseases, which Dr. Haig believes are mere manifestations of poisoning by uric acid. In the present edition many portions of the text have been rewritten, and considerable new matter added. The chapters on treatment contain many practical points with regard to diet in diseases caused by uric acid poisoning.

Desiring to make a practical, useful journal for the General Practitioner, the Editors respectfully solicit Clinical Reports from subscribers and others.

Dominion Medical Monthly

And Ontario Medical Journal

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MODERN PROGRESS IN THE STUDY AND TREATMENT OF TUBERCULOSIS

If all the contributions to be given under the auspices of the Henry Phipps' Institute, for the Prevention, Treatment and Study of Tuberculosis, prove as interesting and instructive as the initial deliverance by Dr. Trudeau, of Saranac Lake, N.Y., himself the pioneer in the Sanitarium treatment for this disease in America, and probably the foremost authority on the subject on this continent, then we will expect a series of lectures of far-reaching and eminent importance. In the *Medical News*, of Oct. 24th, the address is published in full, "The History of the Tuberculosis Work at Saranac Lake," and the address is an intensely absorbing one. No better article in any medical journal has appeared in the medical literature of 1903; and it is inspiring to read of the determination and resolve, of the founder of Saranac Lake, who thirty years ago went into the Adirondack region to seek a new lease of life from the very disease with which his name is now so eminently associated. That one man by his individual and unselfish effort has been able to accomplish so much, exhibits a marvel of resource, and a resolve which is wonderful, if not truly remarkable. Dr. Trudeau's labors, as well as his experience and observations, go to prove that incipient cases of phthisis, under proper medical supervision, which can only be obtained in Sanitaria, can be cured—and it is important

to remember that it is in these alone that hope can be held out. But the most important matter upon which we should have genuine and authentic information is not transient cures or alleviations, but permanent and complete restoration to normal health. For if we can assure our patients of this a distinct and mighty advance has been made in the treatment. Let us follow up Dr. Trudeau's cases. He tells us: "Of the 1,500 cases under consideration, which have been discharged from two to seventeen years, 434 could not be traced, leaving 1,066 which have been traced. Of these, 46.7 per cent. are living. Of these 31 per cent. are known to be well at present, in 6.5 per cent. the disease is still arrested, 4 per cent. have relapsed, 5.2 per cent. are chronic invalids, and 53.3 per cent. are dead. As to the influence of the stage of the disease on the permanency of the results obtained, he found 66 per cent. of the 258 incipient cases discharged are well at present. Of the 563 advanced cases, 28.6 per cent. are well, and of the far advanced cases 2.5 per cent. only remain cured." This probably is the most practical, and at the same time, most interesting—waiving aside all sentimentality—paragraph in Dr. Trudeau's address. If we look at this boldly, and in a cold-blooded spirit, and after eliminating the 258 incipient cases, we do not think there is much left to gloat over; and that if it were not for the exceedingly good after history of these incipient cases, the Sanitarium treatment would be stamped as a dismal failure. But who shall say to prolong a man's life five, ten or fifteen years is not good work, and well worth the trying. These statistics, no doubt carefully kept and accurately computed, point out clearly, and should serve to emphasize the fact, that the life of the incipient tuberculous can be preserved to the State, and made valuable—the incipient, and that alone; that the moderately as the far-advanced case is practically hopeless; that the public should be educated plainly and truthfully to this fact, and that fact having been now abundantly proven, through the medium of private generosity, and philanthrophy, it is time for the State to shoulder its responsibility, and hasten to provide for these institutions.

FRUIT AND NUTS AS FOOD.

The Department of Agriculture at Washington has for the past number of years been conducting experiments and observations relative to the dietary value of fruits and nuts as foods. Altogether, there were nine dietary studies, and thirty-one di-

gestive experiments, conducted. From the deductions, it is emphasized as a fact that both fruits and nuts are true foods, rather than accessories. Upon two women, three children, and two men in advanced life, were these studies and experiments carried on, as well as on two university students. Whilst the cost of this fruit diet averaged from 15 to 18 cents a day, the men doing hard manual labor, and the students grinding away at their studies, it was found that it supplied about 60 per cent. of the protein ordinarily derived from a meat diet. The health and strength of all continued the same, if not slightly improved, In some a gain in weight was observed. Particularly was it desired by these experiments to ascertain the food value of nuts, as these latter were relied on in the fruitarian plan to compensate for the absence of fat from the diet. Fruits are ordinarily rich in carbo-hydrates, and contain little protein. Nuts, on the other hand, are rich in fat. The result of the experiments seem to show that peanuts, especially, furnish more protein than any other variety, and at a less cost, and, along with fruits, furnish a diet which, while being cheap, is also productive of considerable energy.

A TARIFF OF FEES FOR ONTARIO.

One of the many obstacles confronting the embryo practitioner nowadays in this Province is his lack of knowledge as to what price to place upon his services. There is no printed rule or code to go by, and it is only through culling here and there from his neighbors, that he is able to know what to charge at all. This anomalous condition ought to be remedied, and we are glad to learn that a special committee of the Council is to report upon it at the next annual meeting of that very useful body. Many of the younger men of the last decade in practice, may not know that they owe it to that once powerful body on the concession lines, the Patrons of Industry, that there is no tariff of fees in this Province, for it was through their machinations that that section of the Medical Act was expunged. Truly, it does seem strange that these horny-handed sons of toil have passed from the scene, leaving the effects of their existence more on the profession of medicine than upon the calling of agriculture: for, at this not very distant date, it would puzzle the most wise politician to name one good thing which emanated from that now defunct organization. Never more than at the present time did the

medical profession feel the need of a tariff of fees. House rent, foodstuffs, wages, fuel—all have advanced, but the fee of the medical man remains—just what any and everyone have a mind to give. The present system, or rather lack of system, of every man charging what he likes, or what he can get, smacks more of the candlestickmaker, the butcher, or the baker. It is worse than the plumber, and God knows that is bad enough. A pin-hole leak means ten feet of new lead pipe, two or three new taps, and "time." By all means, let us have a tariff of fees. Let us know where we are at. Let us have a maximum and a minimum rate, and let the tariff be general for the whole Province: a proper conception of what is right and just on the part of the Committee; sanction by the Council; ratification by the Legislature. Surely after all that the Province of Ontario, Canada, the world over, owes to medical science, legislators will not be slow to discern what is right and just to our own selves, something which is, at the same time, just and right for the community.

News Items

TORONTO Dispensary treated 13,000 cases during 1902.

TORONTO had 118 cases of diphtheria in October, with 13 deaths.

THERE were 1,735 more births in Ontario during 1902 than in 1901.

ST. BONIFACE Hospital, Winnipeg, is to be improved at a cost of $100,000.

A NEW Western Hospital may soon be built in Montreal, at a cost of $100,000.

DR. MAW, of Middleport, has opened an office in the Overend Building, Caledonia.

SMALLPOX has broken out in New Brunswick on the border of the State of Maine.

THE following officers of the College of Physicians and Surgeons of the North-West Territories were elected at a meeting held at Regina on the 15th September: President, Dr. M. M. Seymour; Vice-President, Dr. A. B. Stewart; Registrar, Dr. J. D. Lafferty; Executive Committee, Drs. Brett and Kennedy.

Special Selections

ORGANIC IRON MEDICATION IN SECONDARY ANEMIAS.—A CLINICAL AND HEMATOLOGICAL STUDY.

BY LINO S. CHIBAS, M.D.,
Senior Assistant House Physician, Columbus Hospital, New York; and
G. A. DE SANTOS SAXE, M.D.,
Assistant Pathologist to the Columbus Hospital, New York.

A great deal has been written in recent years on the value of the various new organic iron compounds in the treatment of anemia, and our only excuse for the presentation of this report is that every new series of clinical observations, made with due conservatism and accurately recorded, is of value in confirming or disproving some fact or theory in medicine.

The problem of treating secondary anemias is an interesting one. In each case there is, in the first place, the primary factor, be it loss of blood through hemorrhage, spontaneous or traumatic; or be it the lowering of the functional activity of the blood-forming organs wrought by disease somewhere in the body, or by the action of toxins; or the direct destruction of the red cells and their hemoglobin in the circulating blood by some more violent toxic agency.

The first question, therefore, is how to remove the primary factor, or, at least, how to arrest its influence on the state of the blood. The second is, how to improve the state of the blood, so as to give it a new lease of life by increasing the amount of hemoglobin—that prime agent of oxygen exchange—and the number of red cells, the carriers of this agent.

In each individual case of secondary anemia there are different obstacles to be overcome as regards the primary factor, and therefore the treatment of the primary disease varies; but the therapy of the secondary condition is alike in all cases. Iron and its assistant, manganese, are the specifics to which we must have recourse—of that there has long since been no doubt—but the form of iron that should be used for this purpose is another question.

The problem as to the exact site and mode of absorption of iron which is administered therapeutically has occupied phar-

macologists for a number of years, and a great deal has been written on the subject, and yet there is still no agreement even as regards some of the essential points of this question. Is iron absorbed at all in the organic state? If so, in what form and in what quantities? What form of iron is most readily absorbed? How does iron act if it is not absorbed, or if only infinitesimal amounts, totally inadequate for the needs of the body, enter the plasma and are taken up by the molecules of hemoglobin? All these questions have been discussed and rediscussed, but as yet, as Hammarsten[1] says: "The action of the iron salts is obscure."

In a clinical article we are not called upon to go into details in discussing the various phases of the question as to the absorption and mode of action of the iron salts, but a few words may be said to show the present status of the subject.

Whether iron compounds of the inorganic group are absorbed at all, is a question of subsidiary interest in the present inquiry. There are two diametrically opposite views on this question. Bunge and his pupils[2] say that inorganic iron salts are not absorbed in any amount, however small, and that Blaud's pills and similar preparations act only by combining with the hydrogen sulphide and the alkaline sulphides of the intestine, thus preventing the decomposition of the organic compounds of iron existing in our food, especially in vegetables, and so permitting the absorption of these compounds into the blood. The opposite view is held by Quincke[3] and others, but the balance of evidence is in favor of Bunge's hypothesis[4]. The well-known fact that enormous doses of iron are required to produce appreciable effects in chlorosis supports this theory. Thus, if a woman takes six grains of reduced iron three times a day (eighteen grains daily), it will take weeks to restore her to the normal condition if her hemoglobin has fallen to 50 per cent. And yet, the entire amount of iron in the blood of a normal woman of average weight is only thirty grains, so that if the inorganic iron were absorbed, as some observers claim, a few days would suffice to restore the balance of hemoglobin and red cells.

On the other hand, organic iron compounds, especially such as are composed of iron with a proteid substance that resembles as closely as possible the proteids of the food as they occur in the intestine (*e.g.*, peptones), are undoubtedly absorbed into the blood in sufficient amounts to produce a comparatively speedy therapeutic effect in anemia, without injuring, as the inorganic compounds often do, the epithelial covering of the stomach and

intestine, and thus causing gastro-intestinal symptoms summarized under the two general headings of dyspepsia and constipation.

It is these advantages that led to the general adoption of the iron peptonates, albuminates, etc., as the remedies to be preferred in the treatment of anemia. In this report we deal with one of these preparations, that known as pepto-mangan (Gude), in which iron and manganese exist in the form of peptonates. Gude's pepto-mangan has been used for a long time at the Columbus Hospital as a matter of routine in all anemic patients during convalescence from prolonged illness or from operations. The satisfactory results which have been obtained with this preparation have been noted, in a general way, by the visiting staff as well as by the house physicians, but until now we had made no study of the exact results, as attested by the examination of the blood before and after the initiation of the treatment.

In order to determine more accurately what could be expected of pepto-mangan in secondary anemias as they occur in a general hospital, we studied a number of cases in the medical, surgical and gynecological wards. Of these a majority were in the services of Drs. Ramon Guiteras and Egbert H. Gradin, visiting surgeon and visiting gynecologist to the hospital, and we take this opportunity to acknowledge their courtesy in permitting us to pursue this work.

About forty cases were studied from October 1st, 1902, to March 1st, 1903, in as thorough manner as possible, with a view of determining the action of the preparation to be tested. Unfortunately, for reasons beyond our control, a great many of these patients left the hospital, believing themselves sufficiently improved, without giving us time to try the remedy for a sufficient period to obtain definite results. We present, however, twelve cases in which the medication was continued for three or four weeks, usually for about a month in each instance. In each of these cases blood-counts were made before beginning the treatment, as well as after it had been discontinued. The cases are given below, simply as they appeared in our notes, and they were not selected particularly on account of the results noted, but merely because they were the cases studied more completely than the rest.

Report of Cases.

Case I.—Mrs. R. F., Italian, 42 years of age, was admitted to the hospital on December 4th. Diagnosis, ovarian cyst.

Symptoms of secondary anemia. She was operated upon December 5th, and the uterus was removed through the abdominal incision, as it was found to be the seat of a fibroid tumor which had degenerated into sarcoma. She was discharged cured on January 10th, 1903. During her convalescence she took one tablespoonful of pepto-mangan (Gude) three times daily. The examination of the blood showed the following findings. December 4th, hemoglobin 50 per cent., reds 3,350,000, whites 15,000. December 18th, after hysterectomy, hemoglobin 39 per cent., reds 2,300,000, whites 16,000. January 10th, hemoglobin 70 per cent., reds 4,250,000, whites 7,800. The patient left the hospital in an excellent condition showing no signs of anemia or debility.

Case II.—A. P., Italian, 25 years old, admitted November 17th, with stricture of the urethra and signs of marked anemia. November 24th, perineal section and internal urethrotomy for stricture. There was considerable hemorrhage during and for a few days after the operation. Examination of blood: December 12th, eighteen days after operation, hemoglobin 68 per cent., reds 3,700,000, whites 10,429. January 4th, 1903, twenty-eight days after beginning the use of pepto-mangan, hemoglobin 95 per cent., reds 4,800,000, whites 8,400. Pepto-mangan was given in doses of one tablespoonful three times daily from December 13th to January 10th. The patient was discharged cured on January 10th, in good general condition.

Case III.—M. S., Italian, 25 years old, admitted October 14th. The diagnosis was perinephritic abscess and tuberculous knee-joint, and the patient showed pallor of the skin and mucous membranes. He was operated upon by lumbar incision for perinephritic abscess on October 24th, and his knee-joint was excised December 18th. Examination of blood: December 13th, 1902, three weeks after first operation, hemoglobin 70 per cent., reds 3,104,000, whites 5,888. December 20th, 1902, two days after excision of joint, hemoglobin 70 per cent., reds 2,750,000, whites 24,000. January 10th, when discharged, hemoglobin 85 per cent., reds 4,640,000, whites 5,150. This patient was given pepto-mangan for three weeks, from December 21st to January 10th. He was discharged improved in general health. The anemia was very much marked on December 20th after the second operation, and the increase in the blood cells and hemoglobin was very satisfactory for a case of this severity after three weeks' treatment.

Case IV.—Ida M., 5 years old, Italian parents, born in the United States, was admitted November 30th, 1902, suffering

from typhoid fever. December 12th, after the convalescence had set in, the child was extremely anemic-looking, with pale skin and pale, bluish-red mucous membranes. Pepto-mangan was ordered, a teaspoonful three times daily, on December 12th. Eight days later the first blood examination was made, two weeks later, the second. The findings of the pathologist were as follows: December 20th, hemoglobin 75 per cent., reds 4,720,000, whites 30,000. January 8th, hemoglobin 85 per cent., reds 4,960,000, whites 9,200. The patient was discharged cured on January 8th.

Case V.—Cesare C., aged 25 years, single. Had been operated upon one year ago in South America for vesical calculus and urethral stricture. Was admitted December 3rd, 1902, complaining of inability to urinate and continuous dribbling of urine through a suprapubic fistula. December 13th, perineal section without a guide and internal urethrotomy were performed. The patient was weak and anemic after the operation, so pepto-mangan, a tablespoonful three times daily, was prescribed on February 5th, 1903. He made a good recovery from the perineal operation, but the suprapubic fistula persisted. After twenty-two days' treatment with pepto-mangan he was discharged improved. Examination of blood: February 6th, 1903, hemoglobin 80 per cent., reds 3,878,000, whites 4,250. February 28th, 1903, hemoglobin 85 per cent., reds 4,516,000, whites 4,600.

Case VI.—M. C., aged 44 years, widower, has had urethritis four times. On admission he gave a history of having suffered from frequent and painful micturition for fifteen months. An examination showed a chronic urethral discharge, a urethral stricture, 12 F. at about 6 1-2 inches from the meatus, and a tumor in the right umbilical region simulating a very large kidney. The prostate was much enlarged and very tender. The urine was of a specific gravity of 1,020, acid in reaction, contained no sugar and no albumin, but numerous pus cells. In addition to treatment by irrigations and dilatation of his stricture, he received pepto-mangan, a tablespoonful three times daily, from February 4th to February 28th, to combat a marked anemia. Examination of the blood: February 5th, hemoglobin 45 per cent., reds 2,149,000, whites 9,760. February 28th, hemoglobin 55 per cent., reds 2,460,000, whites 6,890. The patient improved as regards his urinary symptoms, but his anemia did not show much amelioration after twenty-three days of iron therapy. At the time of writing he was to be prepared for a

second operation, an exploratory nephrotomy for his renal tumor.

Case VII.—A. B., Italian, aged 58 years, married, was admitted to the hospital on November 24th, 1902, complaining of symptoms of enlarged prostate which had been giving trouble for six months. He had lost considerable flesh and strength and looked very anemic. He was operated upon December 27th. His convalescence progressed satisfactory as regards his urinary symptoms, but the anemia persisted, and on January 14th he was put on a tablespoonful of pepto-mangan three times daily. After twenty-five days of this treatment he was discharged somewhat improved as regards the anemia. The report of the two blood examinations before and after the use of pepto-mangan was as follows: January 15th, 1903, hemoglobin 55 per cent., reds 2,940,000, whites 8,300. February 9th, 1903, hemoglobin 65 per cent., reds 3,110,000, whites 8,100.

Case VIII.—A. D., 8 years old, schoolgirl, on admission to the hospital, September 22nd, 1902, complained chiefly of abdominal pain, general weakness, and enlargement of the abdomen. On September 24th the abdomen was opened, and the peritoneal cavity found to contain a large number of tuberculous foci on the peritoneum and a considerable amount of serous fluid. The diagnosis of tuberculous peritonitis was made. On January 27th, 1903, the abdomen was again found full of fluid, and was opened for the second time. On January 28th, the patient was given pepto-mangan, two teaspoonfuls three times daily, for twenty-nine days, at the end of which time she was discharged. The anemia had not improved. The reports of the blood examinations were as follows: January 29th, 1903, hemoglobin 75 per cent., reds 3,920,000, whites 10,000. February 27th, 1903, hemoglobin 75 per cent., reds 3,890,000, whites 7,200.

Case IX.—G. P., Italian, 28 years old, was admitted to the hospital on January 13th, 1903. For the last four months he had noticed a swelling of the left testicle. He had his scrotum tapped ten days before admission, and about five ounces of a clear fluid had been withdrawn. An examination showed a pyriform swelling about eight times larger than the normal testicle, with an apex above the external ring. Its upper part was hard, without fluctuation, dull on percussion, no impulse on coughing and non-translucent. Its lower part fluctuated and was translucent. On January 19th, 1903, the testicle was removed, the

diagnosis of sarcoma of the testis being afterwards confirmed by microscopical examination. On February 1st the patient was given pepto-mangan in doses of a tablespoonful three times daily, and this medication was continued until February 28th, when he was discharged with a well-healed wound and improvement of anemia. The reports of the blood examinations were as follows: February 5th, 1903, hemoglobin 65 per cent., reds 2,362,000, whites 5,900. February 28th, 1903, hemoglobin 70 per cent., reds 3,800,000, whites 7,000.

Case X.—L. M., born in the U.S., aged 25 years, was admitted to the hospital January 3rd, 1903. She had been married four years, had had one child and one miscarriage. No venereal history. One month before admission she was exposed to cold during menstruation, and the flow ceased. One week before admission she began to flow steadily and still continued to do so, at her entrance to the hospital. She has had severe pelvic pains for three weeks The uterus was found retroflexed, and a large doughy mass was found on the left side posteriorly. On January 9th, 1903, she was operated upon by posterior vaginal section. A suppurating hematocele, originating from a ruptured extrauterine pregnancy, was found in the left broad ligament. She was given pepto-mangan in doses of a tablespoonful, three times daily, from January 10th, 1903, to February 9th, 1903. The patient was discharged cured on February 9th. The reports of the blood examination were as follows: January 24th, hemoglobin 65 per cent., reds 3,150,000, whites 9,200. February 9th, hemoglobin 75 per cent., reds 4,318,000, whites 6,100.

Case XI.—Mrs. L. G., Italian, 23 years of age, married six years, III para, last child three years ago. Admitted January 15th, 1903, on the recommendation of her family physician, who had made the diagnosis of ovarian cyst. On admission a careful examination was made, and she was found to be pregnant in the eighth month. The woman was delivered in the hospital on February 12th, 1903, the labor being normal, but accompanied with considerable hemorrhage, leaving the patient markedly anemic, as she had been previously suffering from anemia during her pregnancy. Pepto-mangan was given her in doses of a tablespoonful three times daily from January 25th to February 28th, when she was discharged cured. The reports of the blood examinations were as follows: January 29th, hemoglobin 55 per cent., reds 3,126,000, whites 8,450. February 28th, hemoglobin 75 per cent., reds 4,390,000, whites 6,000.

Case XII.—G. G., Italian, 44 years, single, was admitted to

the hospital on November 26th, 1902. He is accustomed to smoke a pipe. For the past fourteen months he has had a sore on his lower lip, which gradually grew larger. At times it gave rise to a great deal of pain. On examination, a small growth was found in the median line of the lower lip, hard in consistence, ulcerating, and with slight infiltration of the surrounding tissues. The sublingual and cervical glands were not enlarged. The growth was removed by a V-shaped incision on December 10th, 1902. A moderate degree of anemia remained after the operation, and on February 6th, 1903, the patient was given pepto-mangan, in doses of a tablespoonful three times daily. This medication was continued until March 5th, 1903, when the patient was discharged cured. The microscopical examination of the growth showed it to be an epithelioma. The reports of the blood examinations were as follows: February 6th, 1903, hemoglobin 70 per cent., reds 3,219,000, whites 8,318. March 5th, 1903, hemoglobin 85 per cent., reds 4,890,000, whites 7,000.

On reviewing the results obtained we find that, considering the diversity of cases studied under the influence of pepto-mangan, the ratio of increase in the hemoglobin and red cells was very uniform. In one case only (VIII.) of the twelve studied in detail, there was no improvement noted in the anemia, and that was a hopeless case of tuberculous peritonitis, in which, however, the patient was discharged improved as regards her abdominal symptoms after operation. In another case (VI.), the improvement was but slight, but this was a patient with renal tumor, and a marked cachexia. These two cases were as severe tests as an iron preparation could be subjected to, and perhaps the paucity of the results is not to be wondered at in these instances.

In the remaining ten cases reported here, as the table shows, the results were very satisfactory for the short duration of the treatment. There is no question that a few weeks longer would have brought most of the "improved" cases up to the point where we could say that the anemia was "cured." But, unfortunately, our patients belonged to a class in which every day spent in a hospital counts in privations for others who depend upon them, and we have been often obliged, upon the insistent demands of the patients and their friends, to discharge the convalescents at the earliest possible date.

In addition to the forty-odd cases which we studied this winter, pepto-mangan has been used in the hospital for over two

SYNOPSIS OF THE CASES.

No.	Name	Age	Sex	DIAGNOSIS	FIRST BLOOD COUNTS			LAST BLOOD COUNTS			Results as regards Anæmia
					Hem.	Whites	Reds	Hem.	Whites	Reds	
I	R. F.	42	F.	Fibroid of uterus degener. into Sarcoma (Oper.)	50%	15,000	2,530,000	70%	7,800	4,250,000	Markedly Improved
II	A. P.	25	M.	Stricture of the urethra (Oper.)	68%	10,129	3,700,000	95%	8,400	4,800,000	Cured
III	M. S.	25	M.	Perinephritic abscess (Oper.) Tuberculous knee (Oper.)	70%	5,888	3,101,000	85%	5,150	4,610,000	Improved
IV	I. M.	5	F.	Typhoid fever	75%	30,000	4,720,000	85%	9,200	4,960,000	Markedly Imp.
V	C. C.	25	M.	Suprapubic operation for vesical calculus Urethral stricture (Oper.)	80%	4,250	3,878,000	85%	4,600	4,516,000	Improved
VI	M. C.	44	M.	Renal tumor Urethral stricture	45%	9,760	2,149,000	55%	6,890	2,460,000	Slightly Improved
VII	A. B	53	M.	Hypertrophied prostate (Oper.)	55%	8,300	2,910,000	65%	8,100	3,110,000	Improved
VIII	A. D.	8	F.	Tuberculous peritonitis (Oper.)	75%	10,000	3,920,000	65%	7,200	3,890,000	Not Improved
IX	G. P.	28	M.	Sarcoma of testis (Oper.)	65%	5,900	2,362,000	70%	7,000	3,860,000	Improved
X	L. M.	25	F.	Suppurating Hematocele (Oper.)	65%	9,200	3,150,000	75%	6,100	4,318,000	Improved
XI	L. G.	23	F.	Pregnancy and labor	55%	8,450	3,126,000	75%	6,000	4,390,000	Improved
XII	G. G.	44	M.	Epithelioma of the hip (Oper.)	70%	8,318	3,219,000	85%	7,000	4,890,000	Improved

years in anemic convalescents, with uniformly satisfactory results. In none of the cases under our observation did any untoward symptoms accompany or follow the use of this preparation. In no case did constipation, nausea, headache, or digestive difficulties follow its administration.

The results recorded here correspond with those obtained with the use of pepto-mangan by Loomis[5], Van Schaick[6], and Von Ramdohr[7], of New York; Peterson, Perekhan, Doehring[8], of Chicago; Wolffe[9], of Philadelphia; Summa[10], and Bauduy[11], of St. Louis; Von Ruck[12] of Asheville, N.C.; McGuire[13], of Richmond, Va.; Frieser[14] and Pohl[15] of Vienna, and Fasano[16], of Naples.

On the whole, therefore, we have found pepto-mangan a very satisfactory and efficient hematinic in secondary anemias.

REFERENCES.

1. Hammarsten, *Physiological Chemistry*, English Translation, Mandel, New York and London, 1901, p. 176.
2. Bunge, *Zeitschrift f. Physiologische Chemie*, Vol. ix.
3. Quincke, quoted by Hausermann, *Zeitschrift f. Physiologische Chemie*, Vol. xxii.
4. White, *Materia Medica, Pharmacy, Pharmacology and Therapeutics*, 3d Amer. Ed., Edited by Wilcox, Philadelphia, 1895, p 182.
5. Loomis, H. P., The Successful Treatment of Anemia, *N. Y. Acad. of Medicine, Section on General Medicine*, April 18, 1893.
6. Van Schaick, the Diseases of the Blood in their Relations to Surgery, and their Treatment. *New York Medical Journal*, June 2, 1900.
7. Von Ramdohr, Results from the Adminstration of Iron in a Readily Assimilable Form after Gynecological Operations. *N. Y. Medical Journal*, June 26, 1897.
8. Peterson, Perekhan, and Doehring. Experimental Reports with Gude's Pepto-Mangan. *Chicago Clinical Recorder*, 1896.
9. Wolffe, A Clinical Report on Gude's Pepto-Mangan, Philadelphia.
10. Summa, The value of Gude's Pepto-Mangan in the Treatment of Anemia. *New York Medical Journal*, 1895.
11. Bauduy, Observations upon the Treatment of Some Cases of Neurasthenia. *Medical Review, St. Louis, Mo.* February 26. 1898.
12. Von Ruck, K., The Use of Pepto-Mangan for Anemia in Pulmonary Tuberculosis. *New York Medical Journal*, December 15, 1894.
13. McGuire, Surgical Convalescence, with Report of Blood Count in Twenty Cases. *Virginia Medical Semi-Monthly*, 1899.
14. Frieser, Notes on Chalybeate Therapy. The Therapeutic Value of Pepto-Mangan, Gude, Vienna, 1899.
15. Pohl, A Contribution to the Therapeutics of Pepto-Mangan, Gude. *Aerztlicher Central-Anzeiger, Vienna*, Sept. 20, 1899.
16. Fasano, Malarial Anemia, Chlorosis and Rachitis. *Archivo Internazionale di Medicina e Chirurgia*, Naples, May 1, 1899.

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