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AMEBIC DYSENTERY.

A paper read before the Shanghai Medical Society on Thursday, 16th March, 1922, by Dr. W. B. BILLINGHURST.

Gentlemen,

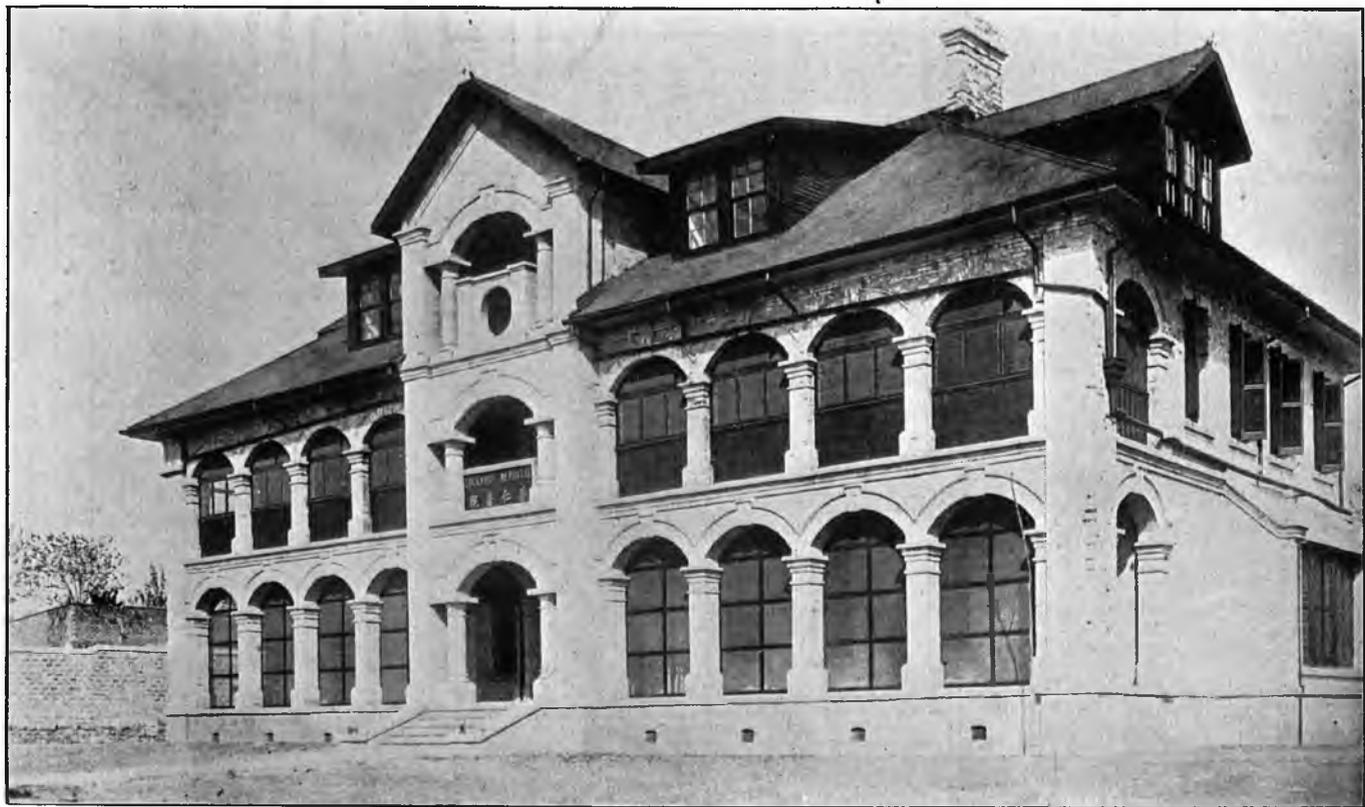
In February we had a profitable discussion on the lessons of the recent Smallpox epidemic, in which nearly every member present took part. Our knowledge of that disease is vague and empirical compared to that of the one under discussion to-night, in which each one of us, who has spent many years in the East, is endowed with a specialist's knowledge and experience.

It is that expert knowledge, which so many of you possess, that I want to tap for the general good to-night. I am going to give you as well as I can in the time at my disposal the results of my 14 years' experience in the treatment of this disease, and I hope that many of you may glean something good, though of course the greater part of what I have to say will be far from new. For our maximum benefit, please remember that it is our *combined* experience we want to summarize rather than that of any one individual.

Dysentery is, and always has been, the most prevalent of all the serious diseases to which the foreigner in Shanghai is liable. A study of the Annual Reports of the General Hospital from 1870 onwards shows that the admissions for Dysentery invariably head the list. From the practitioner's point of view, therefore, we must consider it the most important condition with which we have to deal.

Hospital Statistics. From an analysis I have made of the Hospital Reports for the last 50 years, the following table gives the percentage number of deaths from dysentery that have occurred in this institution compared to the number of cases treated for dysentery, and further the percentage of cases treated for liver abscess compared with the admissions for dysentery during the periods indicated.

| Years | Mortality from dysentery | Percentage of liver abscess cases to dysentery cases. |
|-----------|-----------------------------|---|
| 1870-1880 | 18.47 per cent. (Cases 249) | 16.86 per cent. |
| 1881-1891 | 13.54 " " (" 192) | Not obtained |
| 1891-1900 | 8.6 " " (" 348) | 16.38 per cent. |
| 1905-1911 | 5.35 " " (" 694) | 10.56 " " |
| 1913-1920 | 2.66 " " (" 936) | 2.66 " " |



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METHODS

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The regular and marked diminution in the mortality from dysentery, and in the percentage of cases leading to liver abscess, are entirely due to the improved methods of treatment, and as these improved methods have been those evolved for the destruction of the *Amoeba histolytica* I think, we may conclude, that amoebic dysentery is, and always has been, the prevalent form here. Clinically most of us are sure this is so. Pathologically practically no investigation has as yet been made here into the other forms of dysentery. Dr. Hill is now making a start, and we shall await with interest the results of his work.

We do undoubtedly meet fulminating cases which do not react in the usual way to anti-amoebic treatment; these may be due to a mixed infection, but my own feeling is that the amoeba is the main factor in nearly all. For the present, until further investigation has been made, I would strongly advise that all cases of dysentery should be treated as though amoebic in origin.

PATHOLOGY. At the risk of inflicting upon you a too elementary discursion, I wish first to call to your minds a picture of the underlying pathology of the disease. The essential cause of amoebic dysentery is ingestion of cysts of the *entamoeba histolytica*. The cyst wall is dissolved by the pancreatic juice in the small intestine, and active amoebae set free.

The active amoeba is a large organism, distinguished by the powerful ectoplasmic pseudopodia it is capable of thrusting forth. In the large bowel the amoeba finds its congenial habitat, and immediately attaches itself to the mucous membrane, and by means of its pseudopodia burrows into the submucous tissue. If unopposed it will burrow further into the muscular layers of the bowel, and even enter the submucous veins, whence it may be carried to, and infect, the liver spleen, and occasionally brain.

The reaction of the host to the presence of these hostile organisms is shown by a round celled infiltration in the invaded areas. Such infiltrations beneath the mucous membrane raise up areas of the latter, which pass through the stages of acute inflammation and necrosis, leaving ragged ulcers in their place.

Mucus is poured out by the inflamed bowel during this period, and spasmodic contractions of the colon occur at frequent intervals in its attempt to rid itself of the noxious irritant. If the amoebae are destroyed the ulcers rapidly heal, the mucous membrane regaining in a surprisingly short time its normal function and appearance.

If on the other hand the amoebae are not completely destroyed they may lie quiescent in varying numbers in the submucous tissues, giving rise from time to time to symptoms of recurrence; as from any

cause they become more active in their habits. During its active periods the amoeba multiplies by simple division; in the latent periods cysts may be found on the surface of the mucous membrane, these are carried away in the evacuations, and are the agents concerned in the spread of the disease. The amoeba itself is so sensitive to cold and dessication that it probably never reaches a new host alive except in the encysted form.

From the clinical point of view it seems to me that the main points in the pathology to bear in mind are:—

That the active amoeba burrows, and does most of its nefarious work in the submucous tissue.

That in the later stages of the disease the amoebae are often imbedded in inflammatory tissue, and thus shut off from the circulation, while cysts and entamoebae minutae are found lying chiefly on the surface of the mucous membrane within the lumen of the bowel.

That as long as cysts are being passed in the stool there are still areas of mucous membrane infected with active amoebae in the colon.

Reinfection of the host by sporulation of its own cysts is apparently impossible, as the cyst walls are only dissolved by the pancreatic juices of the small intestine (Wenyon and O'Connor).

The anatomical changes which occur in the bowel as the result of the activities of the amoeba are known to you all. They may be classified as:—

(I) *Catarrhal inflammation*—when the amoeba has failed to penetrate deeply.

(II) *Ulceration of the mucous layer*—when the submucous tissue is extensively invaded.

(III) *Gangrene and Sloughing*—when the muscular layer is invaded, local peritonitis, and even perforation may then occur.

These changes are confined practically entirely to the big bowel.

Clinically we recognize all the types which we should expect from the pathological evidence.

(a) *The simple catarrhal dysentery* with diarrhoea, more or less pronounced, and resisting ordinary treatment. Blood stained mucus may, or may not, be observed in the stool. Immediate improvement occurs when *antiamoebic* treatment is resorted to.

(b) *The acute ulcerative dysentery* with frequent evacuations of blood stained mucus, accompanied by pain over the colon and tenesmus, and later the passage of blood stained sloughs in the stool. The stool may not show signs of foecal matter for several days.

(c) *The gangrenous type* starting like the acute form, and leading to the passage of dirty green sloughs, and large quantities of serum. Fever is usually present throughout. This form is sometimes peculiarly resistant to treatment in the early stages, and death from exhaustion may occur just when the stool shows that the bowel is on the mend.

(d) *The chronic form.*—This is the most troublesome with which we have to deal. Periodic relapses of mucous diarrhoea occur, with constant ill health, exhaustion and emaciation, to which are added all the attendant ills of neurasthenia. In this form the cyst producing amoebae may be shut off from the circulation, and cannot be attacked by emetine given subcutaneously.

TREATMENT.—With the pathological picture firmly fixed in our minds we can now discuss the rational treatment to adopt in the various stages of the disease.

The indications are:—

- (i) *To destroy the amoebae* wherever they may be lurking.
- (ii) *To wash out the deep lying amoebae, and their debris,* and all the inflammatory products resulting from their presence, into the lumen of the bowel, and to get rid of them as rapidly as possible in the evacuations.
- (iii) *To promote the passage of healthy, soft, foecal matter* through the bowel at regular intervals, so as to enable the mucous lining to regain its vitality, and become regenerated over the damaged areas. For this purpose local depletion of the congested areas is of the utmost importance.
- (iv) *To repair the damaged areas of mucous membrane* persisting in the later stages of the disease.

The means at our disposal for achieving these results may be summarized as follows:—

For the destruction of the amoebae we now have the wonderfully effective drug *Emetine*—introduced by Sir Leonard Rogers in 1912—which has just as specific an action on these organisms as *Salvarsan* has on the spirochete.

In an acute recent infection we can almost count on destroying all the amoebae that have penetrated into the vascular spaces, within and deep to the mucous layer of the bowel, in a few days.

In the later and chronic stages of the disease the amoebae cannot be reached so effectually by the subcutaneous injection of emetine. The parasites now lie on the surface of the mucous membrane as cysts, or entamoebae minutae, or are imbedded in inflammatory tissue which

shuts them off from the circulation. In these stages the drug must be given by the mouth. The preparation which has so far proved most effective is *Bismuth Emetine Iodide*. A new drug *Dinol*, recently investigated by Dr. Ainslie Walker, may, if all he promises of it prove true, surpass this and every other intestinal disinfectant.

For the purpose of washing out the deep lying amoebae and their inflammatory products, and for the local depletion of the congested bowel, and the promotion of healthy foecal evacuations all of which are just as important as killing the active amoebae in situ—free administration of Saline purgatives is the essential form of treatment.

Saline aperients act:—(i) by greatly increasing the secretion of intestinal fluid.
(ii) by hindering the reabsorption of this toxine laden fluid.
(iii) by setting up gentle peristalsis of the bowel as a result of its distension by the fluid secreted.

These results are exactly what we wish to aim at in the disease under consideration, and no other purgative can produce the same beneficial effects.

In the old days when amoebic dysentery was treated with daily doses of *Ipecacuanha* the saline purge was not so essential as it is to-day, for the *Ipecacuanha* itself tended to produce a soft foecal motion with plenty of bile. With the subcutaneous injection of *Emetine*, however, there is nothing to stimulate the bowel to healthy action, and a continuous evacuation of inflammatory discharges with no sign of foecal matter may continue for days unless the purge is given. The pain, sleeplessness, and exhaustion resulting, are immediately alleviated after a good foecal motion is obtained.

The acute congestion of the coecum and lower bowel probably causes a spasmodic contraction in the neighbourhood of the *Ileocecal* valve, preventing the passage of the bile containing foeces, and one of the chief functions of the saline aperient is to gently overcome this resistance and promote a flow of fluid foeces from above, which, as I have said before, is such an important factor in the restoration of the big bowel. *In typhoid fever* we endeavour to promote a healthy action of the small bowel by periodically emptying the large bowel with *Enemas*. *In dysentery* on the other hand we must endeavour to promote a healthy action of the large bowel by stimulating the ileum to flush it out from above. *Dysentery* left to itself is not a true diarrhoea but rather a condition of constipation.

Enemas. Direct treatment of the bowel from below, by means of enemas, is probably *unnecessary in the acute stages* of the disease if emetine and sulphates are properly used. In the later stages, for assisting in the repair of the damaged mucous membrane, enemas, and local applications made through the Sigmoidoscope, are of undoubted value.

If used in the early stages enemas must be non-irritating, the aim being to wash away the inflammatory secretions from the surface of the mucous membrane.

Normal Saline or Saline of double normal strength are the forms chiefly used, though Chinosol 1/5000 or Albargin 1/500 (silver gelatose) I can recommend as being the best when a direct attack on the amoeba is desired; neither of them causes any irritation of the bowel. *Albargin* was recommended some years ago by Sir Leonard Rogers as the best and most potent drug for the local destruction of the amoeba, and I must say I had surprisingly good results with it, especially in chronic cases, in the days when one was able to obtain it from Germany.

In acute fulminating cases, to be discussed presently, I think enemas of any kind in the early stages are more harmful than good.

In the later stages of the disease, and in chronic cases, the best enemas are, as far as my experience goes,

| | |
|----------------|---------------|
| Tannin | 0.4 per cent. |
| Silver Nitrate | 0.5 per cent. |
| or Albargin | 1/500 |

While for local application through the Sigmoidoscope Silver Nitrate 10 per cent. on a swab is the best.

Diet. For the first three or four days this should consist of chicken broth and barley water only, afterwards may be gradually added Brand's essence, chicken or calf's foot jelly, cocoa without milk, beef juice, eggs, thin toast, apple puree, scraped beef and mashed potato, and chicken. The principle to remember being to feed up with easily assimilable, non-irritating food, and purge every third day with saline aperients.

TREATMENT OF THE DIFFERENT FORMS OF DYSENTERY.

(i) *The simple acute dysentery.* On the first and every subsequent third day I give Sod. Sulphate, 1 drachm, hourly for six to ten doses, diminishing or increasing the amount according to the resulting effect. One grain of emetine is given daily subcutaneously for 6 doses, and then stopped. After four or five days rest, I frequently give three more one grain doses, but never more.

Many writers advocate smaller and more frequent doses of emetine, but I have not found any benefit in this method. Others recommend continuing the emetine until 12 grains has been given. This in my experience is overdoing it, and may be positively harmful. As one grain of emetine is equivalent to one drachm of Ipecacuanha it would seem quite unnecessary to push the drug beyond the limits indicated.

In most cases of acute dysentery one has to deal with in Shanghai this treatment alone effects immediate, and usually permanent, relief. From our knowledge of the pathology of the disease, however, I should advise a varying course of Bismuth Emetine Iodide, after the emetine has been stopped. A complete course of this drug is 3 grains daily for 12 days, but it is seldom necessary to continue to this length. I have usually given it at 5 p.m. on an empty stomach, allowing a light supper at 8 o'clock, and have found very few patients unable to tolerate it. For these it is often useful to give it with a little Seidlitz powder in the early morning.

(ii) *The acute toxic or fulminating dysentery* is not so simply dealt with. Here the temperature is raised to 101° or 102°. The evacuations become more and more frequent, with constant abdominal pain and tenesmus; mucus, pus, and sloughs are seen in the stool, which fails entirely to become foecal. The pulse soon runs up to 120-140 and exhaustion becomes marked.

A mixed infection is probably present; in any case the amoeba has caused rapid and extensive destruction in the bowel. Most of us have mental pictures of the large bowel in such cases that have proved fatal. The extent and acuteness of the ulceration from coecum to rectum surpasses all one's preconceived ideas of what was possible.

My advice in such cases is

(a) Put your trust in emetine up to six grains.

(b) Above all persevere with the sulphates every third day. If they don't succeed in giving a foecal stool during the first six days of the disease, large doses of Pulv. Ipecac. followed by Castor oil may succeed. Remember a foecal stool will give immense relief and must be obtained at all costs. Our Hospital Mist. Mag. Sulph. Co. is the strongest mixture of sulphates available, and is often a great help if the Sod. Sulph. fails.

(c) For the tachycardia and exhaustion Digalen 10 minims thrice daily by the mouth is invaluable, and subcutaneous salines, especially in children, often prove the turning point in the disease.

(d) For the exhausting tenesmus, which prevents sleep, morphia hypodermically is the only remedy worth trying, the old starch and

opium enema I have never found of the slightest use. Charcoal ($\frac{1}{2}$ ounce, thrice daily) in sweetened arrowroot is said to be helpful for this condition, but I have not tried it.

(e) As soon as the stools become foecal frequent and small quantities of nourishing liquid food should be given, such as:—Beef juice, Brand's essence, Bengers food, a raw egg beaten up with port wine, in addition to the chicken broth and barley water of the early stages.

(iii) *Acute dysentery followed by an early relapse.*

The clinical picture is that of an acute attack, responding within reasonable time to treatment, followed by a period of normal convalescence with healthy looking motions. After ten or twelve days pus and mucus suddenly reappear in the stool, with abdominal pain and tenderness over the colon, or tenesmus. Thick ropy strings of mucus continue to be passed for several days, or even weeks.

Here we are dealing with an *unhealed ulcer*, certainly harbouring active amoebae in its walls.

The indications here are

- (a) To chase the amoeba out of its lair.
- (b) To destroy it by means of *antiseptics given by the mouth*.
- (c) And to assist the ulcer to heal by promoting a healthy flow of soft faeces through the bowel, and applying local treatment by means of Enemata, or through the Sigmoidoscope.

To attain these ends, I would recommend:—

- (a) The free administration of sulphates every third day.
- (b) Bismuth Emetine Iodide by the mouth, two to three grains daily for six to twelve days. Later yellow santonin or Bismuth subnitrate may be useful.
- (c) The tannin, silver, or albargin enema.

It is not necessary to starve the patient in this or in any chronic form of dysentery.

(iv) *Dysentery in Infants.* Amongst infants one is familiar with every variety of case, from the mildest catarrhal, to the most acute gangrenous type. The latter fortunately are comparatively rare. It is well to bear in mind that many forms of diarrhoea in infants, especially those associated with dentition, are accompanied by the passage of quite considerable quantities of mucus without being in any way due to dysentery. In the treatment of amoebic dysentery in infants my experience is that Emetine is well borne, though I have never been convinced that it is as efficacious as in adults. I believe that the

sulphates here are more important than anything else, and advise the concentrated form provided in the *mist: Mag: Sulph. Co.* of the Hospital pharmacopœia

| | |
|------------------|---------------|
| Mag. Sulph. | one drachm |
| Sod. Sulph. | one drachm |
| Acid Sulph. dil. | ten minims |
| Syr. Zingib. | thirty minims |
| Aq. menth. pip. | half ounce |

one drachm of this mixture two hourly for four doses every second or third day for a child under 2 years of age, and two drachms for a child over two, is a most useful dosage to remember. *Emetine* can be given gr. $\frac{1}{4}$ daily up to $1\frac{1}{2}$ grains for a child of 6 months, and gr. $\frac{1}{2}$ daily up to $2\frac{1}{2}$ grains for a child of 2 to 4 years.

The saline or chinisol enema I do think is a good thing for infants, even in the acute stages.

When there is any tendency to collapse subcutaneous salines may be of great assistance, and stimulants may be necessary.

For distressing and exhausting tenesmus a few drops of *Tinet. Opii* by the mouth are certainly justifiable.

After the acute stage has passed *Pulv. Rhei. Co.* gr. ii to gr. iv three times a day is often a valuable help.

(v) *Chronic Dysentery* is the last form I propose to touch upon. In Shanghai we meet with every form of chronic colitis; most of our cases, however, are the result of previous dysentery. After an acute attack, even when thoroughly treated, recurrence may occur. Cysts are passed in the stool at more or less frequent intervals, and cysts indicate the presence of active amoebæ in the wall of the bowel.

The clinical forms met with may be classified as follows:—

(a) The mildest type with no marked symptoms. The patient passes an occasional suspicious looking stool in which cysts are found. He is simply a carrier.

(b) Recurrent attacks of diarrhoea after the slightest chill or indiscretion of diet. The stool may, or may not, present any of the naked eye appearances of dysentery.

(c) More or less frequent relapses with typical dysenteric evacuations. Progressive emaciation, and exhaustion are usually associated with this condition.

(d) The passage at varying intervals of thick stringy mucus in the stool accompanied by pain over the colon. In cases where a pericolic abscess has occurred a considerable discharge of pus is observed, when the abscess empties itself into the bowel.

Mental depression, irritability of temper, and loss of nutrition are symptoms common to all but the mildest forms of this disease.

In the treatment of chronic dysentery it is difficult to be dogmatic. *Clinical experience* is here of the utmost value, and proficiency is only attained after long and careful training. We have all been rewarded by successes, and depressed by unaccountable reverses, in our efforts against this disease, and we are ever learning something new.

There are no standard rules to follow, each case must be judged on its own merits, but the fundamental principle to bear in mind is that the aim of all treatment is to thoroughly cleanse the colon of the amoebae buried in its walls, and to restore the mucous lining to a healthy state. After analyzing many cases I have come to the following conclusions:—

(a) It is usually advisable to take these cases into hospital and treat them seriously, and not to pronounce them cured until formed healthy motions are passed daily. They should, and can be, cured in Shanghai. It is a confession of failure to send them off to Europe or America.

(b) Emetine subcutaneously is not much used for the reasons I have previously stated. The drug in the form of B.E.I. should be given by the mouth; it is more likely to reach the amoeba, when the latter is shut off by inflammatory tissue, through absorption from the bowel than through the circulation.

(c) The sulphate treatment every third day is just as important as in the acute forms of the disease.

(d) Local treatment by the bowel is often necessary. If velvety patches of hypertrophied mucous membrane, or actual ulcers, can be seen with the Sigmoidoscope they should be swabbed with 10 per cent silver nitrate every few days; even one application has a very beneficial effect.

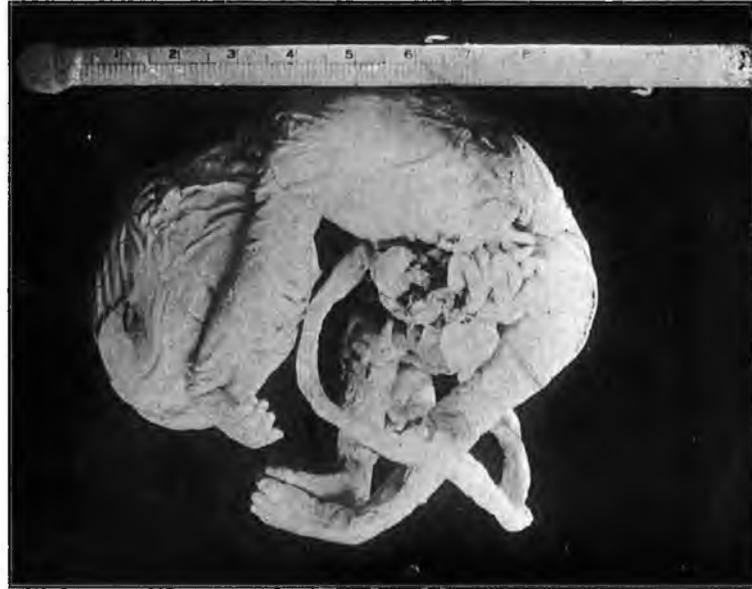
(e) Of enemas albargin is the best, and next Tannin. Silver nitrate I have not found much use, but a hypertonic saline with 3ii to 3iv of salt to the pint is useful if it can be tolerated.

The injection of two pints of kerosene with the patient in the inverted position has been well spoken of.

(f) Yellow santonin, Bismuth Subnitrate, and Rhubarb in the form of Pulv. Rhei. Co. or Tinct. Rhei. often find a useful place, as does also Rhein's mixture.

(g) Abdominal galvanism for 15 minutes daily in certain refractory cases has proved of great assistance.

(h) The diet should not be too restricted. Two or three glasses of sour milk may be added with advantage. It is nourishing, and



RUPTURE OF THE ABDOMINAL WALL.

probably inhibits the growth of putrefactive organisms in the large bowel.

In this condition, almost more than any other, patience and perseverance are an absolute necessity, both for the doctor and patient. A hopefulness and determination to get well must be encouraged by every means in our power, and is often difficult of attainment until success is almost within reach.

**RUPTURE OF THE ABDOMINAL WALL, WITH COILS OF
INTESTINE PROLAPSED THROUGH THE PERFORA-
TION IN A WOMAN FIVE MONTHS PREGNANT.**

By J. HOWARD MONTGOMERY, Choanchiu-fu, Fukien.

The following case is of sufficient rarity and interest to warrant a short report in the CHINA MEDICAL JOURNAL.

About 8.30 p.m. on the 1st of March, 1920, a woman was admitted to hospital with the statement that the bowel was protruding from the centre of the abdomen. It had been wrapped up in a dirty headcloth.

Examination:

The woman was pale and almost pulseless, having come a distance of twelve miles in a chair. There was a large mass of what looked like small intestine, consisting of several coils of bowel matted together. When this was gently moved to the side, it was seen to be protruding from a median perforation about $1\frac{1}{4}$ " long at the umbilicus. The edges of this opening presented healthy granulation tissue, and the bowel was firmly adherent to the opening. Some faecal matter was present, and the bowel, though dark in color, had not lost its lustre; but it was noticed that it was not the sheen of the peritoneal covering, and was like the mucous membrane—the inside of the bowel. The uterus could be easily palpated through the abdominal wall and the fundus reached almost to the level of the umbilicus. As the patient was in a very collapsed condition, no further examination was made. Stimulants and a rectal saline injection were given, and the bowel thoroughly washed with warm saline, and covered with gauze.

History:

The woman was aged thirty-three, and had had five children and two miscarriages, the last child being born eighteen months

previously. She said she was five months pregnant. Three months before she became pregnant, she had a severe attack of abdominal pain that lasted three days, the pain being about the umbilical region. From that time she had repeated attacks of severe pain at irregular intervals. During the attacks she had obstinate constipation and slight sickness, but had never vomited any faecal matter. On the 28th of February, that is, two days before admission, a severe attack of pain occurred which lasted all that day, and also the following day, the 29th of February, and on the afternoon of that day a small lump was noticed at the umbilicus. No such lump was ever seen before, and she was quite certain there never was anything like an umbilical hernia. The same evening this lump burst, and a small knuckle of bowel protruded, and she felt relief, the pain subsiding. During that night and the following day more bowel protruded, and faecal matter was noticed about noon on the 1st of March, when the protruded bowel became smaller and pain entirely disappeared. The temperature was 97.6 and pulse about 140 when admitted about 8.30 p.m.—that is, about twenty-four hours after the bowel protruded from the abdomen and twenty-eight hours after the lump appeared at the umbilicus.

Operation:

Next morning her condition seemed better and it was decided to operate. Pulse was 120 and temperature 96° and the local condition about the same as the previous evening. A preliminary injection of morphine, atropine and hyoscin was given and half an hour later chloroform was administered. It was at once seen on handling the parts that we were dealing not with the serous surface of the bowel but with mucous membrane, and it was at first a little difficult to understand just what had happened. The adhesions between the bowel and the opening at the umbilicus were separated with difficulty, and this part of the bowel was the serous surface, not mucous membrane. The opening was then enlarged up and down, and the condition became clear at once. A piece of bowel, the ileum, about a foot from the ileo-caecal valve, had become caught in what must have been a small umbilical hernial opening; this had become strangulated and with the efforts of the bowel to overcome the obstruction, more bowel was forced into the opening until the lump became visible as described by the woman and her relatives. Later the thin skin gave way and the bowel protruded. At the constricted portion near the hernial opening perforation of the bowel took place, and about three to four feet of small intestine prolapsed inside out through this opening and appeared on the abdomen and accounted

for the appearance of faecal material and that we were dealing with mucous membrane. This invaginated small intestine was easily reduced, and we were then left to deal with a necrotic portion of bowel about three to four inches long, and a large opening in the bowel through which the prolapse had taken place. The bowel at this place was clearly not viable, and therefore a portion of it about nine inches long, including the constricted and perforated part, was resected, and an end to end anastomosis by means of Murphy's button completed. The button was made to fit snugly and omentum stitched over the junction to reinforce the final Lembert's sutures. The abdomen was freely flushed with warm saline and adrenalin, a rubber tube inserted, and the wound stitched up. Rectal and subcutaneous injections of saline were given and the woman put back to bed. Pulse after operation was 100 and better in quality.

Post-operative History:

During the day after the operation, she improved and there was no sickness, but a cough developed and she was raised, almost into the Fowler position, partly to assist drainage, and to relieve congestion of the lungs. The dressings were changed in the evening and had no faecal odour, no urine was passed, but 8oz. was drawn off by catheter.

In the evening $\frac{1}{4}$ gr. morphine combined with atropine was given and she slept undisturbed till 4 a.m. the next morning when she complained of severe abdominal pain. The dressings were changed and still no faecal material or odour noticed, and it was clear the pain was uterine as the uterus could be felt contracting. About $1\frac{1}{2}$ hours later the foetus was born and as there was considerable bleeding, pituitrin $\frac{1}{2}$ mil was injected and later ergotin was also given by hypodermic injection. It was noticed when the foetus was born, that it had a perforation of the abdominal wall near the left costal margin, and the intestines were visible outside the abdominal wall; see below.

The patient rallied well and at 9 a.m. the temperature was 99.6, pulse 90 and general condition good. Calomel in small doses ($\frac{1}{10}$ gr.) was administered every ten minutes until she had gr. $1\frac{1}{2}$. During the morning she passed flatus and at 2 p.m. she had motion and another at 3 p.m. after an enema. By this time, the abortion being complete, the bowels having acted and the pulse under 100, and there being no tenderness of the abdomen or distension and no faecal matter or odour at the wound. I was confident she would pull through and felt very pleased about her condition.

Then, as so often happens in China, especially in a hospital without a trained nurse, the fatal accident occurred. The writer was called off to other urgent work and in spite of repeated warnings to the patient's friends about getting up, they thought they would change her clothes, and got her up on her feet. They had just finished when she fell back collapsed. I was summoned and was quickly on the spot but all restoratives failed, and I felt then and still feel that I lost this case by bad nursing, and that with a trained nurse in charge, this woman's life would have been saved.

Post-mortem:

A post-mortem examination was allowed and was performed almost at once. The end to end anastomosis was entirely satisfactory, no leakage from the bowel was evident, and the line of union was firmly glued together, which was proven by releasing the omentum and then cutting the Lembert's suture and the united peritoneal surfaces still held and required considerable force to rear them apart. There was no sign of general peritonitis and practically no free fluid in the abdomen.

Note by J. Preston Maxwell, Union Medical College, Peking.

The specimen is one of an approximately five months foetus. It is perfect except as regards the abdomen, the thoracic viscera being present and in normal position. On the left side of the abdomen about midway between the umbilicus and the ensiform cartilage, and midway between the middle line and the end of the ten rib there is a perforation, and through this perforation protrudes the liver, and most of the intestine. These bear the appearance of having been outside the abdomen for some time and the latter is much contracted. The umbilical cord appears to be normal and also the umbilicus itself. There is attached to the edge of the aperture a fine membrane which probably covered the hernial protrusion and gave way during the delivery. The specimen is one exhibiting gastroschisis. It is not a very rare malformation, but the lateral opening exhibited in our present specimen is exceptional. Sometimes no membranous covering is present. The teratogenesis is not clear and has given rise to much discussion. Occasionally these lateral openings extend upwards into the thorax but in this case the thorax is intact.

The association of this defect with the mother's history is one of mere coincidence. The defect which the mother had is not in the same place, and probably was a small umbilical hernia,

though the situation of the trouble suggests a connection with Meckel's diverticulum. But there is no proof of this.

A full description of gastroschisis will be found in Ballantyne's Antenatal Pathology. (The embryo) page 513-523.

**SOME OBSERVATIONS ON THE TREATMENT OF
SECONDARY ANEMIA, WHEN CAUSED BY IN-
FECTION WITH ANKYLOSTOMA DUODENALIS.**

F. R. WHELPLY, Jr.

Since my taking over this hospital in December (1921) I have been engaged in the comparison of several forms of treatment for the secondary anemia which is so often seen in our Island. My attention was first drawn to it by a comparison of the red cell counts with the hemoglobin. (See table one.)

The original object was to determine the efficiency of Blands mass as a therapeutic agent in these cases, but I soon discovered that there was an inhibition of cell production as well as a hemoglobin deficiency. We now abandoned the red cell counts as we found they were impossible because of the time occupied if they were to be properly made.

These blocks of cases were all of fifty. All were known cases by finding ova. All received the same treatment with Chenopodium. No change was made in the diet of any case. The time period is the same in each instance. Cases were taken by alternation for each block.

| Block. | Hemoglobin No. 1. | No. 2. | Red Cell No. 1. | No. 2. |
|--------|-------------------|--------|--------------------------------|-----------|
| 1 | 45% | 52% | 3,000,000 | 3,400,000 |
| Block. | Hemoglobin No. 1. | No. 2. | Drug Used. | |
| -1 | 50% | 55% | Commercial Blands. | |
| 2 | 50% | 80% | Fowler's Solution. | |
| 3 | 50% | 60% | Blands and Arsenic 1/64. | |
| 4 | 50% | 80% | Fresh Blands and Arsenic 1/64. | |

These are all average and no conclusions will be drawn from such rough work. These facts are presented at this time in order that others with greater study clinics may carry this farther.

Kilbourne Hospital, Kachek, Hainan.

REPORT OF THE UNUSUAL BULLET WOUND CASE.

By FRANK R. WHELPLY, Jr.

January 14th, Case No. 3014 came to our hospital with a bullet wound through the left shoulder. The entrance wound was in the scapula about midway and just under the spinous process. Its exit was through the pectoral muscles two and one-fourth inches up from the anterior axillary fold at a point seven inches from the midline, giving a wound course which apparently showed injury to the lung and pleura.

There was profuse hemorrhage and a probe showed the entrance wound to pass outward towards the head of the humerus. 500 mils of normal saline were administered intravenously and the axilla opened to ligate the bleeding vessels which were found to be high up in the axilla and direct branches from the axillary artery. We also found that the posterior and internal cords of the brachial plexus had been severed. We did an end to end approximation using silk mattress suture and left free drainage, for we knew the wound was infected. The bullet had glanced from the head of the humerus and gone forward and internal for its exit, this causing the severance of the nerve trunks and practically no arterial injury.

In twenty-nine days the first motion was possible in the fingers of the hand. Then slowly but surely the function returned to the forearm so that supination and pronation were possible. Then slight flexion of the forearm on the arm was noticed and on discharge April 18th, 1922, the patient could handle his chopsticks and raise the hand to his mouth.

The infection was easily controlled and apparently we were able to secure perfect union in a wound which had been made three days before.

PHARMACOGNOSTIC NOTES (1)
CHINESE MATERIA MEDICA.

By B. E. READ, Peking Union Medical College.

1. PA-CHIAO-HUI-HSIANG (八角茴香) *ILlicium ANISATUM*.
STARANISE. STUART, p. 215.

The seeds of this plant, which come from Kwanghsi, are used for producing commercial Anise Oil. These seeds are commonly used as a condiment in preparing food. They are tied together in a small muslin bag and yield their flavor to meat with which they are boiled in water. The colloquial name is Ta-liao (大料). There is commonly sold, at a cheaper rate, the very poisonous seeds of *Anisatum Religiosum*. Death from poisoning by these latter seeds is not an uncommon occurrence. They may be differentiated from the Anise seeds by being slightly smaller, entire absence of sweet Anise smell, straight stalks to the seeds and the carpel have tips more curved at the point than the true Anise. The identity of the plant *Illicium Religiosum* is fully established. Its poisonous principle, sikimin, is well known and its convulsant effects also have been recorded. It is referred to in old Chinese Medicine as Mang-t'sao (莽草).

The writer has met cases of fatal poisoning from *Illicium Religiosum*. In 1910 Mr. Wang Chiu-teh of the Taylor Memorial Hospital, Paotingfu, sent into our laboratory a packet of these seeds for examination. They had been the cause of death to a number of children. Last year Dr. Love, of North Tungchow, had four cases exactly similar, two adults and two children. Dr. Wu Lien-teh makes mention of them in this JOURNAL, vol. xxx, 178.

In 1919 an abstract in the J. A. M. A. 72, 1,651 brings to our notice similar poisoning cases in Buenos Aires reported by Dr. Tonina. Three and a half grams of these seeds administered to a cat in our laboratory produced violent convulsions and subsequent death in a few hours. Further information concerning the chemistry, see the *Pharmaceutical Journal*, 1880, vol. xl, 1,046. The morphology is well shown in the pictures given in Humphrey and White's *Pharmacographia*, London, 1904, p. 583. The statement by Fluckiger and Hanbury in their *Pharmacographia* that, "The fruits of the Japanese variety are not collected and the Chinese drug alone is in use even in Japan," is certainly not true for China. A public campaign to prevent its collection, sale and use would be of great benefit.

The best antidote for poisoning by these seeds is, after the administration of an emetic, Chloral Hydrate or Spirit of Chloroform diluted with water.

2. TA-FENG-TZU (大楓子) HYDNOCARPUS ANTHELMINTICA.
STUART, p. 200.

With the confusion experienced during the last few years in Western countries concerning the correct identity of Chaulmoogra seeds, it is not surprising that the seeds of this tree should have been listed as such. Stuart gives them incorrectly as being *Gynocardia Odorator*. Seeds purchased in Peking, Paotingfu, Tientsin, Tsinanfu and other cities in the North, also Amoy, appear to be all of the same variety as a sample of seeds kindly sent to me by Dr. Hsueh Shou-yi from Yunnanfu. These latter seeds were grown in Kwangnan, and belong to *Hydnocarpus Anthelmintica*.

When compared with those described in Dr. Muir's Handbook, also with samples of genuine Chaulmoogra seeds, and different varieties of *Hydnocarpus* seeds brought up to Peking from India and Indo-China by Dr. Thomas Cochrane, we do not hesitate to pronounce the Chinese seeds as belonging to *Hydnocarpus Anthelmintica*. It is of interest that Dr. Muir considers the esters from this oil to be of considerable value.

3. MAN-T'O-LO (曼陀羅) DATURA ALBA, DATURA STRAMONIUM.
STUART, p. 145.

The Chinese do not distinguish between this and *Datura Stramonium*. The writer considers that such is the case because the former has only been found in the North. The latter has been found growing in great abundance in all parts of Chihli on low lying ground and high up on the hills over 3,000 feet. Its colloquial name is La-pa-hua. Referred to by Meyer as Pai Pa Hsion Hua (白八仙花) and T'ai Pai La Pa Hua (太白喇叭花). The leaves from Jehol have 16.21 per cent ash and 0.149 per cent of alkaloid. 0.163 per cent alkaloid was found in leaves gathered around Peking at a height of 300 feet above sea level. The leaves show an abundance of spiral ducts and oxalate crystals. Trichomes are not as plentiful as in the home plant. The seeds yield an average of 3.48 per cent ash, 23.8 per cent of fixed oil, and 1.49 per cent of volatile oil. The writer was interested in observing the growth of this plant particularly on the ash heaps outside of the Chinese villages where there is an abundance of nitrogen food; also where this was not found, either *Hyoscyanus niger* or *Solanum nigrum*.

was to be found. Attempts to purchase Man-t'o-lo (曼陀羅) in the large cities in the North have proved fruitless. This may be because it is regarded as a very strong poison. On the other hand, it is said to be out of use except as prescribed from foreign drug stores under its foreign name. Man-t'o-lo is used in the Japanese Pharmacopœia for Stramonium. Strictly speaking, this refers in China to *Datura Alba*. However, considering the close botanical, chemical and therapeutical nature of the several daturas it might be well to accept this name in China for Stramonium.

SIZE AND WEIGHT IN TWO HUNDRED AND SIXTY-NINE CHINESE CHILDREN AND YOUNG ADULTS.

The application of scientific nutrition has become of practical importance in pediatrics. The Child Health Organization of America is making this subject one of its chief means of instructing children in "The Rules of Health."

Fortunately this problem is easily solved during the first year of a Chinese baby's life. The Chinese mother is usually able to supply her infant with the proper food—mother's milk, for its first year. No doubt it is due to this fact that the Chinese nation has its present number and physical vitality. In 1912-1914, 19.1 per cent of all babies born in New York City died before they reached the age of one year. Anyone who attends babies' clinics in New York City is impressed by the number of bottle-fed babies attending the clinics. It is a known fact that under ordinary circumstances mothers' milk varies little in quality. Therefore we have reason to believe the Chinese infant has nutritional advantage over the average foreign infant during his first year.

It is largely after the first year of a Chinese infant's life that the question of proper nutrition becomes a problem for the pediatrician. Many tables as standards for estimating a child's nutrition have been compiled. Those available for general use in the United States are:

A. For weight: Bodwich, 1877; Wood, 1910 and 1920; Retan, 1919; Emerson and Manny, 1920.

B. For Height: Bowditch, 1877 and 1879; Peckham, 1881 and 1882; Barnes 1892; Boas, 1892, 1895, 1904; Porter, 1893 and 1894; West, 1894; Macdonald, 1898; Hastings, 1900; Smedley, 1900; Baldwin, 1914.

C. For Chest: Porter, 1893; Gray, 1921.

At present The Child Health Organization of America is using the tables compiled by Thomas S. Wood, M.D. The different sources which he used included at least 250,000 of each sex, and were as follows:

(1) Statistics of American school children published by Baldwin, Boas, Bowditch, Hastings, Holt, Porter and others. (2) Statistics from 10,000 records of children in the Horace Mann School, collected during the past eighteen years. (3) Statistics of life insurance companies for periods of fifteen years and upward. (4) Dublin's statistics of children from fourteen to fifteen years of age examined in New York State for the issuance of working papers.

At present a National Committee of Pediatricians has been appointed to consider the needs for formulating a table which may be more representative of the child's physical status than any tables so far compiled.

Using Dr. Wood's tables an estimate is made of a child's nutrition by comparing the weight with the age and height of the child. A child may be regarded as undernourished when his weight is ten per cent or more below the average for his age and height. The fact that pediatricians feel the importance of a standard as assistance in estimating a child's nutrition causes one to seek for a standard which can be used by pediatricians and Child Welfare workers in China. A search of literature has revealed very few facts concerning Pediatrics in China.

With a view of comparing the physique of a Chinese child with the child of Dr. Wood's tables and with the hope of beginning a compilation of records which may be of further use, I have made records of the weight, relation to age and height of 269 children and young adults. These records consist of—

Age, to nearest, not last, birthday.

Height, to nearest quarter-inch. It would have been preferable to use the metric system, but this was not done out of regard for the persistence in pediatric work of the traditional English unit. Height was measured with the shoes off and the patient straightened up against a wall.

Weight, stripped, to the nearest pound. A balance scale being used for this purpose. All the children except twenty-seven came from the rural districts of Chihli and had therefore had the advantages of life in the country. A physical examination of each child revealed few who were suffering from disease which might have interfered with their normal development. The children examined are from one locality and of one race. The number is too small to

feel that we can use the tables as standards but these statistics are published with the hope that they may stimulate others interested in this subject to assist in the collection of data which will help us to formulate charts which can be used by pediatricians and Child Welfare workers in estimating the nutrition of the Chinese child.

Gray, H.

Jacomb, W. G.

Size and weight in One Hundred and Thirty-six Boarding School Boys.

American Journal of diseases of children, September 1921.

Smith, Charles Hendee:

How to Conduct a Nutrition Class.

Child Health Organization of America, 1919.

| | | CHINESE BOYS. | | | | | | | | | | |
|-------------------|----|---------------|----|----|----|----|----|----|----|----|----|----|
| Age in years: | | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Height in inches. | | | | | | | | | | | | |
| | 38 | 1 | | | | | | | | | | |
| | | 29 | | | | | | | | | | |
| | | | 4 | | | | | | | | | |
| | 39 | | 35 | | | | | | | | | |
| | | | | 6 | | | | | 22 | | | |
| | 40 | | | 35 | | | | | | 51 | | |
| | | | | | | | 23 | | | | | |
| | 41 | | | | | | 43 | | | | | |
| | | | | | 7 | | | 20 | | | | |
| | 42 | | | | 39 | | | 54 | | | | |
| | | | | | | 9 | | | | | | |
| | 45 | | | | | 44 | | | | | | |
| | | | | | | | | | | 7 | | |
| | 52 | | | | | | | | | 62 | | |
| | | | | | | | | | | | 4 | |
| | 53 | | | | | | | | | | 63 | |
| | | | | | | | | | | | | 1 |
| | 57 | | | | | | | | | | | 51 |

* Upper figure in each block represents number observed.
Lower figure in each block represents weight in pounds.

CHINESE GIRLS.

| Age in years: | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-------------------|---|---------|----|----|----|----|----|----|----|----|-----|-----|----|
| Height in inches. | | | | | | | | | | | | | |
| 38 | | 2 32 | | | | | | | | | | | |
| 41 | | | 9 | | | | | | | | | | |
| 42 | | | 37 | 4 | | | | | | | | | |
| 43 | | | 41 | 12 | | | | | | | | | |
| 46 | | | | 40 | 23 | | | | | | | | |
| 47 | | | | | 47 | 20 | | | | | | | |
| 51 | | | | | | 50 | | 26 | | | | | |
| 54 | | | | | | | | 62 | | 16 | | | |
| 55 | | | | | | | | | 76 | | | | |
| 56 | | | | | | | | 1 | | | | | |
| 57 | | | | | | | | 70 | | | | | |
| 58 | | | | | | | | | | | 1 | | |
| 59 | | | | | | | | | | | 89 | | |
| 60 | | | | | | | | | | | 6 | 1 | |
| 61 | | | | | | | | | | | 86 | 91 | |
| 62 | | | | | | | | | | | 1 | 9 | |
| 64 | | | | | | | 1 | 1 | | | 82 | 88 | |
| 66 | | | | | | | | | | | | 1 | 4 |
| 68 | | | | | | | | | | | 110 | 68 | |
| 70 | | | | | | | | | | | | 1 | |
| 72 | | | | | | | | | | | | 108 | |
| 74 | | | | | | | | | | | | | 1 |
| 76 | | | | | | | | | | | | | 3 |
| 78 | | | | | | | | | | | | | 67 |
| 80 | | | | | | | | | | | | | 2 |
| 82 | | | | | | | | | | | | | |
| 84 | | | | | | | | | | | | | |
| 86 | | | | | | | | | | | | | |
| 88 | | | | | | | | | | | | | |
| 90 | | | | | | | | | | | | | |
| 92 | | | | | | | | | | | | | |
| 94 | | | | | | | | | | | | | |
| 96 | | | | | | | | | | | | | |
| 98 | | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | | |

* Upper figures in each block represent number observed.
 Lower figures in each block represent weight in pounds.

Size and Weight in Children and Young Adults. 309

HEIGHT AND WEIGHT TABLE FOR BOYS (Dr. T. D. Wood).

| <i>Height Inches.</i> | <i>5 yrs.</i> | <i>6 yrs.</i> | <i>7 yrs.</i> | <i>8 yrs.</i> | <i>9 yrs.</i> | <i>10 yrs.</i> | <i>11 yrs.</i> | <i>12 yrs.</i> | <i>13 yrs.</i> | <i>14 yrs.</i> | <i>15 yrs.</i> | <i>16 yrs.</i> | <i>17 yrs.</i> | <i>18 yrs.</i> |
|---------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 39 | 35 | 36 | 37 | | | | | | | | | | | |
| 40 | 37 | 38 | 39 | | | | | | | | | | | |
| 41 | 39 | 40 | 41 | | | | | | | | | | | |
| 42 | 41 | 42 | 43 | 44 | | | | | | | | | | |
| 43 | 43 | 44 | 45 | 46 | | | | | | | | | | |
| 44 | 45 | 46 | 46 | 47 | | | | | | | | | | |
| 45 | 47 | 47 | 48 | 48 | 49 | | | | | | | | | |
| 46 | 48 | 49 | 50 | 50 | 51 | | | | | | | | | |
| 47 | | 51 | 52 | 52 | 53 | 54 | | | | | | | | |
| 48 | | 53 | 54 | 55 | 55 | 56 | 57 | | | | | | | |
| 49 | | 55 | 56 | 57 | 58 | 58 | 59 | | | | | | | |
| 50 | | | 58 | 59 | 60 | 60 | 61 | 62 | | | | | | |
| 51 | | | 60 | 61 | 62 | 63 | 64 | 65 | | | | | | |
| 52 | | | 62 | 63 | 64 | 65 | 67 | 68 | | | | | | |
| 53 | | | | 66 | 67 | 68 | 69 | 70 | 71 | | | | | |
| 54 | | | | 69 | 70 | 71 | 72 | 73 | 74 | | | | | |
| 55 | | | | | 73 | 74 | 75 | 76 | 77 | 78 | | | | |
| 56 | | | | | 77 | 78 | 79 | 80 | 81 | 82 | | | | |
| 57 | | | | | | 81 | 82 | 83 | 84 | 85 | 86 | | | |
| 58 | | | | | | 84 | 85 | 86 | 87 | 88 | 90 | 91 | | |
| 59 | | | | | | 87 | 88 | 89 | 90 | 92 | 94 | 96 | 97 | |
| 60 | | | | | | 91 | 92 | 93 | 94 | 97 | 99 | 101 | 102 | |
| 61 | | | | | | | 95 | 97 | 99 | 102 | 104 | 106 | 108 | 110 |
| 62 | | | | | | | 100 | 102 | 104 | 106 | 109 | 111 | 113 | 116 |
| 63 | | | | | | | 105 | 107 | 109 | 111 | 114 | 115 | 117 | 119 |
| 64 | | | | | | | | 113 | 115 | 117 | 118 | 119 | 120 | 122 |
| 65 | | | | | | | | | 120 | 122 | 123 | 124 | 125 | 126 |
| 66 | | | | | | | | | 125 | 126 | 127 | 128 | 129 | 130 |
| 67 | | | | | | | | | 130 | 131 | 132 | 133 | 134 | 135 |
| 68 | | | | | | | | | 134 | 135 | 136 | 137 | 138 | 139 |
| 69 | | | | | | | | | 138 | 139 | 140 | 141 | 142 | 143 |
| 70 | | | | | | | | | | 142 | 144 | 145 | 146 | 147 |
| 71 | | | | | | | | | | 147 | 149 | 150 | 151 | 152 |
| 72 | | | | | | | | | | 152 | 154 | 155 | 156 | 157 |
| 73 | | | | | | | | | | 157 | 159 | 160 | 161 | 162 |
| 74 | | | | | | | | | | 162 | 164 | 165 | 166 | 167 |
| 75 | | | | | | | | | | | 169 | 170 | 171 | 172 |
| | | | | | | | | | | | 174 | 175 | 176 | 177 |

HEIGHT AND WEIGHT TABLE FOR GIRLS (Dr. T. D. Wood).

| <i>Height Inches.</i> | 5 yrs. | 6 yrs. | 7 yrs. | 8 yrs. | 9 yrs. | 10 yrs. | 11 yrs. | 12 yrs. | 13 yrs. | 14 yrs. | 15 yrs. | 16 yrs. | 17 yrs. | 18 yrs. |
|---------------------------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 39 | 34 | 35 | 36 | | | | | | | | | | | |
| 40 | 36 | 37 | 38 | | | | | | | | | | | |
| 41 | 38 | 39 | 40 | | | | | | | | | | | |
| 42 | 40 | 41 | 42 | 43 | | | | | | | | | | |
| 43 | 42 | 42 | 43 | 44 | | | | | | | | | | |
| 44 | 44 | 45 | 45 | 46 | | | | | | | | | | |
| 45 | 46 | 47 | 47 | 48 | 49 | | | | | | | | | |
| 46 | 48 | 48 | 49 | 50 | 51 | | | | | | | | | |
| 47 | | 49 | 50 | 51 | 52 | 53 | | | | | | | | |
| 48 | | 51 | 52 | 53 | 54 | 55 | 56 | | | | | | | |
| 49 | | 53 | 54 | 55 | 56 | 57 | 58 | | | | | | | |
| 50 | | | 56 | 57 | 58 | 59 | 60 | 61 | | | | | | |
| 51 | | | 59 | 60 | 61 | 62 | 63 | 64 | | | | | | |
| 52 | | | 62 | 63 | 64 | 65 | 66 | 67 | | | | | | |
| 53 | | | | 66 | 67 | 68 | 68 | 69 | 70 | | | | | |
| 54 | | | | 68 | 69 | 70 | 71 | 72 | 73 | | | | | |
| 55 | | | | | 72 | 73 | 74 | 75 | 76 | 77 | | | | |
| 56 | | | | | 76 | 77 | 78 | 79 | 80 | 81 | | | | |
| 57 | | | | | | 81 | 82 | 83 | 84 | 85 | 86 | | | |
| 58 | | | | | | 85 | 86 | 87 | 88 | 89 | 90 | 91 | | |
| 59 | | | | | | 89 | 90 | 91 | 93 | 94 | 95 | 96 | 98 | |
| 60 | | | | | | | 94 | 95 | 97 | 99 | 100 | 102 | 104 | 106 |
| 61 | | | | | | | 99 | 101 | 102 | 104 | 106 | 108 | 109 | 111 |
| 62 | | | | | | | 104 | 106 | 107 | 109 | 111 | 113 | 114 | 115 |
| 63 | | | | | | | 109 | 111 | 112 | 113 | 115 | 117 | 118 | 119 |
| 64 | | | | | | | | 115 | 117 | 118 | 119 | 120 | 121 | 122 |
| 65 | | | | | | | | 117 | 119 | 120 | 122 | 123 | 124 | 125 |
| 66 | | | | | | | | 119 | 121 | 122 | 124 | 126 | 127 | 128 |
| 67 | | | | | | | | | 124 | 126 | 127 | 128 | 129 | 130 |
| 68 | | | | | | | | | 126 | 128 | 130 | 132 | 133 | 134 |
| 69 | | | | | | | | | 129 | 131 | 133 | 135 | 136 | 137 |
| 70 | | | | | | | | | | 134 | 136 | 138 | 139 | 140 |
| 71 | | | | | | | | | | 138 | 140 | 142 | 143 | 144 |
| 72 | | | | | | | | | | | 145 | 147 | 148 | 149 |

**STUDIES ON THE EFFECT OF THE SURFACE TENSION
OF THE CULTURE MEDIUM ON THE BACILLUS
TUBERCULOSIS.**

—

P. Y. CHANG, M.A., M.D., Bacteriological Laboratory, University of Minnesota.

The study of methods of cultivation on artificial media of the tubercle bacillus has been a subject of great interest for many years. It was not until the discovery of glycerine media that an accurate study was available. In spite of the fact, there is still a great deal yet to be done in this field, especially on the cause of their characteristic growth on ordinary glycerine media with regard to the physical properties of the media. The work reported in this paper being a continuation of the work conducted by Doctor Larson on his study of the surface tension of the culture media on the growth of bacteria. In his work he found that the surface tension of ordinary liquid media could be reduced by addition of certain soap solutions. With the lowering of the surface tension he was able to change the usual characters of the growth of pellicle bearing organisms, thus bacillus subtilis and bacillus tuberculosis grow down in the body of the media.

The cause of the pellicle formation of such organisms as tubercle bacillus was considered as their vital demand for oxygen. This theory can safely be ruled out inasmuch as tubercle bacilli could grow and grew even better in media or at the bottom of the media when the surface tension is lowered. A more striking fact to disprove our oxygen demand theory is that a lowering of surface tension of the media does not create an increase of oxygen absorption of the media. Green has shown that the ability of a solvent to absorb gases is not directly related to surface tension, the vapour pressure or specific gravity of the solvent. A study of the following table will convince us that the surface tension of aqueous solutions and the amount of oxygen absorbed by 5 mls of such solutions caused no variation. The tensions range from 32.0 to 55.0 dynes and the amount of oxygen absorbed is constant. This constant as will be seen to be the same as that for distilled water alone.

| Solution. | Surface Tension. | CCO ₂ absorbed. |
|-------------------------------|------------------|----------------------------|
| Water | 72.5 | .34 |
| Broth | 55 | .34 |
| Peptone | 54 | .34 |
| One per cent Dextrine | 52 | .34 |
| Broth and Soap | 40 | .34 |
| Water and Soap | 32 | .34 |

Distilled water with a tension of 72.5 dynes absorbs just as much oxygen as a solution of distilled water and soap, which has a surface tension of only thirty-two dynes. Therefore the absorption ability of a solvent is not a function of its surface tension. Skirron found that there was no direct relation between the vapour pressure of the mixture and the ability of the mixture to absorb gases. There is likewise no relation between the specific gravity of a substance and its ability to absorb gases as shown in the following table.

| | Sp. Grav. | |
|----------------------|-----------|--------|
| Water | 1 | .02192 |
| Chloroform | 1.4878 | .207 |
| Alcohol | .7906 | .2044 |

Thus we see there is no direct relation between the physical properties of a solvent and its capacity for taking up oxygen. This has afforded us an evident proof that the formation of pellicle is not determined by the need of oxygen, hence organisms grow better in media of low surface tension where the supply of oxygen is constant. In this connection, we should not overlook the fact that at the upper portion of the media there is a selective zone in which the bacteria grow best and has the most tendency to grow. As we see the pellicle forming organisms grow in this zone and not below until they fall by the weight of their growth. On the other hand, those organisms that grow in the media first show signs of development in this zone, i.e., the zone near or at the surface. From this we deduct that there must be certain effects of this zone which favor or are even necessary for the metabolism of bacteria. The reduction of the surface energy is explained here as the probable reason. This is naturally accomplished either by the reduction of surface area of liquid or by reducing surface tension, or both.

The surface tension of the liquid is reduced to the lowest point possible through the concentration of the surface tension depressants at the surface of the liquid. Pellicle bearing organisms probably select this zone because the surface tension reducing substances concentrated there are required for their metabolism. The pellicle formation is probably a mere coincidence, the surface tension of the fluid being sufficient to support the weight of the organisms just as bodies may be supported on the surface of water due to its high surface tension. The possibility that the lipoids of the cell in ordinary broth, prevent the wetting of the cell and the tension holds the cell up. When the soap is added to the broth the lipoids, being miscible in soap, no longer prevent the wetting of the cell and the water gets on to the cell, and the cell sinks, thus producing a diffuse growth in the medium or at the bottom as

sediment without pellicle production. This fact holds true with tubercle bacilli. The tubercle bacillus has a cell membrane which confers upon it its resistance against wetting, hence also against the entrance of the stains. This membrane contains most of the waxy substances which can be extracted from cultures. Further, this wetting phenomena of cell membranes can also be demonstrated on many spore forming organisms. As it is well understood that in order to bring about the process of sporulation there must be present some unfavorable conditions in which the given organism is grown. Among those the principal one is lack of nutrition. We assume that when the cell membranes are properly wetted they can take up nutrition more readily. Thus we have observed that spore forming organisms lose the property of forming spores when growing in soap broth. Here the loss of spores in low tension may be explained on the ground of proper wetting since the organisms grow. On the other hand, in high surface tension media there is little or insufficient wetting, and because of poor nutritive conditions, spores develop.

When bacteria are grown on liquid media such as broth with a surface tension of fifty-nine dynes the surface tension rises with the growth curve of the organisms until it reaches sixty-eight or sixty-nine dynes depending upon the organism concerned. This observation is important in connection with spore-formation. If spore-formation is a function of wetting, it may then readily be understood why spore-formation begins only after the surface tension of the media has risen. The accepted views concerning spore-formation are that this phenomenon occurs as a result of exhaustion of the nutritive elements of the media to the extent where it will no longer support growth. If this were true we would not expect other organisms to grow on the filtrate of a spore culture. Experiment, however, shows that such filtrates usually prove to be excellent culture media for other bacteria, and therefore it cannot be a question of media exhaustion. In fact, the same organism will grow on such filtrate if its surface tension is again reduced by adding the requisite quantity of soap. This latter experiment disposes of the arguments of those who argue that spore-formation is the result of "toxins" being formed in the media which inhibit growth and leads to spore-formation. Glycerine, besides acting as a food to tubercle bacilli also probably serves as a wetting agent to the cell membrane so as to enhance the organism to consume more readily nutritive material from the media. Thus we see that the question of the degree of wetting of the cell membrane is one of prime importance.

A detailed investigation has been made on the action of various forms of soaps in culture media for growing tubercle bacilli. We have found that ordinary laboratory broth containing beef extract and peptone has a usual surface tension of fifty-nine dynes per c.m. contrasting with that of ordinary distilled water which has a surface tension of seventy-two dynes. Thus we see that the effect of peptone and the beef extract besides acting as a nutrient food to the bacteria also lowers the surface tension of the broth. Larson found that sodium oleate would prevent the growth of certain organisms and at the same time favoring the growth of the bacillus influenza. He explained the function of sodium oleate as an important surface tension phenomena. This could be proved immediately by the luxuriant growth of well formed colonies. Since the bacillus influenza survives and grows better and more rapidly in the absence of hæmoglobin it is self-evident that surface tension is the factor concerned since sodium oleate tends to lower the surface tension of the medium.

Thjotta and Avery were able to grow the bacillus influenza on a blood free media containing the mucoid material from cultures of Friedlander's bacillus and other closely allied organisms. The growth accessory substance or substances which can replace blood and blood derivatives in cultivation of Pfeiffer's bacillus, Thjotta found in both the saline suspension and watery extracts of the heat killed material. They were also able to grow in media containing extracts of yeast cells, green peas and other vegetables. They were not in a position to explain the exact nature of the growth accessory substances, other than presuming that they are substances analogous to vitamins. The above materials probably are merely surface tension depressants. Mucoid substances and extracts of vegetable matters are, no doubt, surface tension depressants. The opposite view to our surface depressant theory seems to hold true with a number of organisms. Many non-pellicle forming organisms attempt to form pellicle or have more abundant growth on the surface in film when the tension of the media is elevated as by charcoal. These characteristics are more or less constant, that is, when they are grown in high surface tension media for then they sometimes attempt to retain this character.

Still another interesting point brought to our attention is that the potassium salt, especially the saturated soap, viz., the stearate has a specific action on the cell membrane of the tubercle bacillus so that despite the high tension of the medium the organisms still grow throughout the medium. This specific action of the potassium soap could probably be explained by our theory of the miscibility

of the fatty material contained in the cell membrane with soap. As a matter of fact, the cell membrane contains a much higher percentage of potassium in their composition although they grow in a medium which contains more sodium and magnesium. This can easily be brought to view by extracting any cell when we would find that potassium is present in much larger quantities than is sodium.

In considering the various salts utilized by bacteria it is interesting to know that, while sodium seems to be necessary for the growth of nearly all bacteria, in fact, as a rule, it cannot be replaced by the potassium salts, yet upon analysis of the salt contained in bacteria it has been found that sodium salts are not stored up as are the potassium salts. Sodium salts are therefore probably utilized by the cell as a means of maintaining the osmotic pressure and the proper turgor of the cell. It is a common view that cells in general have a selective action for the various salts in that they allow one salt to pass while preventing passage of other salts. The work of Dornan, however, seems to explain this selective action of salts on a purely physical basis. In growing bacteria in potassium soaps as referred to above, attention is called to the fact that, in doing this it becomes necessary to make a medium free from sodium salts since if sodium were present in any form in the medium it would replace the potassium and we would have sodium soap formed immediately. Whether potassium soap in the absence of any sodium ion is capable of effecting a more perfect wetting of the bacterial cell than is the sodium soap must be set aside for future investigation. If we accept the theory that wetting is a direct function of the surface tension of the media our observations on the effect of potassium soap on the tubercle bacillus will seem to contradict Larson's view that the pellicle forming bacteria grow throughout the medium as the result of depressing the surface tension.

The object of this work was to develop a method which will enable one to make use of the agglutination test in the diagnosis of tuberculosis. Efforts have been made by many investigators in the past to apply the agglutination test to the diagnosis of tuberculosis. All of these efforts have been unsuccessful owing to the fact that the tubercle bacillus when grown in the laboratory grows in adherent masses from which it seems almost impossible to prepare the homogeneous suspension necessary to carry out the test. The earlier investigators attempted to grow the organism on glycerine broth and by shaking the culture daily hoped to cause the organism to grow evenly throughout the medium, but in no instance were these efforts crowned with success. Besredka reports the prepara-

tion of media by treating egg with sodium hydroxide. The peculiarity of this medium lay in the fact that the tubercle bacillus would grow at the bottom of the culture medium rather than on the surface, as is ordinarily the case. Besredka apparently did not realize that by treating the egg, which contains a great deal of fat, with sodium hydroxide he made a sodium soap and that sodium soap thus prepared serves to lower the surface tension of the culture media which caused the tubercle bacillus to grow in the novel manner which he describes.

The French investigators report that antigen prepared from such media serves well in performing the complement fixation test for tuberculosis. Other investigators, however, have failed to substantiate the work of Besredka and his associates and it is therefore probable that these investigators were over enthusiastic concerning the value of the work.

In reviewing the literature of complement fixation we cannot but be impressed by the fact that the complement fixation method does not lend itself to the diagnosis of tuberculosis. From the literature it is evident that most of the investigators' difficulty lay in the peculiarity of the tubercular antigen since each investigator reports some modification of antigens previously used. In carrying out complement fixation tests on a large number of cases in this laboratory with various antigens it was found that complement fixation is rarely complete with human blood but that excellent fixations may be obtained experimentally by immunizing or infecting laboratory animals with the tubercle bacillus. The conclusion, therefore, must be that the chief difficulty does not lie with the antigen but rather with serum, since, if the antigen were incapable of fixing complement in the presence of antibody it would not be possible to get such excellent reactions experimentally. We therefore are of the opinion that the human individual is incapable of liberating complement fixing antibodies in contrast to laboratory animals which do so very readily. This being the case it seems hopeless to go further in our efforts to develop the complement fixation reaction for use in the diagnosis of tuberculosis. Our attention was therefore turned to the agglutination test.

The agglutination test is more simple in its technique. It is perhaps more specific in character than the complement fixation test and therefore we believe the agglutination test should be used in preference to the fixation test wherever possible. As already pointed out in this paper, we found that by growing the tubercle bacillus in a medium of proper surface tension we were able to get a diffuse growth with which there was every reason to hope that it would

serve as an antigen in carrying out agglutination experiments. In testing out a large number both of known positive and known negative tuberculosis we found that the agglutination test worked very satisfactorily, using an antigen grown on a low tension medium, the test being apparently specific giving complete precipitation with positive serum and no reaction with known negative serums. The greatest weakness of this method lies in the fact that on low surface tension medium the tubercle bacillus grows slowly, some strains requiring several weeks to develop sufficiently to be used in this work.

Our attention was turned from this to another method which was developed in this laboratory some years ago by Larson and associates. It was the method of emulsifying and disrupting bacteria by treating them with carbon dioxide under high pressure. The tubercle suspension was placed in the apparatus under high pressure. After subjecting the organism to carbon dioxide for some hours it is forced from the pressure chamber through a very fine opening into a second chamber connected with atmospheric pressure. As the bacillary suspension is forced through this capillary opening into the chamber of atmospheric pressure the bacteria are emulsified and partially disrupted resulting in a homogeneous suspension which lends itself admirably as an antigen for the agglutination reaction. The importance of any test which will aid us in the early recognition of tuberculosis cannot be overemphasized. While tuberculosis is easily recognized in its more advanced stages, in its incipient form its recognition challenges the ingenuity of the most able medical men. When the disease is so far advanced that its presence is obvious, even with the most careful work it is often so far advanced that only prolonged treatment will restore the patient to health. Such men as Pottenger and other equally well informed in the field of tuberculosis state that if tuberculosis is recognized early cures can be effected in practically all cases. Since agglutinating antibodies are apparently found in the blood stream wherever we have an active infection, it would seem, therefore, that the agglutination test would supply a method of aiding in the early recognition of the disease. Our work, which covers the examination of more than five hundred cases, seems to justify the above statement. The technique in carrying out the agglutination test is as follows.

Tubercle bacilli may be grown on a low surface tension medium; when the growth of the organism has been completed the culture is centrifuged in order to remove the bacteria from the solution containing soap. The sediment is suspended in salt solution, killed by heat, placed in a series of small tubes such as are used in carrying

out the Wassermann test and graduated amounts of the serum in question added to each tube. We have worked with dilutions of serums varying from 1 to 20 to 1 to 3000. The material is then placed in the incubator at 37° for two hours, after which it is transferred to the icebox and left overnight. After the two hours incubation the serum will usually show beginning agglutination which is complete upon standing a few hours in the ice box. The negative serum, on the other hand, produces no change in the bacillary suspension. The reactions are so sharp as to leave little or no room for error in reading the results. In using the antigen prepared by the treatment with carbon dioxide as described above, the technique is similar to the one just described. The reactions are equally good, and therefore after trying out both methods we favored the latter method, since the antigen is so much more easily prepared and the test can be carried out on a large scale without difficulty. Results of the agglutination test on five hundred cases is given in the table which follows.

While working with the tests bearing on the diagnosis of tuberculosis we were also interested in the effect of low surface tension medium on the pathogenicity of the tubercle bacillus. It is a matter of common observation that tubercle bacilli, even when killed, cause necrosis of tissues when injected subcutaneously into the tissue structures. In an effort to immunize guinea pigs with the antigen treated by the carbon dioxide method we were struck by the fact that no necrosis was obtained following the injection of such material. Even though antigen was prepared from virulent strains only a temporary enlargement of the regional lymph glands was noted. This enlargement subsided in the course of some days after which the animal presented no changes as a result of experimental inoculation. Protective experiments are now in progress in an effort to determine to what degree this antigen immunizes guinea pigs. Parallel with this work other series of animals were injected with virulent cultures grown on medium of low surface tension. A series of six animals were injected with what were supposed to be virulent cultures but in no instance did these injections result in the development of tuberculosis. While this work is not sufficiently far advanced to express a final opinion, nevertheless it appears that growing the tubercle bacillus on a low surface tension medium robs it of its pathogenicity. The medium on which the latter antigen was grown was as follows:

Saturated.

Potassium Palmitate.
Potassium Stearate.
Sodium Palmitate.
Sodium Stearate.

Unsaturated.

Potassium Oleate.
Potassium Rescinoleate.
Sodium Oleate.
Sodium Rescinoleate.
Castor Oil Soap.

After trying out various soaps of fatty acid we have been able to confirm Larson's observation that sodium rescinoleate is the most desirable, although not in every respect ideal, as a surface tension depressant. The latter soap is a perfectly clear aqueous solution but does not hydrolyze as readily as other soaps and for that reason has been used extensively in our experiments. Another point which I believe has not been observed heretofore is the fact that soaps of the saturated fatty acids do not depress surface tension of water more than is done by any colloid, namely, to a point of about fifty-nine dynes. Whereas all the soaps of the unsaturated fatty acids are powerful surface tension depressants. As a matter of fact, soaps of the saturated fatty acids such as stearate and palmitate not only fail to reduce the surface tension of the ordinary broth but, on the contrary, raise its surface tension. This is due to the fact that these saturated soaps precipitate out readily in the absence of unsaturated soaps and by their surface action absorb surface tension depressants normally found in broth, thus raising the surface tension of this medium.

TABLE I. Potassium Rescinoleate in Pure Potassium Broth

| Amount of 5% Soap added | Amount of Broth | Surface Tension in dynes | 2nd Day | 3rd Day | 4th Day | 5th Day | 8th Day | 10th Day | 12th Day | 14th Day | 16th Day |
|-------------------------|-----------------|--------------------------|-------------------|-------------------|-------------------|-------------------|------------------|----------------|------------------|----------------|-------------|
| 0.2 cc. | 50 | 57.3 | Pellicular growth | Pellicular growth | More surf. growth | Pellicular growth | Drop of pellicle | | | | |
| 0.5 cc. | 50 | 54 | | Growth in med. | More growth | Pellicular growth | | | Drop of pellicle | | |
| 1 cc. | | | | .. | Same | | More growth | | More growth | | More growth |
| 1.5 cc. | 50 | 46 | | | | Growth in med. | Growth in med. | | " | | " |
| 2 cc. | 50 | 45 | | | | " | " | | " | | " |
| 2.5 cc. | 50 | 42.5 | | | | | | Growth in med. | " | | " |
| 3 cc. | 50 | 42 | | | | | | " | " | | " |
| 3.5 cc. | 50 | 40 | | | | | | | | Growth in med. | " |

TABLE II. Sodium Rescinoleate Soap in Pure Sodium Chloride Broth

| Amount of 5% Soap added | Amount of Broth | Surface Tension in dynes | 2nd Day | 3rd Day | 4th Day | 5th Day | 8th Day | 10th Day | 12th Day | 14th Day | 16th Day |
|-------------------------|-----------------|--------------------------|------------------------|---------|-----------------|---------|---------|----------|----------|-----------------|-------------|
| 0.2 cc. | 50 | 52.2 | Slight growth in media | | Growth | Growth | Growth | " | " | Growth in lumps | More growth |
| 0.5 cc. | 50 | 50 | " | " | " | " | in | " | " | in | " |
| 1 cc. | 50 | 44 | | | Growth in media | " | media | " | " | media | " |
| 1.5 cc. | 50 | 40 | | | | " | " | " | " | | " |
| 2 cc. | 50 | 38.5 | | | | " | " | " | " | | " |
| 2.5 cc. | 50 | 38 | | | | " | " | " | " | | " |
| 3 cc. | 50 | 37.4 | | | | " | " | " | " | | " |
| 3.5 cc. | 50 | 36.5 | | | | " | " | " | " | | " |

TABLE III. Potassium Oleate Soap in Pure Potassium Chloride Broth

| Amount of 2% Soap Added | Amount of Broth | Surface Tension in dynes | 3rd Day | 5th Day | 7th Day | 10th Day | 12th Day | 14th Day | 16th Day |
|-------------------------|-----------------|--------------------------|---------------|----------------------|-----------------|-----------------|-------------|-------------|----------------------|
| 0.2 cc. | 50 | 49 | Slight growth | Growth more in media | Growth in media | Growth in media | No pellicle | No pellicle | More growth in media |
| 0.5 cc. | 50 | 42 | | " | " | " | | | " |
| 1 cc. | 50 | 37 | | " | " | " | | | " |
| 1.5 cc. | 50 | 35.5 | | " | " | " | | | " |
| 2 cc. | 50 | 35 | | " | " | " | | | " |
| 2.5 cc. | 50 | 34.5 | | " | " | " | | | " |
| 3 cc. | 50 | 34 | | | | " | | | " |
| 3.5 cc. | 50 | 33 | | | | " | | | " |

TABLE IV. Sodium Oleate Soap in Pure Sodium Chloride Broth

| Amount of 2% Soap Added | Amount of Broth | Surface Tension in dynes | 3rd Day | 5th Day | 6th Day | 8th Day | 9th Day | 10th Day | 12th Day | 14th Day | 16th Day | 17th Day | 20th Day | 24th Day | 26th Day | 28th Day | 30th Day | 32nd Day | 34th Day |
|-------------------------|-----------------|--------------------------|-------------------------|-----------------------|----------------------|----------------------|----------------------|----------|----------------------|----------|----------|----------|---------------|---------------|------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 0.5 cc. | 50 | 60 | Pel- licle slight | Pel- licle more | Pel- licle cle | Pel- licle cle | Pel- licle cle | | | | | | | | | | | | |
| 0.75 cc. | 50 | 53 | | | | | | | Grow. in media | Grow. | Grow. | Grow. | More grow. | More grow. | No pel- licle in media | No pel- licle cle | No pel- licle cle | No pel- licle cle | No pel- licle cle |
| 1 cc. | 50 | 48 | | | | | | | | | | | | | | | | | |
| 1.25 cc. | 50 | 64.5 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |
| 1.50 cc. | 50 | 45.5 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |
| 1.75 cc. | 50 | 45 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |
| 2 cc. | 50 | 44 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |
| 2.25 cc. | 50 | 42.5 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |
| 2.50 cc. | 50 | 39 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |
| 3 cc. | 50 | 38.5 | | | | | | | " | " | " | " | " | " | " | " | " | " | " |

TABLE V. Data Collected of Sodium Oleate Soap (2%) in Ordinary Broth of Seventy-two Dynes

| Amount of Soap Added | Amount of Broth | Surface Tension in dynes | 2nd Day | 3rd Day | 4th Day | 6th Day | 8th Day | 9th Day | 12th Day | 16th Day | 18th Day | 20th Day | 24th Day |
|----------------------|-----------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------|----------|--------------------|-------------|-------------|
| 0.1 cc. | 50 | 60 | Pellicle growth | | | Pellicle growth | More growth | |
| 0.5 cc. | 50 | 56 | | " | " | " | " | " | | | " | growth | |
| 0.75 cc. | 50 | 44.9 | | | | Grow. in media | Grow. in media | Grow. in media | Abund. growth | Same | Grow. in media | | More growth |
| 1 cc. | 50 | 44 | | | | | | " | " | Same | " | | |
| 1.5 cc. | 50 | 43 | | | | | | White edge | " | Same | " | | |
| 2 cc. | 50 | 43.5 | | | | | | | " | Same | Slight edge growth | | |
| 2.5 cc. | 50 | 43.3 | | | | | | | " | | Grow. in media | | |
| 2.75 cc. | 50 | 43 | | | | | | | " | | " | | |
| 3 cc. | 50 | 42.5 | | | | | | | " | | " | | |

TABLE VI. Potassium Palmitate (2%) in Pure Potassium Chloride Broth

| Amount of Soap added | Amount of Broth | Surface Tension in dynes | 3rd Day | 5th Day | 6th Day | 7th Day | 9th Day | 12th Day | 15th Day | 17th Day | 19th Day | 22nd Day | 30th Day |
|----------------------|-----------------|--------------------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0.2 cc. | 50 | 70.5 | Turbid growth | Pellicle growth |
| 0.5 cc. | 50 | 64 | " | " | " | " | " | " | " | " | " | " | " |
| 1 cc. | 50 | 62 | " | " | " | " | " | " | " | " | " | " | " |
| 1.5 cc. | 50 | 60 | " | " | " | " | " | " | " | " | " | " | " |
| 2 cc. | 50 | 58 | " | " | growth in media | growth in media | white edge | thin pellicle | " | " | " | " | " |
| 2.25 cc. | 50 | 57.5 | " | " | " | " | growth in media | growth in media | growth in media | " | " | " | " |
| 2.50 cc. | 50 | 57 | " | " | " | " | " | " | " | growth in med. | growth in med. | growth in med. | growth in med. |

TABLE VII. Sodium Palmitate (2%) in Pure Sodium Chloride Broth

| Amount of Soap added | Amount of Broth | Surface Tension in dynes | 2nd Day | 4th Day | 6th Day | 7th Day | 14th Day | 15th Day | 16th Day | 18th Day | 20th Day | 22nd Day |
|----------------------|-----------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0.1 cc. | 50 cc. | 64.5 | Pellicle growth |
| 0.5 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 1 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 1.5 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 2 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 2.25 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 2.50 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 2.75 cc. | 50 cc. | 64.5 | " | " | " | " | " | " | " | " | " | " |
| 3 cc. | 50 cc. | 61.5 | | | | white edge | white turbid | edge med. | line thicker | thicker still | " | " |

TABLE VIII. Potassium Stearate (2%) in Potassium Chloride Broth

| Amount of Soap | Amount of Broth | Surface Tension in dynes | 2nd Day | 3rd Day | 4th Day | 8th Day | 10th Day | 12th Day | 14th Day | 16th Day | 20th Day | 30th Day | 40th Day |
|----------------|-----------------|--------------------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 0.2 cc. | 50 cc. | 65 | Pellicle growth | Pellicle growth | | | | | | | | | |
| 0.5 cc. | 50 cc. | 64 | " | " | | | | | | | | | |
| 1 cc. | 50 cc. | 62.8 | " | " | | | | | | | | | |
| 1.5 cc. | 50 cc. | 61 | " | " | | | | | | | | | |
| 2 cc. | 50 cc. | 60.8 | | growth in med. | growth in med. | growth in med. | growth in med. | growth in med. | growth in med. | growth in med. | growth in med. | growth in med. | growth in med. |
| 2.25 cc. | 50 cc. | 60.5 | | " | " | " | " | " | " | " | " | " | " |
| 2.50 cc. | 50 cc. | 60.4 | | " | " | " | " | " | " | " | " | " | " |
| 3 cc. | 50 cc. | 60 | | " | " | " | " | " | " | " | " | " | " |
| 3.50 cc. | 50 cc. | 59 | | " | " | " | " | " | " | " | " | " | " |

DISCUSSION.

TABLE I shows that the tubercle bacillus grows down in the medium when the surface tension has been depressed to below fifty dynes by Potassium Rescinoleate.

TABLE II summarizes the effect of Sodium Rescinoleate on the tubercle bacillus. It is seen to be about the same as when Potassium Rescinoleate was used.

TABLE III shows that the effect of Potassium Oleate was quite similar to that of the Potassium Rescinoleate.

TABLE IV shows the effect of Sodium Chloride and Sodium Oleate. Under these conditions pellicle formation ceases at forty-eight dynes.

In TABLE V is given the tabulated results obtained by growing tubercle bacilli in broth containing no Sodium Chloride. Here we observe the interesting fact that pellicle formation does not cease until the surface tension has been depressed to forty-four dynes or about six points lower than that in the sodium and potassium soaps of rescinoleate.

TABLE VI is one of the most interesting in the series in that here we have a saturated soap, Potassium Palmatate, which causes the organisms to grow throughout the medium at a tension as high as fifty-eight dynes, something which has not been observed in any of the media depressed with an unsaturated soap. Pellicle formation, however, showed itself on the fifteenth day. This is probably due to the fact that the surface tension of the medium was raised owing to the growth of the bacteria, as has been observed with other cultures. It has already been pointed out in this paper that during their growth bacteria raise the surface tension of the culture media. This is of particular interest inasmuch as this finding was only recorded in the potassium soap media and never in the sodium soaps.

In TABLE VII we have Sodium Palmatate showing that there is pellicle formation throughout from the very beginning of bacterial development indicating that sodium soap in contrast to potassium soap is not able to wet the bacteria.

TABLES VI and VII would then seem to indicate that potassium soaps exert a specific influence and that, as far as bacteria are concerned, we are not ready to conclude that wetting is in every respect a function of the surface tension of the media.

TABLE VIII shows the effect of Potassium Stearate. Potassium Stearate, like Potassium Palmatate, apparently wets the bacteria at a higher surface tension since pellicle formation ceased at between sixty to sixty-one days.

TABLE IX, showing the effect of Sodium Stearate soap on the pellicle formation, shows that we were not able to cause the pellicle cessation with this saturated soap.

TABLE X shows that where Sodium Rescinoleate has been used the pellicle formation ceases at about forty-eight days. This is in accord with the work of other investigators in this laboratory where they show that pellicle formation with sodium soaps usually ceased at from between forty-five to fifty days.

SUMMARY AND CONCLUSION.

Tubercle bacilli normally form pellicle when grown on liquid media. The tubercle bacillus, like other pellicle forming bacteria, will grow down in the medium when the surface tension is reduced showing that the tendency of the organism to grow on the surface of the medium is not due to the demand for oxygen but rather to the physical condition of the medium.

The potassium soaps apparently have a specific wetting effort upon the membrane since the potassium soaps cause the organisms to grow down in the medium at a much higher surface tension than do the sodium soaps.

The selective zone at or near the surface of the medium is probably more desirable for the development of bacteria in that in this zone the conditions of wetting are better and hence the possibility of the organisms to get nutritive material more readily. The castor oil soaps have been found to be the best surface tension reducing agents since they more nearly fulfill the requirements than do the other soaps, although they are by no means ideal.

By analogy with other bacteria it is believed that the tubercle bacillus raises the surface tension of the medium as the growth and development of the culture progress. The pathogenicity of our strains could be attenuated, if not completely removed, by prolonged growth in a medium of low surface tension.

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A SLIDE RULE FOR COMPUTING AND CONVERTING CHINESE DATES AND AGES.

PAUL H. STEVENSON, The Anatomical Laboratory of the Peking Union Medical College.

Among the Chinese where the importance of age is exceeded only by the inaccuracies attending its computation by the people themselves, the scientific observer is often at quite a loss to interpret correctly the more or less vague information usually forthcoming along this line from the persons under observation. Although this difficulty is one that must frequently confuse a great number of clinical observers and adversely affect their observations and statistics especially in the case of infants and children, still it becomes of even greater annoyance to those engaged in the collection of accurate anthropometric data of any kind, particularly when dealing with that part of their data bearing upon dentition, growth curves or general somatic indices among the immature.

While engaged in recent studies involving the measurement of several hundred students of various ages it was found advisable to record not only the stated age of the student but even more so where possible the month and year of his birth. Although a small proportion of the students, in spite of instructions to the contrary, and usually with disastrous results, essayed to furnish this information in terms of the foreign calendar, still the great majority were able to give accurately the information desired when allowed to do so in terms of their own native months and dynastic years. Answers such as the following were recorded in the appropriate space: "Kuang Hsu, thirty-first year, tenth month," or "the sixth month of the third year of Hsuan T'ung," or still differently, "the fourth month of the twelfth year before the Republic." Such information, as stated above, has the distinct advantage of being accurate in the great majority of cases. The stated age in each case acts as a check against error in the year while the Chinese month given could be accepted as correct in practically one hundred per cent of the cases.

For the conversion of this data into terms of the foreign calendar where that was desired or, as was more often the case, for the direct computation from this data of the exact age of the student, several different methods were tried. As a result of several experiments a very simple and rapid method was worked out. Subsequent experience has so proven the value of this method both in

the matter of time saved and in the greater accuracy of results obtained that a brief report of it is herewith given in the hope that it may prove helpful to others likewise confronted with the tedious task of dealing with Chinese dates and ages.

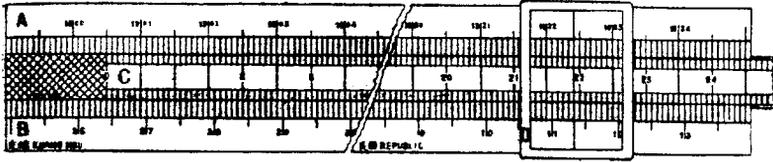
Description.

The method utilizes the familiar principle of the common slide rule. Upon the upper scale "A" are marked off the foreign calendar years, each year appropriately divided into its twelve months. The entire length of this scale corresponds to such a span of years as will conveniently include the span of life of the majority of students or subjects observed. On the lower scale "B" is calibrated in a similar way the Chinese calendar, making the year lengths equal to those of the foreign calendar (a purely arbitrary accommodation for the sake of convenience) and taking care that the scale is so adjusted that the beginning of each Chinese year corresponds to the second month of the foreign calendar.* On the sliding scale "C" are a series of spaces, each corresponding accurately in size to the space arbitrarily chosen as representing one year on both the upper and lower scales. The lines dividing those spaces are numbered consecutively from zero to the number of years included in the entire length of the rule. A sliding marker "D" consisting of a thin glass fastened in a light metal frame and carrying a fine vertically ruled line completes the equipment of the rule.

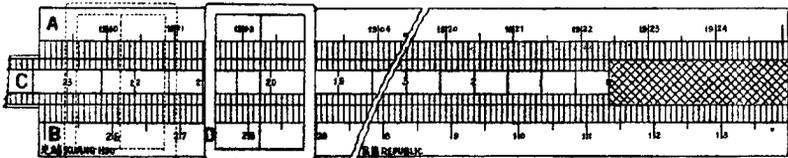
Operation.

The principle underlying the operation of the rule consists simply in subtracting in terms of years the distance between two fixed dates. This is done by locating the two dates in question on either the upper or lower scales and then reading off the intervening distance from the sliding rule. Inasmuch as the gradations of the sliding rule are arbitrarily made to correspond in size to years the result as read is already in terms of years and no further computation is needed.

* Although it would be a relatively simple matter to indicate on the scale the intercalated months in those of the Chinese years containing thirteen months and more accurately to oppose the first day of each Chinese year against its respective day in the foreign calendar, yet the adjustment suggested above has the advantage of simplicity and the error which will appear in only a very small percentages of cases is a negligible one.



Reference to the two accompanying figures which represent two slightly different though equally rapid and accurate methods of handling the rule make further explanation unnecessary. In the first instance (Fig. 1) the date of birth of the person in question has been given as Kuang Hsu, twenty-sixth year, sixth month, and the zero mark in the sliding rule "C" is set at this date. The line on the sliding marker "D" is then set at the date upon which the examination is made, in this case the first day of June, 1922, and the age of the person, in this case twenty-one years and eleven months, is immediately read off the sliding rule "C" beneath the line on the sliding marker "D". When using the rule in this way for the examination of a large number of persons at the same time the marker "D" remains stationary (on the date upon which the examination is taking place, of course) while the sliding scale "C" is moved back and forth in order to bring the zero mark to the appropriate position corresponding to the date of birth of the person in question.



In the second instance (Fig. 2) the sliding rule "C" has been reversed and the zero mark placed opposite the date in the foreign calendar corresponding to the date of examination. This position of the sliding rule "C" is maintained where several people are examined on the same date, while the sliding marker "D" is moved to the opposite end of the rule sliding back and forth with each person examined, stopping over the month and year of birth in each case and allowing the respective age to be quickly read off the sliding scale "C" under the line on the marker "D". Thus two students are indicated in Fig. 2 as appearing for examination on the first day of June, 1922 (v. zero mark on "C"). One gives as the day of his birth the first day of the third month of Kuang Hsu's twenty-eighth year. The marker "D" when moved to the proper place to correspond to this date shows at once that this student is twenty

years and two months old. The second student reports a date of birth falling in the second month of Kuang Hsu's twenty-sixth year, and the marker when moved back to a corresponding position shows immediately that he is in the twenty-second year old class.

It will be noticed in passing that those lines on sliding rule "C" drawn midway between each year are slightly more conspicuous than those passing immediately through each year. This is in accordance with the usual practice in gathering anthropometric data of considering the sixth months immediately previous and the sixth months immediately following the year in question as a class entity. According to this practice two persons, one of whom is nineteen years and nine months and the other twenty years and two months both belong to the twenty year class period. The above-mentioned ruling on sliding rule "C" is an aid in the rapid classification of such ages in their proper groups.

When used to convert Chinese years and dates into terms of the Julian calendar and vice versa, the sliding marker "D" is set on the date to be converted and the corresponding date as indicated by the vertical line on the marker is read off the opposite scale. For example, the fifth month of the eleventh year of the Chinese Republic corresponds to the sixth month, or June, of 1922 (v. marker "D", Fig. 1). Again, the year 1902 corresponds to Kuang Hsu's twenty-eighth year, and by the same method it is quickly seen that Kuang Hsu's twenty-sixth year corresponds to the year 1900 (v. marker "D", Fig. 2).

NOTES FROM THE FIELD.

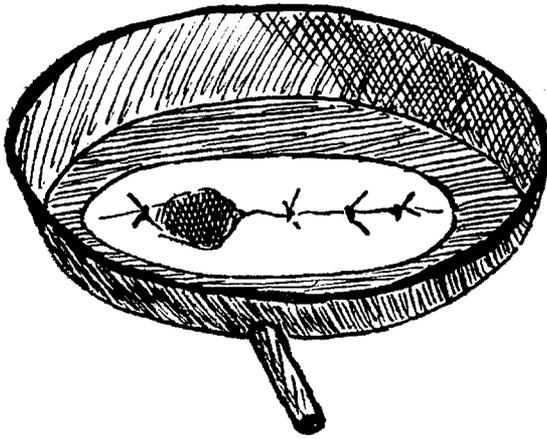
GEORGE H. PEARSON, M.B.

I am enclosing with this, small drawings of an apparatus which I recently had made by the local worker in kerosene tins or sheet iron. It is so simple and useful that I should like to pass it on.

I first saw this idea used in the wards of Mr. Biekersteth of the Liverpool Royal Infirmary where it was known as "Mr. Biekersteth's Shrimp-pot."

It is for use after suprapubic incision of the bladder when drainage alone is desired, as after prostatectomy or removal of a calculus.

It consists, essentially, of a small flattened basin, with a large hole in its floor and a drainage tube leading away to one side. A convenient size is about six inches long by $3\frac{1}{2}$ broad and say,

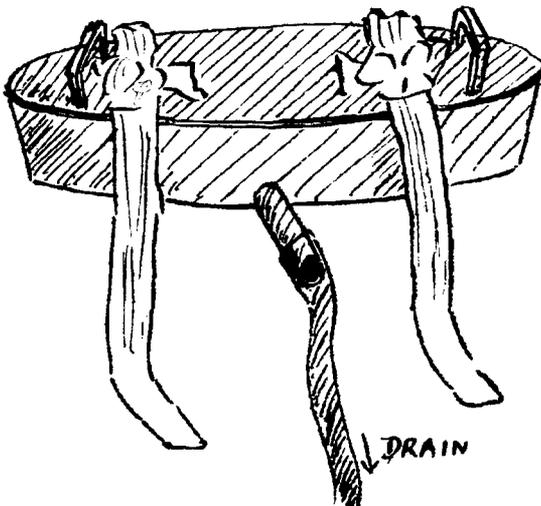


THE SHRIMP POT

VIEWED FROM ABOVE AND SHOWING SUPRA
PUBIC WOUND IN POSITION. LID HAS
BEEN REMOVED TO SHOW WOUND.

THE SHRIMP POT

IN POSITION ON PATIENT.



1¼ inches in height. It is covered by a removable lid which fits into place. The floor is made of one piece of metal, in the centre of which is a long elliptical cavity, which is to be placed over the patient's wound. Care should be taken to have the surrounding rim made perfectly flat otherwise it may be uncomfortable.

When placed in position, the whole apparatus can be retained in position by a couple of bandages tied round the patient. No dressings are required. All urine or discharge issuing from the wound immediately passes off into a receptacle at the side of the bed.

My shrimp-pot cost me 260 cash. It has already saved pounds of dressings.

The whole thing is easily sterilized by boiling once daily between dressings and keeps perfectly fresh.

Mrs. Pan, aged thirty-seven, two months before coming to our hospital, had a fall while trying to protect her house from soldiers' looting. At the time, she was about nine months pregnant, and had already borne nine children, including a pair of twins.

Shortly after the fall, labor commenced but no child was born. After some time bits of the flesh of the child began to come away piece by piece. Mrs. Pan became very weak, and it was finally decided that she should be brought more than the two days' journey by chair to the foreign hospital. The patient's condition on arrival was very poor, Temp. 99, Pulse 100, Resp. 26 but, wisely or not, we thought best not to delay in cleaning out the uterus. She was prepared as quickly as possible, and anæsthetized by chloroform followed by ether.

Through the abdominal wall, the uterus felt very firm and hard extending as high up as the umbilicus. Fluid, very like fæces, oozed out from the vagina, and inside the vagina were bits of human debris—and a couple of good sized round worms. Careful feeling to see if there were a recto-vaginal fistula showed that there was none.

The cervix was only slightly dilated, so that it took a few minutes of manual dilatation before a hand could be put into the uterus. A firm mass was to be felt on pressing down against the cervix. Nearest the cervix, were one femur, the vertebral column, ribs, both humerus, and decaying flesh still attached to the vertebrae. Pressing hard down against the mass were the bones of the skull. Each bone came away by itself. With one, care had to be taken in extraction as it had buried its sharp edges in the lower anterior wall of the uterus. On feeling along all the wall of the uterus—

which remained distended, with firm, thick, non-contracting walls, one peculiarity was discovered. In the posterior wall about in the mid-line, perhaps two inches above the internal os, was a hole large enough to admit the finger. Apparently, it was through this hole that faeces and worms had been passing.

We did all we could for the woman with stimulants and saline, but, although she rallied, was quite conscious, comfortable and even hungry, she died about ten hours after delivery.

WOMEN'S WORK AND THE GENERAL HOSPITAL.

By J. PRESTON MAXWELL, Peking.

INTRODUCTION.

Medical Missions have passed through the pioneer period and the problems now facing us are not those of pre-Boxer days.

In those days even the medical side of missionary work was on its defence and many and varied were the tales which were scattered about from time to time. Hearts, livers and eyes were supposed to be extracted for the preparation of foreign medicine, and a death in hospital in many places meant the emptying of the hospital for the time being.

Old customs bound us, and we had to walk warily in order to convince the people that we were not there for our own sake but for theirs.

To-day whether we will it or no, everything is in the melting pot and we are laying the foundations of the model hospital of the future in China. No one else can do it, and in such a matter as that of women's work we need to be sure that we, the leaders, are on sound lines and have a real constructive policy to follow. Is the women's hospital of the future to be a separate one, and if so how is it to be staffed? Is the true policy to be that of general hospitals, and if so how are the Profession and the Public to be educated so that the conventions, laws and moral restraints needed for such an enterprise shall be upheld and become the custom of the land? Guidance is needed and it is our duty as Christian leaders to point the way.

THE PROBLEM.

Put in another way, the issue is: How best can we provide for the care of women and children in hospital work and for the future of family practice in China?

Before we can answer or begin to answer this question one must answer two others:—

(a) What is the present position of women in China in relation to men?

(b) What is the probability of there being an adequate supply of women doctors for women's work in China?

(a) What is the present position of women in China in relation to men?

There is no such thing as "purdah" in China. Women move freely and unveiled in public, and though the rich may shrink from publicity, they avail themselves freely and in increasing numbers of the train, the tram and the ricksha. Provided that true modesty is preserved, in the vast majority of cases there is now no difficulty in a man who has won the confidence of the people getting requisite examination of patients even in gynecological troubles, and such difficulty as there undoubtedly is amongst the ignorant and the prejudiced is daily becoming less. And this not due to the present wave amongst young Chinese women, especially of the school and student class, of intolerance against any and every form of restraint; it is rather due to the wise action of the pioneers who did not try to force things, but were willing to wait and bear until the common sense of the Chinese themselves led them to relax rules which up to that time had been more than strict, and mainly due to the low moral character of those amongst the temple priests and the people who presumed to call themselves doctors.

(b) What is the probability of there being an adequate supply of women doctors for women's work in China?

The answer is a simple one to anyone who knows China. You have little, if any, excess of women here. Female education is as yet a luxury and the marriage age is young. Moreover, if the women and children are not to depend on male doctors, China must develop a female medical service on a scale unexampled anywhere in the world.

Grant any conceivable social revolution and it is yet infinitely easier to visualize the development of a general medical profession worthy of the confidence of women and children, than to imagine the adequate meeting of the demand by an army of women practitioners.

And we have to remember that a healthy family practice is one built up from the bottom. It used to be said and it is still true in a great degree that the general practitioner must be a good obstetrician. It is the beginning of the family. Gain your patient's confidence in this and you capture, so to speak, the children, and these are the future fathers and mothers of the next generation of families. And just as

a male doctor in this way reaches the whole family, so a female doctor will do, gaining the confidence and practice of *all* its members.

When the question is stated in this way, a great deal of irrelevant discussion drops aside. Why discuss whether women in general will prefer to bring their gynecological troubles to an unknown woman doctor, or to an equally unknown male doctor? The answer may well be allowed to be self-evident. Or, whether a family practitioner, whose contact is usually made on the diseases of the children, really belongs to either category? We are not concerned with such academic discussions. We are concerned in solving the social problem of the future medical care of 200 millions of women and children—say four-fifths of the future medical practice of China. Is it seriously believed by anyone that the medical profession of China, alone among the medical professions of the world, is to be in the hands of women? If not, then we must face the problem on no narrow lines of preference, or prejudice, but on the basis of the large social factors that control the problems of supply and demand.

Therefore, the question of male versus female will never crop up in our discussion at all. We suppose throughout that we use all the medical women that we can be obtained from all the schools. But we must enquire how best to train our Profession and our Public, and build our hospitals so as to provide adequate medical service for the women and children of the land. The more forward-looking of us may see the need for training both the public and the profession by using male house-surgeons in the women's wards, as is done already in many general hospitals, and women nurses in the male wards. Most of us will merely admit the inevitability of the future, and will recognize it in our designs, and take advantage of the flexibility it gives us in meeting emergencies, so gradually following as the way is prepared for us. A few with a special call and a special vision, will justifiably ignore the larger issues, and establish specialized nursing homes for the diseases of women. Some will shut their eyes to all problems and to all need for progress. With such this chapter has nothing to do.

It will be found on consideration of the foregoing remarks that we to a great extent eliminate the sex problem. Of course in our plants and organizations sex will be recognized, and care taken for the guarding of purity and delicacy which are so necessary in a land where Christ is not the ruling influence. But China ought and should think of a doctor in terms of Christian character and professional skill rather than in terms of sex.

The nursing of women, for instance, *must* remain in the hands of women, and there is no doubt in our mind that as Western medicine becomes, as it is rapidly doing, indigenous in China, the nursing of

men also, will more and more pass into women's hands, and developments in this direction should be encouraged. One difficulty at present is the small supply of adequately trained women nurses, for it must be borne in mind that the sex problem varies *pari passu* with adequate training, the better trained the individual the less sex problem will you have.

PRACTICABILITY.

It may be urged that the foregoing is very well in theory, but that facts are against the writers. Is it really so? The present sex cleavage in our Church organizations and hospitals is artificial, arbitrary and illogical, and is not based on any religious or insurmountable prejudice of the race.

1. As we have already said Chinese women are not and never have been secluded. They move freely, unveiled in public, and though the delicately nurtured shrink from the roughness of the outer world, they appear freely in trains, trams and other public places when necessary.

2. Public opinion has gone far in advance of the foreigner, and in some cases the hands of foreign men and women have been forced against their will to grant more freedom and their opposition has been most mischievous.

We now see many girls' schools, girls' sports, girls taking part in public athletic displays, an insistent plea on the part of the Chinese for co-education, actual achievement of this in some medical colleges and in some of the government schools and universities.

We see women in Church movements, in politics and the demand of the Chinese Church for an extension of this.

3. Look at the Church herself. Anyone who has had experience of the Church life of the last 25 years cannot but marvel at the breaking down of sex barriers in the healthy sense. Where are the partitions which used to shut off the women in our Churches? One has seen them disappear, not as the result of foreign suggestion or pressure, but as the expression of Chinese views on the subject as the Chinese acquired the authority to rule. And we have women in official positions in many of the Churches, especially in the South.

4. What about the hospital? And the dire disaster which was predicted in many quarters when foreign matrons were introduced into mixed hospitals? In some parts also it was considered impossible for women doctors to take part in work in general hospitals, though there has never been any difficulty in running women's in- and out-patient departments by men in these hospitals. One of the most important

gynecological clinics for Chinese is being run by a man at the present time, and the experience of the large hospitals such as that attached to the Union Medical College, Peking, is proof that there is a growing appreciation of good medical work which is even stronger than a disinclination to come to a man doctor. The ideal staff for a service which includes gynecology and obstetrics is a mixed one of men and women rather than one by either sex alone.

Go to the government hospitals and dispensaries and what does one now find, men doctors and women nurses; women doctors and women and men nurses; that is, the professional skill is establishing its position irrespective of sex, *but* it has to be or ought to be combined with the proper female nursing facilities, especially in the case of women patients.

From what has already been said it will be abundantly manifest that we take a new view of the whole matter. Put bluntly, our view is that the problem is not what it was twenty years ago; that the whole world has advanced during that time; that the whole question of the relation of the sexes in China is rapidly changing; *whether we like it or not* the restraints of separation are disappearing and must be replaced by the development of a moral restraint, and that it is for the medical missionary body to lead in pointing the way whereby this can be developed; and it has to be remembered that a visible example of what can be done is worth a mountain of words and letters. And true moral restraint is of Christ, for it springs from purity of thought as well as action.

It is our own judgment that another twenty years will see the number of purely women's hospitals almost down to the figure which prevails in the homelands. But we are not considering the question of the position and *raison d'être* of special hospitals; our problem leads us to the consideration of the following question: Is it possible, at the present time, to construct and run a general hospital in which both men and women shall work and in which at the same time the proper social and moral customs shall be observed?

There has not been, and should not be, any difficulty about the work and relations to one another of the visiting staff. There is not the slightest difficulty in men and women, whether Chinese or foreign, working alongside one another in this capacity. The real difficulty comes in relation to the house staff and nurses. Here it is a question of common sense for the most part and careful hospital planning. And before we sketch a plan of how this can be accomplished, let us see what advantages are to be obtained from the general as opposed to the separate hospital.

1. *Professional.* It is pathetic at the present time to go into a Chinese city and find an ill-equipped general or men's hospital run by a man alone, and also an ill-equipped women's hospital run by a woman

alone. Even if working in concert, both of these medical missionaries are bearing a load which they ought not to do. Those who have worked single-handed know what we mean and what the strain of difficult cases means, and there is no doubt that from the point of view of the doctor himself, and also from that of the patient the advantages of concentration are undoubted, and that if the man and woman were working together under one roof, the strain would be less and the patient benefit because it makes consultation easier.

2. *Possibility of specialization.* It is not merely a desirable thing, it is in our minds essential, that every medical missionary should have such a general grasp of surgery, medicine and midwifery that he should be able to deal with all and every case that comes to him or to her. But this does not mean that it is not advisable that as far as may be the patient should have the benefit of a specialist. The more you scatter your medical men and women, the more impossible does it become for these medical men and women to follow the lines of their own tastes, and it is a great advantage to have the eye, ear, nose, throat, etc., treated by those who have special skill. We were asked the other day whether there was a certain class of case in a certain region. Our answer was: "These cases certainly exist, but you will not see them till they find that there is a doctor at the hospital who is skilful enough and bold enough to tackle them with success."

3. *Equipment.* There are few of our medical missionary hospitals which are equipped as we could wish. Modern hospital equipment is a complicated and expensive matter if the work which should be done is to be done, and the proper means of diagnosis are to be used. Now if you scatter your hospitals, practically speaking, you impoverish all. Take, for instance, two articles, or rather group of articles. A modern sterilizing plant for dressings and gowns and water is a costly matter, and whereas with a general hospital it can be used for all the work of the hospital, it means that if it has to be divided between two hospitals neither gets a really good plant. And X-ray apparatus, which not only needs a plant but someone who knows how to run it. In this case one hospital may get it and the other *hospital* goes without, and you may argue as you like that patients can be easily sent from the one hospital to the other for examination; in practice it does not work out as well as it looks on paper, even if one had perfect roads and a well-equipped ambulance for the really sick cases, which you are not going to have.

4. *Overhead expenses.* The cost of putting up a general hospital of adequate size may be great, but it does not commence to touch the sum needed for two separate hospitals if they are to accommodate the

same numbers which the general hospital is to take; and when one considers paths, gatehouses, adequate ground and repairs, one easily sees that the concentration is going to save considerably for the Mission Body which runs and builds the place.

5. *Evangelistic opportunity.* Although this has been mentioned last, it is not considered as unworthy of consideration. And we argue that the evangelistic opportunity is increased rather than lessened by the general hospital. You can afford a better trained and better paid staff if the resources of the separate hospitals are pooled, both as regards men and women. And the interaction of several distinctly evangelistic workers is apt to be stimulating to all and each, and the general hospital should be able to afford what the separate hospital rarely can do, namely, that one of its staff workers should get away at a time to do visiting and follow-up work amongst the patients who have gone home.

But lest one be tedious, let us look at the possibilities of co-operation. There are two types of hospital suitable for joint use; other plans being modifications of these main types. (There is a third type, much inferior to the two mentioned below, where you have men on the ground floor and women on the floor above. As a rule, women dislike this plan when compared to the one with separate wings or pavilions which the writer has found to work well in practice.)

The first one is that of the single two or three-storied building with the women on the one side, the men on the other, and the joint departments for diagnosis, such as Eye, Ear, Nose and Throat, X-ray, etc. on the lower floor in the centre, operating theatres and dressing-rooms on the middle floor in the centre, whilst the third floor gives good accommodation for the male resident staff on the one side and the female resident staff on the other, completely shut off the one from the other. You can have two entry offices and one record office. Such a building is economical to heat and light, and supply with water, because of its compactness, and provided it has been well built the overhead expenses should not be great. And in this case a single dispensary will supply the needs of both sides.

The other type is the pavilion type. Here there is no upper story, or generally not, but the result of the spreading is a greatly increased overhead expense and a much more difficult and expensive building to heat and light, as there is, of course, a greatly increased length of wiring, piping, etc.

In either case the operating theatre, sterilizing plant, electrical plant, including X-ray, is not duplicated, and this means an enormous saving in expense.

A satisfactory working staff for a medical mission hospital of say 60 beds is a minimum of three, say two men and one woman, not

necessarily all foreign, meeting in a joint council with the nursing superintendent and running the hospital as a team with their nurses and assistants. This allows for one of the senior staff being on furlough whilst two are always on duty.

But in either of these plans, although one of the team must act as hospital superintendent, it is not necessarily one of the men; the woman might equally do so; and in the ideal plan this appointment should be made by the Council of the mission or missions after consultation with the Hospital Council, which should include all the senior staff; should not go by seniority but by an evident fitness for the post, and should only be tenable for a certain term of years, so as to give others of the staff a chance for developing new plans and ideas.

In the evangelistic work in the hospital the same system may be carried out. Give one of the Hospital Council the charge of the evangelistic work and let him or her make it a speciality. Itineration work, where there are hospitals manned by one or two workers, is well-nigh impossible with the present pressure of patients, but where there is a team it becomes again possible, and medical itineration work is an able evangelistic agency and has of recent years been much neglected. Further it allows of patients far away who could really get help, being seen at or near their homes and advised to come in to the hospital.

What about the resident staff for these hospitals? The tendency is already showing itself and will increase rapidly as the years go on, to abandon the training of medical students and engage for these hospitals graduate nurses, male and female, and male and female orderlies.

What is to be the proportion of these to one another? It is at present difficult to say, as the supply is only gradually increasing, and China has of late taken such amazing steps in the space of a few years that the problem may be solved before one realizes it. When one visits the nucleus of a government medical school, and finds Chinese doctors working over male and female out-patients with the aid of Chinese female nurses, one realizes that it is only a matter of time before the female nurse will oust the male in our general wards, just as has taken place in all the lands of the West. Of course there will always be a place for well-trained male nurses, especially in certain classes of male patients.

But for this one must have the right type of female nurse, women of education, who have had a proper nursing training and who realize the privileges and the responsibilities of the position and the self-control needed in it.

And to this end these nurses must be properly housed; healthful recreation must be provided; and they must be wisely supervised and

led by one who inspires by her own skill and conduct; a like exhibition of love, gentleness and discreetness in dealing with the hospital patient who responds in the vast majority of cases most fully to such influence. This nursing superintendent should be on the Hospital Council but under no circumstances should she be asked as has been the case too often in the past, to take charge of medical work for which she is not fitted or intended.

The personnel of the male resident staff needs to be as carefully selected as the female. Their housing and recreation needs to be provided with due care to health and happiness.

In many places one may have to begin with male nurses on the male side, and female ones on the female side, but they ought all to be under a female nursing superintendent, and a wise Hospital Council, if they are in touch with the Chinese public, will soon learn when to introduce the female nurse into the male wards.

As regards the operating theatre, convenience must govern the supply. There is no reason of which the writer knows why female nurses should not be put in charge of the operating theatre.

Do let us be a little bolder in our acceptance of the trust of the people! Statistics were requested from a hospital in China involving questioning female patients about menstruation. The reply was that it was impossible, for the patients objected to be questioned and would not give details of this kind. And yet in another hospital, and a general one, only a long day's journey away and farther inland, these and more searching statistics about marriage and the consummation of marriage had been obtained without any difficulty by the exercise of a little tact, for ten years before this request was made. Why is it that this sex difficulty is more apparent in some of the older medical mission hospitals than in those of newer foundation? Is it not because in some instances, at least, it has been assumed that there is no such things as development of public opinion?

We are quite aware that some of our views will be interpreted as being hostile to women's hospitals. Not at all. There are some women's hospitals in China which will endure as long as we have hospitals at all; but we plead for a broader view of the whole subject—consideration of our resources and how we can best accomplish the work given us by the Great Physician.

Let us recapitulate our conclusions:

1. The mixed hospital is the *only* one which is going to adequately meet the needs of the women and children as well as the manhood of China.

2. In a development that is most surely coming the Christian Church should not by their practice enter a blind alley.
3. Sex problems in China have vastly altered and have made a change of policy imperative.
4. A general hospital, on whose staff men and women meet on terms of perfect quality, professional skill being the distinctive feature, facilitates staffing, minimizes trouble during furloughs, and the friction which comes from nursing superintendents being asked to function as hospital superintendents during doctors' furloughs.
5. It admits of specialization, adequate staffing and proper opportunity for Chinese women doctors as well as men doctors.
6. It makes for economy in construction, overhead expenses, provision of equipment and drugs and stores.
7. It makes possible a larger and more efficient staff for evangelistic work.

ANATOMICAL AND ANTHROPOLOGICAL ASSOCIATION OF CHINA.

At the annual meeting of the Anatomical and Anthropological Association, held on Wednesday, June 7th, Dr. Davidson Black gave an illustrated talk on "The progress of the Third Asiatic Expedition of the American Museum of Natural History during the early part of this season's work."

At the close of the discussion a business meeting was held at which the President, Secretary-Treasurer and Councillors were unanimously reelected to office. The Secretary-Treasurer, Dr. Charles Packard, presented his report and the President, Dr. Davidson Black, briefly outlined a general plan of work for the coming year whereby it is hoped the scope and interests of the Association may be enlarged. It is proposed to hold the meetings of the Association for the presentation and discussion of topics of a more strictly technical nature, as far as possible in conjunction with the following societies: The Faculty Medical Society and the Journal Club of Laboratory and Clinical Medicine of the Peking Union Medical College, and the Peking Branch of the China Medical Missionary Association. In addition it is further proposed to hold a number of open meetings of the Association during the year for the presentation of papers of more general public interest both by members and by visiting scientific men.

The following is a brief abstract of Dr. Black's address:

Through the courtesy of Mr. Roy C. Andrews, leader of the Expedition, it has been my good fortune to be the guest of the Third Asiatic Expedition of the American Museum of Natural History during the first few weeks of this season's work. I was able to accompany the Expedition as far as Urga and with Mr. Andrews's generous help to secure a considerable amount of valuable material for the Department of Anatomy of this institution.

The Expedition left Kalgan on April 21st and from the outset has been singularly successful, especially in the realm of geology and palæontology. An extensive Cretaceous deposit has been discovered, and for the first time in Eastern Asia fossil remains of Dinosaurs have been found; of these both the duck-billed herbivorous type and carnivorous forms have been identified by Dr. Granger. Eocene, Oligocene and Miocene deposits of Tertiary time have also been located and numerous fossil mammalian remains have been recovered, among which are fragments of an enormous animal closely related to, if not identical with, Foster Cooper's Baluchitherium, the largest land mammal yet known. Professor Berkey and Dr. Morris have been able to make further observations on the geology of the area thus far traversed which will be of great importance in throwing light upon the obscure questions of the continental structure of Eastern Asia. Mrs. Andrews who accompanied the Expedition to Urga in charge of the work of color photography has been successful in obtaining a large number of unique studies. Mr. Shackelford who is the motion picture historian of the Expedition has had unusual opportunities to record events of interest, and for the first time permission has been granted to photograph the great spring festival of the Mytr in Urga in all its magnificent detail. The difficulties of transport under all conditions of weather have not been few, but so far the cars under supervision of Mr. Colgate have stood up well under the severe strain of heavy loads and hard travel. The Expedition will continue its work during the summer months, and on its return in October a report on the results of the season's work by Mr. Andrews will be awaited with keen interest.

THE SACHS GEORGI TEST FOR SYPHILIS.*

H. W. Y. TAYLOR, M.B., Ch.B. (Edin.), Mukden Medical College.

HISTORY. In 1918 Sachs and Georgi published their work on the test now known by their name. They placed their first results at about one hundred per cent agreement with the Wassermann reaction. Later, testing 2,770 sera, they modified their claim to 94.4 per cent agreement. Every year since 1918 has seen an increasing number of serologists taking up this problem, some for the sake of finding out what the precipitate really is, and others in the hope that the more cumbersome Wassermann method might be superseded by a test equally reliable. Numerous simple tests are now being worked out, but none, so far, has given quite such good results as the Sachs-Georgi test.

THE TEST

Flocculation or precipitation is the result of interaction between:—

1. Alcoholic extract of heart (human, beef, pig, sheep, chicken, and others).
2. Human serum.
3. Salt solution, optimum concentration 0.85 per cent.

PREPARATION OF EXTRACT. A fresh pig's heart is cut open and freed from blood clots by washing with tap water. It is dried with a clean cloth, and the fat and connective tissue, including the large blood vessels, valves and endocardium, are removed with a scalpel, scissors, and forceps. The clean heart muscle is either minced or cut into small pieces, placed in a bottle with glass stopper, and extracted with absolute alcohol in the proportion of one gram of heart muscle to 5 mls of alcohol. A convenient amount is 80 grams of heart muscle to 400 mls of alcohol; 98 per cent alcohol or 95 per cent alcohol may be used, but we found that absolute alcohol gave more reliable results. The bottle is shaken at frequent intervals for two days, during which it is kept at room temperature in a dark cupboard. An alternative simpler method is to shake it for four hours in a shaking machine. The extract is filtered into another bottle, and placed in the refrigerator for two days. It is again filtered back into the original bottle which has been cleaned with absolute alcohol, and is now ready for use as a stock solution of lipoids. This stock solution is kept in the dark at room temperature. It should be examined in bulk every time it is used. If there is the slightest sign of precipitation of the lipoids it should be

*From the Clinical Laboratory, Department of Medicine, Peking Union Medical College, Peking, China.

filtered before use. The filtrate should then be placed in the refrigerator for twenty-four hours, and again filtered.

DILUTION OF EXTRACT

| | | | | | | |
|-------------------------------|--------------------------------|------|-----|-------|-----|------------|
| Stock solution | 1 volume | e.g. | ... | ... | ... | 1 mil. |
| Absolute alcohol | 2 volume | | .. | .. | .. | 2 mils. |
| | | | | Total | ... | 3 mils. |
| 1% Abs. Alc. Sol. Cholesterin | (0.06 mil to 1.0 mil of above) | | | | | 0.18 mil. |
| 0.85% salt solution | equal volume added rapidly | | | | | 3.18 mils. |
| | | | | Total | ... | 6.36 mils. |

ALLOW TO STAND FOR 5 MINUTES

| | | | | | |
|----------------------|-------------------|--------------------|-------|-------------|-------------|
| 0.85% salt solution, | 4 volume of above | (add less rapidly) | ... | 12.72 mils. | |
| | | | Total | ... | 19.08 mils. |

ALLOW TO STAND FOR 5-20 MINUTES

On the day of the test, a quantity of the stock solution sufficient to test all the sera is withdrawn by pipette, and transferred to a large test tube, a small Erlenmeyer flask, or, most convenient of all, a cylindrical flat-bottomed tube. This amount of stock solution is diluted with two volumes of absolute alcohol. To cholesterinize this diluted extract, 0.06 mil of a one per cent absolute alcohol solution of cholesterin is added to each mil of the total amount, as indicated in the table above. To this cholesterinized extract an equal volume of 0.85 per cent salt solution is added. It is almost unanimously agreed that this volume of salt solution should be added rapidly and the whole shaken at once, gently but thoroughly. Some workers recommend a burette for this purpose. We used a large test tube, and poured the required quantity down the inclined plane of the cylindrical tube.

On the addition of salt solution, the extract of lipoids changes from clear to opalescent, and finally to turbid. The diluted extract is allowed to stand for five minutes, and then a quantity of salt solution equal to four volumes of the cholesterinized extract is added, making a total of five volumes of salt solution. We prefer to add the four volume amount of salt solution with moderate speed, because it retains the opalescence better than when added slowly. In addition, it reduces the possibility of false, i.e., non-specific positives, to a minimum, and enables the results to be more easily read. Georgi states that the most important step in the whole technique, is the manner in which the salt solution is added. We experimented with extracts several times. Using the same extract, we added the salt solution rapidly and slowly, in different ways, and noted the flocculation results at short intervals. We believe the rapid addition of the first volume of salt solution is the most important factor.

When adding the second quantity of salt solution, note how the opalescence returns, and try to retain it by shaking gently. Vigorous shaking makes it disappear. The opalescence tends to disappear after the diluted extract has stood for a few hours. No matter how the salt solution is added, a flocculent precipitate almost invariably comes down within forty-eight hours.

When print is just visible through the opalescent extract, the results within 24 hours are usually good. When print is too easily seen, the flocculation reaction does not seem to occur so rapidly, and reactions are weaker, taking longer than 24 hours to give the full quota of 4 plus results. When print is not seen at all, then the + plus results are usually excellent within 24 hours. The lower grade plus results, however, are not so easily read, because the flocculi in the denser medium are not distinctly seen. We attempted to shorten the period of incubation by adding the salt solution to the stock extract slowly, drop by drop. We gave it up on account of the turbidity of the negatives. Some workers prefer this method. Our main objection to it is that it does away with the possibility of reading one and two plus results quickly.

After the diluted, cholesterinized, salinized extract has stood for 5-20 minutes, it is ready to be added to the test tubes containing the serum and the saline.

PREPARATION OF MATERIALS USED IN THE TEST

If four tubes are used for each serum, then 19.08 mls of diluted extract is enough for ten sera and the controls. It is advisable to have two different extracts prepared as above. One acts as a control to the other. After a few months, one may begin to lose its power to react. A new extract must then be prepared.

The hearts of five pigs and one sheep were extracted with absolute alcohol and tested in a series of 700 sera. These extracts all proved reliable, although not equally so. The most reliable extract was one of pig heart. With it was ascertained the optimum amount of one per cent absolute alcohol solution of cholesterin required to give the best flocculation results. This extract was used in all of the 700 test, and invariably gave results slightly better than the others.

The greater the amount of stock solution used, the smaller the margin of error when adding the cholesterin. One should not begin with a quantity of stock solution less than one mil.

CHOLESTERIN is not easily dissolved in absolute alcohol unless it is first thoroughly ground up in a mortar. One gram of cholesterin is added to 100 mls absolute alcohol and kept in a glass stoppered bottle.

SALT SOLUTION. 0.85 per cent is the optimum concentration at which flocculation takes place. It should be prepared from good quality sodium chloride, and recently distilled water. It must be filtered and sterilized, and should not be more than a few days old.

SERUM. Ten to fifteen cubic centimeters of blood are received from the patient into a sterilized test tube, and either put in a refrigerator for half an hour or left at room temperature for 2-3 hours, until the serum has separated from the blood clot. Blood or serum which cannot be used on the day received, should be placed in the refrigerator to prevent bacterial growth. In tubes where the serum has not come to the surface, the clot should be separated from the sides of the tube with a sterilized platinum needle or glass rod. If the amount of serum is insufficient, then centrifuge. The serum is poured or pipetted off into small test tubes which have been cleaned, sterilized, and numbered. The addition of a little hæmoglobin to the serum does not seem to make any difference.

The sera are heated in a water bath for 30 minutes at 55-56 degrees centigrade, and allowed to stand for at least three hours at room temperature. We found that inactivated sera which have stood overnight in the refrigerator, give the same results as inactivated sera which have stood only three hours at room temperature.

PIPETTES. For each serum it is convenient to have one small pipette, graduated in 0.05 or 0.1 mil divisions. These can be made by choosing glass tubing of a bore similar to that of a one mil pipette graduated in tenths, and making a pipette nozzle on it. Water is passed from the graduated pipette by capillary attraction through the nozzle, and the divisions required, marked off with a grease pencil. The whole is coated with paraffin wax, and the coating cut through with a thread opposite the grease marks. The divisions are painted with hydrofluoric acid ("diamond ink") which is allowed to act on the glass for 5 minutes. The pipettes are dipped in hot water and cleaned.

A simpler and more accurate way, is to choose tubing and nozzles where the bore and nozzles give 4 drops to the 0.1 mil and use the drop method. But selecting the tubing is difficult.

Other pipettes which will be found useful, are one 5 mil pipette graduated 1.0 mil and 0.1 mil. Four one mil pipettes graduated 0.1 mil. One 0.1 mil pipette graduated 0.01 mil. This is used for adding cholesterolin.

SETTING UP THE TEST

The necessary routine, from the point of view of one man performing the whole test, will be considered. When the blood has

clotted, the serum is removed and inactivated in the water bath as described. During this half hour the necessary number of small test tubes ($\frac{1}{2}$ by 3 inches), are set up in wire or copper trays or racks. These tubes must have had several washings in distilled water, before being sterilized. They must be used for the Sachs-Georgi test only. Any alkaline or acid reaction will cause non-specific results. Hard glassware is better than soft.

Four tubes are allowed for each serum. The tubes are numbered with a grease pencil thus 1 2 3 4: 1 2 3 4, etc., and the number of the serum is put on each number 1 tube.

In a separate rack are put up tubes for extract, positive, and negative controls. Ten tubes are sufficient for these.

THE MAIN TEST

| | Serum Control | | | |
|-----------|---------------------|----------------------|---------------------|-----------------------|
| | <i>First Tubes.</i> | <i>Second Tubes.</i> | <i>Third Tubes.</i> | <i>Fourth Tubes.</i> |
| Saline | 0.9 mil. | 0.9 mil. | 0.9 mil. | 0.9 mil. |
| Serum | 0.05 mil. | 0.1 mil. | 0.1 mil. | 0.1 mil. |
| Extract X | 0.5 mil. | 0.5 mil. | Nil | 0.5 mil of 16.6% Abs. |
| Extract Y | Nil | Nil | 0.5 mil. | Alc. in saline |

CONTROLS

| | | <i>Positive.</i> | <i>Positive.</i> | <i>Positive.</i> | <i>Negative.</i> | <i>Extract.</i> |
|-----------|-----------|------------------|------------------|------------------|------------------|-----------------|
| Back Row | Salt Sol. | 0.9 mil. | 0.9 mil. | 0.9 mil. | 0.9 mil. | 1.0 mil. |
| | Serum | Pos. (A) | Pos. (A) | Pos. (B) | Neg. | Nil |
| | Extract X | 0.5 mil. | 0.5 mil. | 0.5 mil. | 0.5 mil. | 0.5 mil. |
| Front Row | Salt Sol. | 0.9 mil. | 0.9 mil. | 0.9 mil. | 0.9 mil. | 1.0 mil. |
| | Serum | Pos. (A) | Pos. (A) | Pos. (B) | Neg. | Nil |
| | Extract Y | 0.5 mil. | 0.5 mil. | 0.5 mil. | 0.5 mil. | 0.5 mil. |

NOTE: Pos. A and Pos. B and Neg. are sera which are known to react positively and negatively with a previous Sachs-Georgi or Wassermann Test.

For convenience in handling salt solution, serum control, and the two heart extracts, use a rack with holes suitable for large test tubes, or for flat-bottomed cylindrical tubes (1 by 6 inches are useful), and set up four tubes. Into the first, pour the 0.85 per cent salt solution. Into the second, pour 3.32 mls of absolute alcohol and 16.68 mls of salt solution. This is a useful proportion to work from when preparing the serum control. Into the remaining two tubes pour the necessary amounts of extracts X and Y as previously described. Some workers

prefer to use small Erlenmeyer flasks. To prevent confusion, mark the tubes distinctively with a grease pencil.

Pipette 0.9 mil salt solution into all the tubes except the extract control tubes,—which receive 1.0 mil. Now add sera, taking care that all of it reaches the saline, and does not remain on the sides of the tubes.

Add the diluted alcohol to every fourth tube. When the extracts are ready for use, note the degree of opalescence and adopt some method of visibility, such as the use of print or a band of black material. After a little experience, a standard of transparency can be adopted, and when the diluted extract fails to conform to the standard, a new dilution should be prepared.

Pipette 0.5 mil of the diluted extract into the first three tubes, viz., extract "X" into tubes 1 and 2, and extract "Y" into the tube 3. The best results are secured when this pipetting is done quickly. The opalescence is thus retained, and the tendency to precipitation which may show itself in one to two hours, is avoided.

READING THE TEST

The tubes are shaken until the serum, extract, and salt solution are thoroughly mixed. They are placed in the incubator and kept at 37°C. for 24 hours, after which the results are recorded. To classify the results we used a modified form of Messerschmidt's classification, viz.

- xxxx large flocculi suspended in a clear medium.
- xxx small flocculi suspended in a clear medium, or large flocculi suspended in a turbid medium.
- xx smaller indistinct flocculi, suspended in a turbid medium.
- x hazy appearance macroscopically, hand lens shows flocculi present.
- 0 medium only.

In this way the naked eye can pick out the different kinds of reactions and experience enables one to do the readings very quickly, the hand lens being required only occasionally.

The tubes, four at a time, are held between the eye and the light, in such a way that the lower third of the tube is between the eye and the window sill. A dark background is thus obtained. The tubes should be shaken gently. Small flocculi are most easily seen at the sides of the tube, as they slowly move round and reflect the light. They are distinguished from the air bubbles, which are produced by too vigorous shaking, by the way they remain suspended, and by their soft fleecy appearance. Small gritty particles, such as dust, have a

hard clear outline. If, on shaking, a greyish column rises from the bottom of the tube and rapidly disappears, leaving no distinct flocculi in the medium, it should not be regarded as a true precipitate. ALWAYS READ THE POSITIVE, NEGATIVE, AND EXTRACT CONTROLS FIRST. Use a hand lens for the last named. It is advisable to take a second reading after 48 hours in the incubator. On most occasions all the results will be obtained in 24 hours. The results are then easily read because doubtful or one plus readings seldom occur. On the other hand, a one plus may go up to four plus in 48 hours. This is a rare occurrence if the test has been done correctly. There is the additional disadvantage that some of the precipitates show signs of redissolving after prolonged incubation. The majority of sera which were negative during 24 hours' incubation, remain so during another 24 hours, but a few one plus and two plus reactions appear. These positive results probably indicate syphilis, but experience is required in reading the weak positive reactions which occur after 24-36 hours. Close attention must be paid to the control, especially to the extract and negative serum controls. To put it shortly, a non-specific positive, even a weak one, is uncommon in 24 hours, whereas the possibility of non-specificity must be considered after 24-30 hours. The process of flocculation, of whatever kind, takes time. The chief factors controlling flocculation in the Sachs-Georgi test seem to be (1) the way in which the extract is diluted, (2) the amount of cholesterin added, (3) the period of incubation. We gave up the refrigerator method because sometimes the precipitates redissolved.

The suggestions made here, are based on the observation that on several occasions the extract control was positive, and that the diluted extract (not necessarily on the same occasions), left at room temperature for 48 hours had large flocculi similar to those seen in a four plus reaction.

Occasionally the serum control in the Sachs-Georgi test has shown spontaneous flocculation of the serum. One such serum was observed. The flocculation was two plus. This serum was not observed to be anti-complimentary in the Wassermann reaction. In a series of 248 sera following the 700 sera here considered, two sera were observed to be anti-complimentary in the Wassermann reaction but the Sachs-Georgi serum control did not show spontaneous flocculation. Opinions differ as to whether every case of spontaneous flocculation is due to anti-complimentary power in the serum, and vice versa, whether every anti-complimentary serum shows spontaneous flocculation. The majority of those who have worked on the problem believe there is a definite relationship between these two phenomena.

CONTROLS

At first it may be found difficult to select sera which will act satisfactorily as positive controls. This difficulty disappears with experience in retaining for use as positive controls carefully selected sera which gave large distinct flocculi in a previous test.

The effect of glycerine in preserving positive and negative sera was tried. At the end of three weeks the four positive and two negative sera which were being experimented with, were accidentally thrown away. The experiment proved that sera, with and without the addition of glycerine, when kept in the refrigerator for three weeks, retain their original positive and negative characteristics. This is contrary to the statements of Sachs-Georgi, and others, that sera must be tested within three or four days.

A four plus with the positive sera means that the extract is probably going to react well with the other sera. But a weak positive result with the control, can not be taken as an absolute indication that the extract will react weakly with the unknown positive sera.

The fine dust which gets into the tubes during dust storms in Peking makes the readings more difficult, causes weak flocculation to occur in a number of tubes, but does not render the results valueless.

On January 5th, ten sera of known Wassermann results were tested with a simple absolute alcohol extract of beef heart which had been previously used for the Wassermann reaction, but discarded because of its weak antigenic power. The results were good, and would have been put at 100% correspondence had the positive been stronger.

On January 7th, twenty-seven sera were tested again with three simple absolute alcohol extracts of beef heart. The results were again encouraging, though not so easily read as the first series.

Absolute alcohol extracts of pig and sheep heart were now prepared, also 95% alcohol extracts. Different amounts of cholesterin were experimented with, and the extracts prepared in different ways. By the end of January, we were hopeful that pig and sheep heart extract were capable of giving reliable results. We used absolute alcohol and 95% alcohol extract of pig heart, and tested seven hundred sera, first reading our own results and then comparing them with the result of the Wassermann reaction on the same sera.

| | | | | | |
|--------------------------------|----|----|----|-----|------|
| Exactly the same | .. | .. | .. | 567 | sera |
| Almost the same (1 plus diff.) | .. | .. | .. | 70 | „ |
| Marked difference | .. | .. | .. | 54 | „ |

Out of 700 taken in direct sequence, the agreement with the Wassermann results is 92.2%; the difference 7.8%.

COMPARISON OF ACTUAL RESULTS BETWEEN
WASSERMANN AND SACHS-GEORGI METHODS

| Wassermann Sachs-Georgi | Antigen Z Extract X | Antigen Y Extract Y | Wassermann Sera | Sachs-Georgi Sera |
|----------------------------|------------------------|------------------------|--------------------|----------------------|
| | xxxx | xxxx or xxx | 114 | 127 |
| | xxx | xx or x | 1 | 12 |
| | xxxx | — | 0 | 0 |
| | xxx | xxx or xx | 19 | 16 |
| | xxx | x or — | 0 | 7 |
| | xx | xx or x | 11 | 11 |
| | xx | — | 2 | 2 |
| | x | x or — | 11 | 17 |
| | — | — | 542 | 508 |
| | | | Total | 700 |
| | | | | 700 |

NOTE: Antigen Z was the more reliable of the two antigens and extract X the more reliable of the two extracts.

COMPARISON WITH RESULTS OF OTHER WORKERS

| | | | | <i>Coincidence with Wassermann.</i> | <i>Number of sera tested.</i> |
|------------------|-----|-----|-----|---|-----------------------------------|
| Sachs and Georgi | ... | ... | ... | 94.9% | 2,770 |
| Taniguchi | ... | ... | ... | 91% | 296 |
| Messerschmidt | ... | ... | ... | 85.1% | 1,122 |
| Parker and Haig | ... | ... | ... | 93.07% | 520 |
| d'Aunoy | ... | ... | ... | 98.07% | 2,150 |
| Baumgartel | ... | ... | ... | 90% | 7,000 |

The most favourable reports have come from Germany, U.S.A. and Britain. A few workers in France, Italy, Spain and other countries who have published their work have not got such good results.

CLINICAL HISTORIES AND ANTI-SYPHILITIC TREATMENT IN RELATION
OF THE WASSERMANN AND SACHS-GEORGI TESTS

We were not able to collect all the clinical histories in the cases which showed a marked difference between the Wassermann and the Sachs-Georgi results.

Fifty-four histories were traced including 30 of the cases which showed a "marked difference."

| | | | <i>No. of Cases.</i> | <i>Previous history or clinical evidence of syphilis.</i> | <i>Previous anti- syphilitic treatment.</i> |
|----|-------------------|-----|----------------------|---|---|
| A. | Wassermann neg. | ... | 14 | 14 | 11 |
| | Sachs-Georgi pos. | ... | | | |
| B. | Wassermann neg. | ... | 16 | 0 | 0 |
| | Sachs-Georgi pos. | ... | | | |
| C. | Wassermann pos. | ... | 7 | 5 | 2 |
| | Sachs-Georgi neg. | ... | | | |
| D. | Wassermann pos. | ... | 17 | 16 | 9 |
| | Sachs-Georgi pos. | ... | | | |

A. Fourteen were Wassermann negative and Sachs-Georgi positive, all of whom gave a syphilitic history, or a clinical diagnosis of syphilis. Eleven had had anti-syphilitic treatment. Of special interest in this group are the three following.

3488 Diagnosis: Syphilis, Wassermann negative, Sachs-Georgi xxxx.
 Age 37, when 20 years old had a severe attack of gonorrhœa.
 Age 35, legs were swollen. In May 1920 had three injections of 606 at 10 day intervals. Five months later Wassermann gave positive result. Was given three more injections. One month later the Wassermann still positive. After four more injections the Wassermann was negative on two consecutive occasions. Patient says he never had a chancre and never suspected syphilis. Has had phthisis for 15 years with frequent hæmoptysis.

3575 Diagnosis: Tuberculous adenitis and scrofuladerma, Wassermann negative, Sachs-Georgi xxx.
 Age 31. Complains of suprasternal ulcer which he has had for three months. Has enlarged submental, submaxillary right side, axillary, femoral and inguinal glands. One and one-half years ago, his right axillary glands discharged pus. Six months ago had two soft masses removed from suprasternal region by army doctor. Losing strength and weight. No cough, no night sweats, gait normal. Had chancre 6 years ago but no secondary symptoms. No previous anti-syphilis treatment.

3899 No diagnosis. Wassermann negative: Sachs-Georgi xxx and x.
 Age 38. No complaint. Patient had syphilis and wants blood tested. August 1920 had sore on penis and at same time gonorrhœa. Had five injections at a Japanese hospital in Mukden. Physical examination: Well nourished, mucous membranes not pale, glands not palpable, hair thin and falling out, throat, etc., normal.

The three cases which had had no previous anti-syphilitic treatment were:

3575 Diagnosis: Tuberculous glands and scrofuladerma. Chancre 6 years ago. Sachs-Georgi xxx. Wassermann negative.
 3756 Diagnosis: Syphilitic arthritis: Had scar on penis. Sachs-Georgi xxx and xx. Wassermann negative.
 4031 Diagnosis: Periostitis (impression: syphilitic), no history. Sachs-Georgi xxxx and xxxx. Wassermann negative.

B. Sixteen were Wassermann negative and Sachs-Georgi positive, none of whom gave a syphilitic diagnosis of history.

| | | |
|------------------------------------|---|------------------------------------|
| Trachoma | 3 | Chronic infective arthritis of |
| Gonorrhœal conjunctivitis | 1 | vertebræ, cause unknown |
| Cirrhosis of liver | 1 | "Pains in right leg" |
| Acute meningitis | 1 | Chronic leg ulcer |
| (causal organism unknown) | | Trychophytosis |
| Fracture of finger phalanx | 1 | Œsophageal stenosis |
| Skin disease | 1 | Routine exam. of employees |

Of special interest is

4023 Diagnosis: Oesophageal stenosis. Boy of 13; origin disease unknown. Sachs-Georgi xx and x. Asked for repeat of blood examination. Without knowing whose blood it was; found xxx and x and discovered it was the same boy.

C. Seven were Wassermann positive and Sachs-Georgi negative.

2 had syphilitic history and no treatment.

3 had syphilitic history and anti-syphilitic treatment.

1 (3934) Kala-azar xxxx. No history of syphilis.

1 scleritis xx. No history of syphilis.

D. Seventeen were Wassermann positive and Sachs-Georgi positive in varying degrees.

Sixteen of these had been diagnosed as syphilis, one as a skin complaint. Nine had had anti-syphilis treatment by injections of salvarsan.

Example. No. 4067: Wassermann xxxx: Sachs-Georgi xx and xxx. From Methodist Hospital "had had nine injections of 606 recently, and P. U. M. C. had reported three Wassermann as xxxx during the past few months. What does the Sachs-Georgi say?

4068: Wassermann xxxx: Sachs-Georgi xxxx and xxxx. From the Methodist Hospital, "had negative Wassermann ten months ago but is thought to be syphilitic. What does Sachs-Georgi show? Patient had chancre year before last, and has had two injections of 606. The Wassermann negative: his history is syphilitic."

The above type of history corroborates what we had observed on several occasions, that the Wassermann test occasionally reacts positively with a serum at one time and fails to react positively at another time. The Sachs-Georgi test also does this.

Thirty-five cases had syphilis clinically or in their history. Thirty-one of these were Sachs-Georgi positive, i.e., 88.2 per cent; 24 of these were Wassermann positive, i.e., 68.6 per cent. This lower figure for the Wassermann is due to the number of cases which are negative after a few injections of arsphenamine.

It alters matters, when it is stated thus, that out of thirty sera which were Wassermann negative and Sachs-Georgi positive fourteen had a history or clinical evidence of syphilis, i.e., 46.6 per cent.

Out of seven sera which were Wassermann positive and Sachs-Georgi negative five had a history or clinical evidence of syphilis, i.e., 71.4 per cent.

A study of the histories suggests the following conclusions:

(1) That the Wassermann test fails to give a positive reaction after the second to ninth or more injection of arsphenamine, usually

after the fifth. This is not an absolute rule. That the Sachs-Georgi test continues to give a positive reaction, and usually a strong one, after two to nine injections of arsphenamine. This is not an absolute rule. These two facts should be taken in conjunction with the second conclusion.

(2) Cases of tertiary syphilis usually show stronger positive results with the Sachs-Georgi than with the Wassermann test. This is probably due to the fact that most of the tertiary cases have had previous treatment with arsenic.

(3) The Wassermann test gives stronger positive results in cases of early secondary syphilis than the Sachs-Georgi test. This is not an absolute rule.

Five sera were Wassermann xxxx and Sachs-Georgi xxx or xxx. These cases had had a chancre five to seven months previously. One case of early secondary lesions was missed by the Sachs-Georgi but gave xxxx with the Wassermann.

(4) The Sachs-Georgi test may prove to be of more value than the Wassermann test in cases of latent and congenital syphilis.

(5) Both tests react to skin diseases, probably of syphilitic origin. These considerations require a great deal of investigation before they can be considered proved or disproved.

From the fifty-four histories collected, it is reasonable to infer that the 92.2 per cent correspondence between the two tests means a correspondence both in cases which show syphilis clinically, and also in those which do not show it clinically. The greatest divergence occurs in cases which have been treated with injections of arsenical preparations. Of twenty cases which had received injections, eleven were Wassermann negative and Sachs-Georgi positive; the remaining nine were positive for both tests.

PERCENTAGE DIFFERENCE 7.8

In a consideration of the fifty-four cases which constituted the 7.8 per cent difference we found that only eleven showed a xxxx difference. Four of these eleven had had anti-syphilitic treatment. Generally speaking the differences were found in the weaker and doubtful reactions. It is our observation that a substantial majority of the weak plus results in the Sachs-Georgi test are specific for syphilis in one form or another.

SPINAL FLUID

During 1921 Georgi and others claimed that the Sachs-Georgi test was applicable to spinal fluids and gave more reliable results than

the Wassermann test. The method employed in this laboratory is the Noguchi method.

Georgi recommends the following proportions

| | |
|-------------------------------|-----------|
| Fresh spinal fluid | 1.5 mils |
| Diluted heart extract | 0.75 mils |

Incubate for 20-24 hours.

We tested seven spinal fluids putting up controls with diluted alcohol and spinal fluid, and also salt solution 0.85 per cent with the diluted extract. We had one four plus result (4203), the rest were negative.

| 4023 | No. | Noguchi | Sachs-Georgi |
|------|------|---------|--------------|
| xxxx | 4183 | ± + | — |
| | 4181 | — — | — |
| | 4182 | — — | — |
| | 4184 | — — | — |
| | 4179 | — ± | — |
| | 4203 | xx xxxx | xxxx |
| | 4205 | — — | — |

4203 Age 28, sore on penis four years ago, and again 5 months ago. Rash January 1921, and alopecia, pain in muscles and joints September 1921, two injections January and September 1921. Present complaint is deafness; left eye partially blind, and facial paralysis on the left side; unable to walk or stand without support.

DISCUSSION. Consideration of the Sachs-Georgi test opens up a wide field of discussion. It also leads to a survey of the numerous simple tests recently brought forward. The three tests which have given the most reliable results are the Sachs-Georgi, the Meinicke, and the ultramicroscopic. In the hands of a large majority of those who have published their work, the Sachs-Georgi test has yielded results closely approximating to the Wassermann test in specificity and reliability. It was the possibilities of its practical importance which led us to give it a trial with pig heart extract as a modification of the original test. With a view to improving the simplicity of the test we attempted to obtain reliable results without the use of cholesterin. The positive results were perfectly reliable, but not so good as when cholesterin was used. Since the results of our attempts on this point of technique were written up, Professor C. Y. Wang of Hongkong University has published the results of his work on 200 sera. He used an extract of human heart which was diluted very carefully, according to minute instructions, with salt solution. He claims that in this way his precipitation test, which is similar to the Sachs-Georgi test, can be performed without the use of cholesterin. It is probable

that pig heart, prepared and diluted according to the method he recommends, would give good results.

It was also our experience that some series of results were practically 100 per cent the same as the Wassermann results, both in positiveness and in the degree of positiveness, whilst other series were not so good. As we went on our results became more and more reliable. Hence, there is a personal factor which has to be taken into consideration. Thus, after 700 sera had been tested, Dr. Chang tested 248 sera and obtained a correspondence with the Wassermann test of 96.3 per cent.

Since much of the success of the Sachs-Georgi test lies in the preparation of the extract, i.e., in the diluting of it, we thought it might be a good thing to investigate the extract with a view to standardizing it. Dr. Wu accordingly examined four preparations of pig extract, two of sheep, two of chicken, and one of beef. The results were expressed in milligrams of lecithin $H_3 PO_4$ per mil of extract. The results seem to indicate that it is not a question of quantity of lecithin $H_3 PO_4$ which controls the flocculation phenomenon in the Sachs-Georgi test. The extracts, all of them reliable, varied in their content of lecithin $H_3 PO_4$ from 0.17 milligrams per mil to 0.59 milligrams per mil.

Considering the Sachs-Georgi test from the practical point of view, we believe that with a few weeks' experience of the test and a knowledge of its weak points, it is possible for anyone to report reliably on the syphilitic or non-syphilitic nature of human serum. As a series of unreliable results is discouraging, a short training of from seven to ten days is advisable for those who are not accustomed to pipetting and handling small quantities of serum. The Wassermann technician should be able to obtain good results without previous training. The first thing the beginner wants to see is a four plus flocculation. A high standard should be set for this, namely, a clear fluid with many distinct flocculi, visible from four to five feet away. From this one can grade down as one wishes. If the majority of the negative results are clearly negative, and the majority of the positive results are four plus, the other gradations in that series are reliable, and syphilis should be suspected even with one plus readings. Experience in reading is essential, and if the smaller hospitals take up the Sachs-Georgi test and have no Wassermann with which to compare, the importance of accurate and intelligent reading cannot be overstated. This does not mean a wearisome eye-straining process, but it does entail careful reading and practice in reading. When all the results, excluding the four plus results are doubtful or one plus, the two

things to be suspected are first, insufficiently cleaned glassware, and second, a faulty method of diluting the extract.

We have no hesitation in recommending that the test be adopted by hospitals, both for in-patient and out-patient work, provided a number of negative and positive sera are tested in the same series with the suspected sera. In view of the prevalence of syphilis in many Chinese cities, from the humanitarian as well as from the purely scientific point of view, it is highly desirable that a simple, cheap, specific test such as this, be made available for diagnostic purposes.

For what these results may be worth to hospitals and practitioners in China grateful acknowledgment is due to Dr. Young and Dr. Ten Broeck for their helpful criticism and suggestion, and also to Miss McCoy, Dr. Chang (Mukden Medical College), Dr. Joffick, Dr. Liu and Dr. Wu for their active co-operation.

SUMMARY AND CONCLUSIONS.

- (1) 700 sera were tested.
- (2) There was 92.2 per cent correspondence with the Wassermann test.
- (3) The Sachs-Georgi test, performed with an extract of the heart of the black pig common to North China, is a reliable test for syphilis.
- (4) The test is simple, cheap, and specific.
- (5) In the Wassermann Laboratory it is very useful as a supplementary aid to blood and spinal fluid test.

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MEDICAL EVANGELISM.*

G. W. LEAVELL.

Is our Christianity worth propagating? Not, is CHRISTIANITY worth propagating? We have no doubt as to that; but, is o-u-r Christianity worth propagating? Have I a salvation that is worth passing on? In this first questioning we do not ask, What is Christ to the world? but, What is Christ to *me*, and what is my relation to Him? Believing that He is supreme in the heart of every one here—shall we look into His face, and seeing no one save Jesus only standing in our midst, deal with the problem of evangelism that is so close to our hearts?

Have I a vital experience of Christ? Out here in China in the heart of heathenism, at the end of the earth, have I an experience that knows that Jesus satisfies, that He alone is enough, with or without results? Have I a message that can transform and uplift men? Have I a power—the power for victory over sin in my own life, and power in service? Have I that experience, that message, that power that He has promised and is ready to give even to-day and at this very hour?

Throughout the life of the Lord Jesus Christ there was a theme—and this was the theme of His life: "I am come to do the will of Him that sent Me." Every great oratorio, every true symphony, every splendid opera of power, has running through it from beginning to end, through every part, that which we call the theme, and every note and every sound that is brought into that oratorio, or that symphony, or that opera, must be brought into harmony with that theme. Now you hear the sound of a woman's voice, alone, in song, now you hear the mighty throes of the great orchestra, backed by trombone and kettledrum. It does not matter which you hear, underlying all is the same theme, and every note and every part of that oratorio or symphony is subjected to that theme. Throughout the life of our Lord Jesus He lived the theme of His life, and whether you find Him pegging away at the trade of the hammer and nails or find Him sitting alone by the well of Samaria, talking to the outcast woman, or find Him healing the one who is sick or find Him upon the Cross of Calvary, you realize that everything which entered into His life or thought, or word or deed was brought into harmony with the theme of His life which ran throughout His life even

* Paper read by Dr. G. W. Leavell of Wuchow at the meeting of the South China Branch of the C. M. M. A. on December 8, 1921.

from His boyhood days to His ascension. What is the theme of our schools? What is the theme of our preaching? What is the theme of our literature? What is the theme of medical missions? What is the theme of our hospitals? If our theme is not to make Jesus to men a personal Saviour—we have missed the power of our life as missionaries.

The theme of medical work in China should be *EVANGELISM*. In hospital mission work in China we are convinced that the evangelistic spirit of the hospital is determined by the zeal and interest shown along this line by the foreign doctors and nurses with whom the hospital staff have very intimate association. They see us through and through. If we are evangelistic they realize it. If we are the least indifferent they catch our spirit. Our duty and responsibility here is tremendous. It has been a very difficult problem to enlist the hospital staff in the Stout Memorial Hospital for direct evangelism. The medical work has always been satisfactorily done by the staff but the evangelistic side has never been satisfactory. Is it because we have given less attention to the needs of the soul than to the body? I fear it has been. Early this year we began having a prayer service every morning for the doctors and staff. This was to be a fifteen minute prayer service conducted by the evangelist, doctors and nurses in rotation. All the doctors, nurses and office staff were expected to attend. We have found these meetings a great blessing in promoting better understanding between the doctors and nurses and the staff in general. Many problems have been prayed through and the idea of personal evangelism has been emphasized. We are trying to get the nurses and doctors away from the idea that the Hospital evangelist and Bible-woman are here paid to do the evangelistic work and all others must leave it to them. A recent study in the daily staff prayer meetings on Personal Evangelism covering a period of two weeks has been very helpful. The spirit is catching. On the last morning the writer asked for the show of hands from any one who would promise to lead at least one to Christ personally within one month and the response was gratifying although the entire company did not promise. When we realize that in six months in the Wuchow Hospital 595 evangelistic meetings were held which touched the individual daily life of 20,744 souls we see the tremendous opportunity that is upon us. Is it possible for the evangelist and Bible-woman to cover the ground? Preaching from three to four sermons a day to the same people sometimes for three or four months in the wards of the Hospital is no small task and we wonder how the evangelist can keep going without repetition.

He certainly must be a Spirit filled man. We are convinced that the time has come when we should ask for a missionary evangelist to take entire charge of the evangelistic work of the Hospital. He would have his hands full. Of the 156 people who have expressed their belief in our Lord and Saviour Jesus Christ in the Hospital this year—only five have been baptized. How necessary it is that these who come and hear be more fully instructed. Pray for us in this responsibility which is too great for us. The object of medical missions is to heal the sick and preach the Gospel. Dr. Peter Parker, and that veteran pioneer of medical missions, Dr. John G. Kerr, demonstrated the inestimable value of combining the healing art with the preaching of the Gospel. Dr. Parker said, "China was opened to modern civilization, not with the point of the bayonet, but with the point of the lancet." Medical evangelism is best done in the mission hospital that preserves an even balance between the two phases of its work—healing the sick and preaching the Gospel. He is the best medical evangelist who comes nearest to the pattern of Christ and turns with equal zeal and enthusiasm for thorough work from the diseases of the body to the needs of the soul. In modern times Dr. David Livingstone probably came as near filling these conditions as any man. The medical work may easily be the most important evangelistic factor in any mission during its earlier years—but I am not prepared to say that this should be true after the work has developed and the confidence of the people served is established. As a pioneer agency the evangelistic work of medical missions is chiefly useful in two ways.

First—it is a powerful force to combat the opposition which is fostered by ignorance and superstition and a lack of confidence on the part of the people among whom we work. This is strikingly shown by the securing of a large plot of land in the name of the Hospital, for development of the growing work, in a certain nearby mission station.

In the second place—medical mission work is a constant demonstration of a practical religion—one that teaches men the spirit of Christ to extend the helping hand to all men and peoples regardless of their race, caste, or social position. It is a constant marvel to the patients in the Hospital at Wuchow that we should do this, for such a sentiment is not found in the thinking of the heathen.

Evangelistic opportunity in medical work is abundantly offered in the free clinic where daily preaching services are held and personal work is done by trained workers. The doctors in the mission Hospital have personal contact and influence with the so-called private patients that come to the Hospital to consult the physician.

In the homes there is good opportunity for telling the Old Old Story of Jesus and His love. As a permanent agency in evangelizing, the mission Hospital accomplishes most through the exceptional opportunities offered to give hospital patients systematic instruction for days at a time. This is of the greatest importance. We try to emphasize this in our work by the daily ward services held in each ward of the Hospital; by personal work done at the bedside and by the general preaching services held for all patients and staff in the assembly room at night, twice a week. The Sunday morning Sunday School co-operating with the S. S. at the Chapel and counted as a part of it is another effective agency. The distribution of well selected literature in the rooms and wards of the Hospital is an agency for winning to Christ that can not be too strongly stressed. You may be surprised to know that in the Hospital at Wuchow in one month, from May 16th to June 16th this year, evangelistic services were held, and there were no special programs or meetings.

A long established medical work has a profound and far-reaching influence on the surrounding community which makes for the cause of civilization and humanity, and so indirectly is an aid to evangelism. It is difficult to estimate this influence but that it is of great value no one would deny.

The ideal medical missionary hospital combines the hospital work, dispensary and itinerating and it is very difficult to have a well balanced evangelistic program without the three branches of the work. Each has a very large and important place. Itinerating is most useful in opening up new fields to evangelism in pioneering and making known the character of the work. In itinerating one's camp and time is sure to be full. The opportunity for preaching on itinerating trips is excellent. On a recent trip up the West River in three days we were able to treat 318 people, hold six preaching services with an average attendance of 100—to give out 300 tracts (which were all we had)—the response to the appeals was more than twenty people raising their hands to confess belief in Christ. No doubt they believed all they knew to believe—but how poorly they had been taught and how little they had heard of the unsearchable riches of Christ Jesus. This clinic was held in one of our out-station chapels and we pray that it strengthened the hands of the preacher there as he stands among so much ignorance and superstition to tell of His wonderful love. Some of the patients treated there have come to the Hospital for treatment and one poor woman made the journey to the Hospital on the same boat by which we returned.

In the dispensary work done at the Hospital daily—except Sunday—we have increasing opportunity for getting a large local acquaintance and many of these patients can be followed up by the evangelist and Bible-woman. Many times people come to the dispensary and seek assistance for others, in the homes from whence they come, and the messenger of Christ has opportunity in this way to preach through the healing done in these homes. There are drawbacks to dispensary and itineration work that are not satisfactory to the physician from the scientific standpoint but the evangelistic opportunity cannot be estimated if the most is made of the privilege that it affords.

A well-equipped hospital is essential as a base from which to operate in doing medical mission work. It need not, however, be of large dimensions to achieve the highest usefulness as an agency in evangelism. It goes without saying that room should be provided capable of taking in all who apply for admission. The building should grow with the opportunity and the opportunity grows with the years of dispensary and itinerating work that must be done. Besides being a base from which dispensary and itinerating work is done the mission hospital is a factor in the evangelistic work of the mission because it enhances the reputation of the mission's work, Human nature is the same in China as elsewhere and the people are most ready and willing to hear from the lips of those who have helped them in sickness the story of Him who Himself took the infirmity of the world and bore them on the Cross.

But with all our fine hospitals, equipment, workers, staff, meetings and success along every line we cannot evangelize without the simple old-time methods of Christ. Christ never held a protracted meeting. Christ was never known to write a sentence except on the seashore and that was soon obliterated by the waves of the sea and forever destroyed. But Christ's simple method was in dealing with the individual. Let us go back to the first Chapter of Mark, the wonderful Gospel that every missionary should know intimately, for there he finds the fullest instructions for the work he must take up day by day. "Come ye after Me, and I will make you to become fishers of men." "Come ye after Me"; there is only ONE to follow, and that is Jesus Christ.

I know that there have been some missionaries and some missions, and perhaps some of us, of whom it might be truly said that we "have toiled all the night, and taken nothing"—some of us have toiled for months and some for years. Why have we taken nothing? Have we let our nets down on the wrong side? Perhaps we have wasted time by philanthropic efforts in support of the cause or have given too

much of our time and thought to crowded dispensaries, hospital routine, systems, financial returns, statistics that satisfy; or to performing hundreds of operations. Perhaps we have given too much attention to the day schools or boarding schools and the arrangement of curriculums and all manner of efforts; and in looking after these things we have toiled all night and caught nothing, because we have not pursued our search for the individual soul. In our efforts in the schools, in the hospitals, and in formal preaching has the search for souls been neglected? If we have been led astray by these various kinds of bait, let us cast our nets in the same sea, from the same boat, but let us cast them down on the right side. If we will cast them down on the right side we may find the nets so full that they will be well-nigh breaking. Let us abandon our old methods, if they are interfering with our evangelistic efforts, and follow the Christlike method of winning the individual to Him. I believe we should put our whole emphasis in mission work on evangelism. Will we make Evangelism our theme? Will it permeate our lives, our thoughts, our deeds, our words and our walk from this hour forward? Let us be fishers of men. "He that winneth souls is wise." "They that be wise shall shine as the brightness of the firmament; and they that turn many to righteousness as the stars for ever and ever."

DEPARTMENT OF OPHTHALMOLOGY.

ABSTRACT OF OPERATIVE CLINIC.

Held by Professor H. J. HOWARD AND Dr. T. M. LI at the
Ophthalmological Section, September 16th.

Subject:—1. OPERATION FOR CATARACT WITH SCLERO-CONJUNCTIVAL SUTURE.

2. DISCUSSION FOR SECONDARY CATARACT.

CASE I. Female Chinese, aged 65. Diminishing vision, right eye, two years; left eye, few months.

Vision R. E. Hand movements. No correction helps.

L. E. -2.00 sphere -6/60.

Projection sense both eyes—good. Examination shows an opaque right lens and lenticular opacities in left.

Urine and feces normal. Wassermann negative.

Diagnosis: Mature senile cataract of right eye. Incipient cortical cataract of left eye.

During the operation the following points in technique and pathology were brought out:

Smith of India, who had an experience of 40,000 cataract operations, developed an intracapsular method of extraction. In many cases, the advantage of removing the lens with its capsule is quite universally recognized. In this case, because of its maturity and a thickening of the capsule, it was thought best to remove the lens in its capsule by the use of Verhoeff's extraction forceps.

The anterior capsule, however, was too resistant, and it was necessary to tear off a segment of the anterior capsule with Week's sharp-toothed forceps and release the swollen lens matter and the nucleus, which were then easily removed.

Since the lens was not removed in capsule, the posterior lens capsule remained behind. This will become fibrous and will probably require a dissection later on in order to produce a clear pupillary space.

An important safeguard, particularly in China where the cooperation of the patient is not dependable, is the introduction before the operation of a sclero-conjunctival suture which is looped away from the field of operation, but pulled tight and tied when the operation of extraction has been completed. This prevents escape of vitreous when the patient makes any manipulations either involuntarily during sleep or because of lack of understanding.

CASE II. Male Chinese, aged 10. Diminishing vision in both eyes for five years. Seen first three weeks before, when vision of both eyes was limited to hand movements, and both lenses were found to be opaque.

Diagnosis: Juvenile cataract of both eyes. Three days later a combined extraction with insertion of sclero-conjunctival suture was performed on the right eye. Eleven days later a linear extraction of the left lens was done. The present condition is a secondary cataract of the right eye.

The pathology of the case and the operation brought out the following discussion:

"Cataracts in children very quickly become soft, because the lenticular fibers have not yet become sclerosed and consequently their degeneration is the more rapid. In the right eye a combined extraction was performed with the hope of removing the soft lens matter in its capsule, but the anterior capsule ruptured, releasing only a very small amount of straw-colored fluid, the entire contents of the capsule. It was not possible with the child under a general anesthetic to remove the capsule then without endangering loss of vitreous, so the eye was closed and the wound allowed to heal,

with the idea that subsequently an incision through the capsule could be done with safety.

With the experience of the right eye before us, a simple linear extraction of the soft lens matter in the left eye was later done."

At the secondary operation a dissection was performed and a good-sized pupil made in the membrane, using Ziegler's knife needle.

Drs. H. J. HOWARD AND T. M. LI *at the Ophthalmological Sectional Clinic, September 17th.*

Subject:—FOCAL INFECTIONS AND TOXIC AMBLYOPIAS.

CASE I. Chinese soldier, aged 21. Sudden onset of blurring of vision with almost complete blindness in eight days. Blurring began three weeks before admission, following the eating of green peppers with vinegar. On the day following a second meal of green peppers and vinegar, he had a full feeling in his head, temporal headache, buzzing and vertigo lasting twelve days. On admission vision reduced to light perception. Optic discs showed neuritis, arteries small and tortuous, veins engorged. Slight hemorrhage in right fundus. Wassermann negative, otolaryngological, dental and X-ray examinations negative.

Diagnosis: Methyl-alcohol amblyopia.

For two weeks he was given potassium iodide gm. 0.3 t.i.d. with only slight improvement. Then strychnine gr. 1/30 once a day with slight improvement.

CASE II. Foreign child, one year old. For a severe attack of crescentic form of malaria received large doses of euquinine each day for ten days, and two doses of 0.15 novarsenobenzol, one on third and one on ninth day. Child was comatose on second day of the disease, and this lasted seven days with gradual return to consciousness. Then blindness was observed. The euquinine was continued twice a week for six weeks. Parasites found in blood for two weeks. On examination optic discs were found to be white, vessels small, small black dots on choroid. K. I. in small doses was given. Four weeks after euquinine was stopped there began to be restoration and at the end of eight weeks this was complete.

Diagnosis: Quinine amblyopia.

CASE III. Dr. Li reported a case of chronic iritis with acute exacerbations in which all examinations such as of tonsils, sinuses, teeth and gastro-intestinal tract were negative. Blood Wassermann was also negative. But there existed an active chronic prostatitis.

The iritis ran a very stubborn course until the prostatitis was actively treated.

CASE IV. Dr. Howard reported a case of diminished vision and vitreous opacities in which all examinations for the location of foci of infection proved negative except the X-ray examination of the teeth. This is a type of case often seen in China, perhaps proportionately as often among foreign residents as among the natives.

Discussion of these cases brought out the following points:

In the first case the cause seemed to be very definitely associated with the green peppers and vinegar. The vinegar, which often in China is simply diluted acetic acid, probably contained wood alcohol. The findings and the progress of the case, with only very slight improvement, seem to point to this as the cause, although the proof is not in hand.

In Russia, during the war, when the sale of alcoholic drinks was prohibited, there was a very sudden increase in cases of toxic amblyopia due to the drinking of denatured spirit which contains wood alcohol. Treatment was without avail.

In the second case the onset, the progress, the pathological disc findings and the restoration all point to a quinine amblyopia.

It has been found that in severe cases of malaria, sometimes a dose of quinine sufficient to cause amblyopia is not sufficient to kill the parasite.

Professor H. J. HOWARD AND Dr. T. M. LI *at the Ophthalmological Section, September 19th.*

Subject:—OPERATIONS ON EXTRA-OCULAR MUSCLES FOR STRABISMUS OF VARIOUS FORMS.

CASE I. Foreign male, aged 53. Complains of moderate photophobia, more or less constant headache, occasional diplopia. Eyes tire readily, especially with close work. The associated parallel movements' test reveals an underaction of the left eye in looking up and to the left. Right hyperphoria— 10° .

Diagnosis: Paresis of the left superior rectus.

At operation a complete tenotomy of the right inferior oblique under local anesthesia. Two days later muscle balance tests with eyes in primary position showed the hyperphoria to be completely corrected by the tenotomy. Lateral deviation not affected.

CASE II. Chinese male, aged 23. Complains of headaches and frequent diplopia. Patient able to fuse, but only for a moment or

two at a time. Examination of muscle balance showed an esotropia of 20° and a hypertropia of 20° for distance, and an esotropia of 9° for near. Associated parallel movements' tests showed complete underaction of left eye and overaction of the right eye in looking up and to the left.

Diagnosis: Paralysis of the left superior rectus and spasm of the right inferior oblique.

Operation: Complete tenotomy of the right inferior oblique under local anesthesia.

Two days later muscle balance tests showed the right hypertropia of 20° reduced to a right hyperphoria of 1° ; lateral deviation not altered.

Discussion of these cases brought out the following points:

These two cases of tenotomy of an inferior oblique muscle represent a type of operation which has been rarely done. In the minds of some it is a radical procedure.

There are six pairs of so-called associated antagonists. One pair is composed of the superior rectus of the left eye and the inferior oblique of the right eye. If for some reason or other the left superior rectus is paretic, there is produced a diplopia when the individual looks up and to the left, because its associated antagonist, the right inferior oblique, pulls the right eye up, so that its visual axis is no longer parallel to that of the left eye.

A paretic or a paralytic superior rectus always shows a hyperphoria or a hypertropia.

Case I represents one type of case, a paresis of the left superior rectus producing a marked vertical deviation of the visual axes, which however, is only latent, therefore fusion exists. In Case II there is no fusion, therefore a hypertropia which is associated with an esotropia. The strabismus is a disfiguring one.

In each case the purpose of an operation is to diminish or completely annihilate the vertical deviation. This can best be done by producing the same sort of a limitation in the associated antagonist of the paralytic superior rectus, i.e., a tenotomy of the right inferior oblique in each case is the only thing to do.

CASE III. Female Chinese, aged 17, with history of scar on the right cornea and a convergent squint of the right eye that occurred following an attack of smallpox in childhood.

A dense central opacity of the right cornea. No anterior synechia.

Muscle balance tests unsatisfactory, but for near there is at least 70° of esotropia.

There are multiple motor anomalies, chief of which are a marked overaction of the right internal rectus and an underaction of the right external rectus.

Diagnosis: Right esotropia caused by amblyopia exanopsia.

Operation: For cosmetic purposes a complete tenotomy of the right internal rectus was done following local anesthesia.

CASE IV. Female Chinese, aged 20, with a history of convergent squint of the left eye since babyhood.

Associated parallel movements' tests show multiple motor anomalies of both eyes, chief of which are a marked overaction of the left internal rectus and a marked underaction of the left external rectus.

Diagnosis: Left esotropia with amblyopia exanopsia.

Operation: Resection of the external rectus and complete tenotomy of the internal rectus of the left eye.

Discussion of Cases III and IV.—Generally it is wiser in cases of esotropia to perform an advancement or a resection of the external rectus of the deviating eye, and follow this if necessary by a graduated tenotomy. In cases where complete tenotomy of an internal rectus is done, it generally happens that the outward deviating action of the eyeball continues to progress for some months and sometimes for years, so that the end result may be just as disfiguring a divergent squint as it formerly was a convergent squint.

In Cases III and IV there was such a marked overaction or spasm of the right internal rectus that it was felt that nothing less than a complete tenotomy of the internal rectus would suffice. In fact complete tenotomy is indicated only in just such a type of case.

ABSTRACT OF CONFERENCE ON OPHTHALMOLOGY.

Professor HOWARD, Dr. LI, Dr. PI AND Dr. DZEN at the
Ophthalmological Section, September 20th.

Subject:—INTERESTING CASES OF 1920-1921.

Two cases of neuro-epithelioma.

CASE I. A female child about two years old, with a large tumor mass involving the eyeball and protruding from the right orbit, and with loss of vision of the left eye.

The vision of the child's right eye began to diminish about five months prior to admission. The vision rapidly grew worse and finally

the eye became totally blind. At this stage the pupil had a yellowish color. Two months later the eye appeared larger and protruded. Shortly after the eyeball ruptured and a tumor was then seen protruding from the ruptured globe. The tumor then grew very rapidly and the suffering of the child increased. Shortly after the tumor ruptured through the right eyeball, the parents noticed that the left eye was also losing its vision and that the pupil was becoming grayish in color.

Ocular Examination: R.E. Examination shows a tumor protruding from the right orbit for about 5 cm. anterior to the orbital margin. Both lids are quite adherent to the tumor and are markedly stretched over the base of the tumor. The growth is nodulated, beefy red in color, bleeds when handled and has a very foul odor. Signs of an eyeball cannot be recognized, although a knob at the anterior end of the tumor indicates the probable position of the globe prior to its disintegration.

L.E. Examination of the left eye shows it to be sightless, with a widely dilated and immobile pupil through which a dirty yellowish irregular-shaped mass is seen with the unaided eye. With an ophthalmoscope, no red reflex is visible. The mass does not move and appears to extend forward to about 4 or 5 mm. from the lens at its temporal border and to about 2 mm. at its nasal side. The surface of the mass is somewhat nodular.

Laboratory Examination: Her urine is normal. The W.B.C. are 11,000, and R.B.C. 4,976,000; Hæmoglobin 35 per cent (Tallquist).

Clinical Diagnosis: Neuro-epithelioma of both eyes.

Result: From a personal visit to the child's home we learned that the child died about four months after the operation. The parents said the tumor had refilled the orbit and at the time of death protruded as far as the margin of the orbit. Death was probably due to glioma or neuro-epithelioma of the brain.

Pathological Report: By Dr. H. E. Meleney.

Microscopic Examination: "Sections all show approximately the same picture. The tissue consists almost entirely of tumor cells lying close together in a continuous mass, and held in place by a very sparse connective tissue stroma. The tumor cells are of medium size, have oval vesicular nuclei and very little demonstrable cytoplasm. No definite fibrils are visible between the cells, but in places the cells are of spindle shape and their cytoplasm reaches out to a pointed end. Mitotic figures are present in small numbers.

Pathological Diagnosis: Glioma of Retina."

CASE II. A female child 15 months old, with a tumor protruding from the left orbit.

History: Parents first noticed when the child was three months old that its left eye could not see as well as the right. Shortly after they observed a white spot in the pupillary space which grew larger and larger. The parents then noticed a mass about the size of a small pea protruding through the left pupil into the anterior chamber. The tumor grew rapidly and finally ruptured the eyeball about two months before admission. From the time of rupture the mass grew with great rapidity, pushing the lid margins apart and protruding more and more from the orbit. On two occasions the mass was injured by falls of the child which caused profuse bleeding. The tumor has bled a little many times.

Ocular Examination: The right eye is normal in every respect. No trace of the left eyeball is visible. In place of it there is a large tumor protruding for 3.5 cm. from the margin of the orbit. Its vertical diameter is 6 cm., its horizontal diameter 6.5 cm., and its maximal circumference is 22 cm. It has a dirty red color, is somewhat irregular and at several places has broken down and exudes a bloody fluid. The odor of the mass is very foul.

Clinical Diagnosis: Neuro-epithelioma.

Operation: Two days after a transfusion, total exenteration of the left orbit was done under ether. There was no evidence of tumor extension beyond this orbit.

Result: For ten days the child continued to improve. Then it developed nausea, vomiting and high fever, grew rapidly weaker and died in four days.

CASE III. A soldier, aged 22, who came to the clinic eight months after being struck in the face by a soccer football. Ever since the blow he had had a diminution of vision in each eye. An examination showed that his best vision was R.E. 6/20 and L.E. 6/60. The evidence of the low vision was revealed by the examination of each fundus. The macula of the right eye had a sharply defined hole involving the lutea and about two-thirds the size of the disc. There also were choroidal changes in the area immediately surrounding the hole. There was almost an identical hole in the left eye, but this was below the lutea but still in the limits of the macular region. At the lutea, however, there were marked choroidal and retinal changes.

We were able to follow him carefully for about five months. During that time we gave him potassium iodid only. There has been no increase in the vision of his right eye, but a considerable increase

in that of the left, which like the right one was 6/20 at the last examination.

This case is of peculiar interest because up to the present there is not a case on record of hole in both macular regions. It is also of interest because there was a considerable increase in vision of the left eye. Whether it was due to the action of the potassium iodid, it is impossible to state.

CASE IV. A male Chinese, aged 53, complaining of blurred vision and inability to open the lids of both eyes wide. The patient has evidently suffered with a chronic trachoma for a number of years. Finally, following an attack of acute conjunctivitis, he sought the help of an elderly woman who was regarded in his part of the country as a sort of medical practitioner with special knowledge in the treatment of "sore eyes." By means of a needle she picked up the conjunctiva of both upper and lower lids, snipping it here and there with a pair of scissors. This procedure, he said, gave him some relief for a few days, but his symptoms of discomfort soon returned. During the next two months he had the treatment repeated about every three days. He had sixteen such treatments on the right eye and twenty on the left.

As a result of these treatments the lids became thick and heavy and were covered with granulations, so much so that he found that he could open his eyes only with difficulty.

The movements of his eyes were also somewhat limited. He said that in order to give him some relief his wife on three or four occasions used a hook and a small knife to remove several pieces of tissue from his eyes.

A few months ago he consulted a native doctor, also of the quack variety, who needled the adhesions and granulations on eleven different occasions to enable him to open his eyes wider. The quack also needled him in other places, such as the skin of the upper lids, between the thumb and index finger, over the mastoid processes, the middle over the forehead, over each eyebrow, and around the outer canthi. He was told by the quack if these needlings did not cure him he would have to needle his toes and other parts of his body.

He came to us with marked symblepharon of both eyes involving both upper and lower lids. The temporal third of the right cornea was covered with scar tissue and adhesions; also the upper fourth of the left eye. In order to elevate his left lid he wore a metal clip which held a fold of skin of the lid. This clip held the lid up, but also produced an ectropion. The wire clip he was accustomed to remove at night and to replace in the morning, else the tissue would surely have long ago become necrotic and sloughed away, leaving a large cicatrix.

CASE V. A male Chinese, aged 59. Symptoms of glaucoma came on in the left eye about two years ago, and in the right eye about a year ago. Both eyes became blind about three months ago.

Upon admission, only the faintest perception of light in each eye. Tension taken with McLean's tonometer was R.E. 50 and L.E. 80.

Coarse linen threads were drawn through the anterior chamber close to the iris angle by means of a Graefe knife with a small hole in the blade for carrying the thread. The two ends of the thread were cut within two millimeters of their exits from the chamber. Conjunctival flaps were brought back and sutured securely so as to cover the ends of the threads.

One of the threads could readily be seen lying across the surface of the iris in the anterior chamber, but the other thread was placed too close to the periphery of the chamber to be seen.

During the past six weeks the tension has been taken on an average of every second day. The tension during that period has been coming down. During the last week it averaged 30 in the right eye and 45 in the left.

Discussion by Dr. Howard:

"The threads were not inserted for the purpose of direct filtration as is done in Zorab's operation where silk sutures are inserted. Linen sutures were used because they are completely absorbed within a few weeks after being placed in living tissue. The question to be decided was whether, following absorption of the threads, were channels lined by endothelium left behind. While working with Verhoeff in Boston in 1918, I inserted linen thread in the eyes of rabbits. In less than two months the threads had entirely disappeared. The rabbits' eyes were enucleated and examined microscopically. No evidence of the threads remained; nor was there any evidence of filtration channels to be found.

I felt, however, that the experiment should be tried upon a human if possible, and selected a case in which there was as much hope for improvement by this method as by any other. It is too early to state anything definite about the linen thread method. Certainly the tension has been materially lowered in both eyes. The tension of the right eye has been within normal limits for the past two weeks, and the tension of the left is slowly coming down. There is distinct evidence that the thread which has been visible through the cornea is being absorbed. In another month I should expect it to entirely disappear. At that time our conclusions should be more definite as to the value of the method."

Professor H. J. HOWARD AND Dr. T. M. LI at the *Ophthalmology Section, September 21st.*

Subject:—TRACHOMA.

CASE I. A male Chinese, aged 30.

Diagnosis: Chronic trachoma of both eyes and partial ptosis of the right upper lid.

Operation: Heisrath's resection of the tarsus of the right upper lid.

CASE II. A male Chinese, aged 26. Has had a chronic trachoma for years, for which he has been treated in another hospital. All signs of an active trachoma have disappeared, but the palpebral conjunctiva shows many scars and the lids many wild hairs.

Diagnosis: Trichiasis of both upper lids.

Operation: Modified Streatfield-Snellen operations were performed on both upper lids.

CASE III. A male American child, aged 5.

Diagnosis: Follicular trachoma of both eyes.

Operation: Expression of the contents of the trachomatous follicles of both eyes under ether anesthesia.

Discussion of Cases I, II and III:

Trachoma in China is a dreadful scourge. The disease is common to all parts of China. It is probable that it is more prevalent in North China than in any other part. Statistics gathered by us recently from examinations made of various groups show that over 50 per cent of all the population in this province at least have trachoma in some stage. In institutions like orphan asylums and famine refuges the proportion runs as high as 68 per cent.

Trachoma is an insidious disease in that a great many people may have it for months or even for years without any subjective symptoms.

Trachoma ultimately is a self-cured disease, i.e., the diseased areas in the conjunctiva are slowly transformed into fibrous connective tissue. Since it has a tendency to contraction, various complications result. These generally take the form of entropion of the upper lid, rarely of the lower; of wild hairs generally known as distichiasis or trichiasis; of a thickened deformed tarsus of the upper lid which may cause a partial ptosis as well as an entropion.

The results of the disease in the cornea are the more serious as regards sight. Often there are produced ulcers of the cornea which

perforate. Or there may result without perforation dense cicatricial changes which are called maculæ of the cornea.

In the first case a removal of most of the tarsus through a double elliptical incision in the conjunctiva of the upper lid was done. Mattress sutures, which also held in position the lower ends of the levator muscle fibers, were put in through the lid.

In the second case a plastic operation of the upper lids for the purpose of deviating the course of the wild hairs was done. The modified Snellen operation has with us proved to be the quickest operation and one whose results are excellent.

In Case III the disease was still in the first stage. Therefore there was no involvement of the cornea or deformity of the lids. The problem was to eradicate the disease from the conjunctiva. In our experience we have found that an expression of the contents of the trachomatous follicles, with as little traumatism as possible, greatly hastens the cure. Following such an operation there should be daily rubbings of the diseased lids with Hgcl_2 (1-500 sol.) and boric acid powder. These remedies are applied with pressure by toothpick swabs. The use of zinc sulphate in $\frac{1}{4}$ or $\frac{1}{2}$ per cent solution is advised several times a day. Treatment in such a case will probably have to be continued for four or five months.

Professor H. J. HOWARD AND Dr. T. M. LI *at the Ophthalmology Sectional Clinic, September 22nd.*

Subject:—PRESENTATION OF CASE OF TUBERCULOUS UVEITIS AND A CASE OF PRIMARY OPTIC ATROPHY.

CASE I. A male Chinese, aged 17, complaining of blurred vision of both eyes. His family history and past history are negative.

He first noticed about one month ago that his right eye was red. A few days later the vision of that eye became blurred. This blurring has steadily increased. The left eye became affected in the same way five days ago and the vision has steadily diminished.

Examination shows vision R.E.—hand movements.

L.E. 6/20.

There is moderate circumcorneal injection of both eyes. The cornea of the right eye is very hazy; the left eye is only slightly so. On the lower posterior surface of the right cornea are a dozen or more discrete milky spots, varying from .5 to 2 mm. in diameter. On the posterior surface of the left cornea there are numerous fine deposits which have not become discrete.

The iris of each eye is dull in color, and the pupils are slightly irregular, but there are no synechiæ. The pupils react to light and

accommodation, but the right one only sluggishly. No clear fundus reflexes can be obtained, the media of the right eye being the more cloudy.

General physical examination negative. Examination of teeth and accessory sinuses is also negative. Three diagnostic subcutaneous tuberculin tests indicated the presence of an active tuberculosis. Wassermann test proved to be positive + + .

During the past four weeks the patient has received three doses of arsphenamine and three therapeutic injections of old tuberculin. In addition he has been given atropin instillations, and hot compresses for his eyes and potassium iodide by mouth.

The haziness of the cornea has almost completely disappeared, the deposits on the posterior corneal surface have changed from day to day, but have tended recently to gather around the periphery, leaving the central area practically free.

It is possible now to see that the vitreous of the right eye is filled almost completely with massive opacities. The vitreous of the left eye is quite cloudy, and contains large membranous opacities.

The diagnosis of the cause is the double infection of tuberculosis and syphilis. The tuberculous uveitis is probably aggravated by the general luetic infection.

CASE II. A male Chinese, aged 45, complains of blindness which began to come on about a year ago. Admits both syphilitic and gonorrhoeal infections twenty years ago.

Examination shows vision of both eyes is reduced to faint light perception. Pupils are semi-dilated, round and do not react to light. Ophthalmoscopic examination shows that the media are clear, the disc margins regular and sharply fined, the disc surfaces have a distinct grayish pallor and the arteries are contracted.

The spinal fluid Wassermann is positive, + + + + . Dental examination reveals the presence of several abscessed roots. These roots have subsequently been extracted.

Diagnosis: Primary optic atrophy due to syphilis.

Dr. GEORGE E. DE SCHWEINITZ at the *Ophthalmology Sectional Clinic*,
September 22nd.

Subject: "SOME NEWER ASPECTS OF UVEAL TRACT DISORDERS AND
THERAPEUTIC MEASURES FOR THEIR RELIEF."

ABSTRACT ON CONFERENCE ON OTOLARYNGOLOGY.

Dr. A. M. DUNLAP, *Professor of Otolaryngology, at the Otolaryngological Sectional Clinic, September 16th.*

Subject:—ŒSOPHAGOSCOPY."

A case was presented. Chinese male, aged 64 years. Chief complaint, difficulty in swallowing solid food. Duration two months. Considerable loss of weight and strength. Fluoroscopy showed incomplete constriction of œsophagus above level of the ninth thoracic vertebræ.

A Mosher No. 15 œsophagoscope was used. The following points of technique were brought out:

- 1.—Œsophagoscopy can easily be done under cocaine anesthesia.
- 2.—The œsophagoscope is inserted with mandrin in place until the pharynx is passed and the upper part of the œsophagus is entered.
- 3.—Mandrin is then withdrawn and the scope gently pressed downward with the end always in view, to avoid injuring fragile tissue.
- 4.—The location of the normal narrowing of the œsophagus at the aortic arch may be noted.
- 5.—When the abnormal wall is reached, a specimen may be removed by biting forceps.
- 6.—The scope is then gently withdrawn.

Dr. A. M. DUNLAP, *Professor of Otolaryngology, at the Otolaryngological Section, September 17th.*

Subject:—"REMOVAL OF TONSILS AND ADENOIDS IN THE SITTING POSTURE."

This posture is called the "Boston method" because it was first used extensively there. Its purpose is to prevent the aspiration of blood and tissue from the mouth. The position is not in itself dangerous. The patient must not be so deeply under anesthesia that his reflexes are lost; he must be able to cough up anything entering the larynx, but there must be general relaxation.

The following points in technique were stressed:

- 1.—The tonsil must be gripped with a tenaculum which will hold.

- 2.—The fold of mucous membrane extending from the pillars to the tonsil is cut and the white capsule of the tonsil exposed, first anteriorly and then posteriorly.
- 3.—The snare then enucleates the tonsil with its capsule intact.
- 4.—Never send a patient away from the operating table bleeding.
- 5.—Clamping bleeding points with hemostats for a few minutes may be sufficient. If it is not, then tie with catgut or silk.
- 6.—In adenectomy, go up as far as possible behind the palate with the adenotome. Whatever is left can be removed with the finger nail.
- 7.—The patient is then bent forward so that the blood may pass out through the nostrils.

Dr. J. HUA LIU of the Department of Otolaryngology at the Otolaryngological Section, September 19th.

Subject:—"RADICAL MASTOIDECTOMY."

The case history was presented. A Chinese male, aged 33 years. Chief complaint, purulent discharge from left ear—duration 25 years. At the age of 7 years he had a painful swelling over the left mastoid region. It broke and discharged pus for over a year, then healed gradually. After closure of this wound a foul discharge appeared in the ear, which has continued to date.

The radical mastoid operation has for its purpose the union of the external auditory canal, the middle ear, the antrum and the mastoid cavity into one cavity, capable of being drained without interference.

The radical operation was called for in this case principally for six reasons:

- 1.—Long duration.
- 2.—History of acute attack of mastoiditis.
- 3.—No yielding to ordinary treatment.
- 4.—Tympanic membrane gone and ossicles necrosed.
- 5.—Hearing gone.
- 6.—Granulations on promontory.

The following points of technique were stressed:

- 1.—The incision is carried down to the bone except at the upper end, which overlies but does not cut the temporal muscle.
- 2.—The antrum and mastoid cavity are made as large as possible.

- 3.—The mucous membrane of the floor of the antrum should be left intact to avoid injury to the horizontal semicircular canal.
- 4.—In the upper posterior region care must be taken to avoid the lateral sinus or dura and the facial nerve.
- 5.—In order to avoid reinfection through the eustachian tube this is obliterated by Yankauer's curette. The cavity is loosely packed with iodoform gauze strips through the external auditory meatus, and the posterior auricular wound sutured without drainage.

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All medical papers and other literary communications intended for the JOURNAL, and all books for review and magazines in exchange, should be addressed to the Editor, St. John's University, Shanghai.

Changes of address of members of the Association, departures and arrivals, and all business communications should be sent to Dr. R. C. Beebe, 5 Quinsan Gardens, Shanghai.

Every member of the China Medical Missionary Association, who has paid his dues for the current year, is entitled to a copy of the CHINA MEDICAL JOURNAL for the year, postage free. To those not members the subscription to the JOURNAL is \$5.00 Mex., per annum. In remitting by cheque, please specify Shanghai Currency. Payment should be made to the Treasurer of the Association, Dr. H. H. Morris, 4B Miuhong Road, Shanghai, or to Dr. Beebe 5 Quinsan Gardens, Shanghai.

Editorial.

The sudden death from Pneumonic Plague of two such devoted and valued workers as Doctors Marcus Mackenzie and Edmund Fallows Lawson of the C.M.S. Mission in Foochow, Fukien, is a loss to the personnel of medical missionaries and their own mission in particular which will be hard to replace.

We understand that Dr. Lawson was first stricken down, and that Dr. Mackenzie became infected while ministering to his colleague: but particular information has not yet been received by the JOURNAL. A brief obituary notice issued by the C.M.S. is published in this number.

We all know that in the course of epidemics of Bubonic Plague, which are fairly common in South China, cases of the pneumonic type are occasionally met with, and are a fearful menace to the doctors and nurses who attend them; especially as they are unsuspected until the doctor is in actual contact with the case.

The lesson to us who are spared is plain: Vigilance, and the willingness to answer the Divine summons. "Watch therefore; for ye know not on what day your Lord cometh."

In Memoriam.—MARCUS MACKENZIE, M.D., EDMUND FALLOWS LAWSON, M.B.

Fukien has suffered a very heavy loss in the death, under such tragic circumstances, of our two dear brothers. The cause of their death seems to have been a kind of pneumonic plague. So far as it is possible to find out the disease was brought to Foochow by a patient who came in from a country village and died very quickly. Dr. Lawson was attending the case and

pronounced it pneumonia, and it was only after he had passed away that people realized that the trouble was the same in both cases. Dr. Mackenzie of course was by Lawson's side through most of his illness, and must have got the infection from him.

Dr. Lawson took ill on Sunday, June 11th, and passed away on Wednesday evening, 14th, at 8.15. On the following Sunday, June 18th, at 2.30 a.m., Dr. Mackenzie was taken ill with the same symptoms and at 3.45 on Tuesday, 20th, he too had passed within the veil.

With true Christian courage and devotion Doctors Marion Hook and E. G. Fishe willingly undertook the appallingly heavy task of the complete care and management of the second case, while both had already had to bear much of the strain in the former one. It is an example which makes our ordinary service pale into insignificance.

Both of our two brothers were ready to give of their very best at all times. Service of God and of others was their only joy, and in the midst of its fullness they have been translated to a higher life of richer service.

Dr. Mackenzie was born in 1871 in Dublin. He came to China as a Clergyman and a Doctor in the year 1897 under the Dublin University Fukien Mission, and was located to Funing. In February 1904 he married Miss A. E. M. Aston of the C. E. Z. M. S., Hinghwa, who died in October of the same year. In 1909 he married Miss Ethel Skegg, also of the C. E. Z. M. S., Foochow, who died in August 1911. By his second wife he leaves one son, Marcus, a boy of eleven years of age, who is at school in England. To him we tender our loving sympathy. Dr. Mackenzie served in the R. A. M. C. from 1916 to 1919.

Dr. Lawson, though he joined the Mission in 1912, had only spent about five years in Fukien. Part of that time was spent in Funing, for he also was a member of the Dublin University Mission, and part in Foochow. He had to go home twice for special reasons, and the second time, which was during the war, he joined the R. A. M. C. and only returned to Fukien a year ago.

Almost at a moment we have lost a tried and trusted friend of twenty-five years standing, and a young brother of brilliant missionary promise.

God grant that some may be found who are willing and worthy to fill the places left vacant.

JOHN HIND,

Bishop of Fukien.

PUBLICATION COMMITTEE.

NEW ISSUES: Penrose's Gynecology, Neal's Skin Diseases, Robbs' Nursing, all stop-gap editions pending the preparation of new books on these subjects.

Surgery, Vol. V, Holt's Diseases of Children, Part II, and also Parts I and II in one volume are also ready.

The complete Surgery in one volume should be ready by August.

The Fundamentals of Pharmacy by Mr. E. N. Meuser, Phm. B., Lecturer in Materia Medica and Pharmacy, West Union University, Szechwan, will be ready by the end of August. All those interested in this subject please note. Every Hospital and Dispensary should order it.

Radiology

DANGERS IN THE X-RAY ROOM.

Early in December, 1919, the daily press announced that a well-known French X-ray specialist, Dr. Auguste Jaugeas, had been electrocuted whilst carrying out an ordinary X-ray examination of a patient. The following account of how the accident occurred is given: "Dr. Jaugeas was making a screen examination at a hospital in Paris. The equipment consisted of a small high tension transformer, working from alternating current, without a rotating rectifier and with a radiator type of Coolidge tube. The X-ray room was very small, and the high tension wires from the transformer to the tube were hanging in the form of a loop. Dr. Jaugeas was making a fluoroscopic examination, and had his hand upon the wheel of the tube stand, which was of metal, for the purpose of adjusting the height of the tube. The tube stand was not 'earthed,' and the result of the movement of the tube was to bring one of the hanging wires in contact with the stand, causing a direct short-circuit from the main through the transformer to Dr. Jaugeas, who fell with his hand still grasping the tube holder, which he pulled down with him; the floor was of concrete, which made matters worse." It should be understood that with the ordinary X-ray apparatus there is no danger of an accident of this kind to either the patient or the operator. The small American type of transformer in use was one in which the secondary high tension wires are in direct connection with the primary current. With an apparatus of this kind it is imperative that examination couches, screening stands, and so on, should be earthed, and if this had been

done the accident could not have happened. With this type of apparatus it is also essential that the wiring should be such that any short-circuiting is impossible. Unhappily, both these precautions had been omitted.

The risk of such an accident is very remote if precautions are observed. But it may be advisable to point out here clearly the precautions necessary to insure the safety of the operator.

DANGERS IN THE X-RAY ROOM.

1. All metal parts of the Outfit, such as the Switch Table, Couch, Screening Stand, Tube Stand, and particularly the Tube Box and handles controlling the movements and diaphragm, should be efficiently earthed. For this purpose a flexible cable is preferable to a rigid wire, which may break or become disconnected. The earth wire should be connected to a water supply pipe, a drain pipe or an earthing plate. Wooden floors are safer than concrete for the operator. Concrete should be covered with some suitable material, such as wood or thick linoleum. Rubber-soled shoes may prevent a nasty accident.
2. When operating X-ray Tubes there should be no slack wires; all connections should be taut and kept so by a spring.
3. Whenever possible, heavily insulated wires should be used, but even these should always be treated with the same precaution as a bare wire, as the insulation deteriorates in the course of time.
4. All connecting wires and High Tension Apparatus must be out of easy reach or guarded so that assistants or patients cannot inadvertently touch them.
5. It is most important that overhead wires should be examined from time to time, and precaution should be taken so that a live wire cannot fall on the patient or operator. With this end in view, it is a good plan to place across the X-ray room several bare wires connected to earth and at right angles and below the High Tension overhead wires, so that should one of these break it is brought into contact with an earthed wire.
6. Periodically examine all wires leading from the High Tension Apparatus to the overhead High Tension Cables, and if necessary duplicate the method of fixing.
7. Great care should be taken that all fuses carry only the maximum current required by the apparatus, so that any overload or earth leakage will immediately blow the fuse.—*Archives of Radiology and Electrotherapy, January 1920.*

Books Received

AIDS TO ORGANOTHERAPY, by Ivo Geëkie Cobb, M.D., M.R.C.S., Neurologist. Author of the *Organs of Internal Secretion and A Manual of Neurasthenia*. Price 5 - net.

THE INTENSIVE TREATMENT OF SYPHILIS AND LOCOMOTOR ATAXIA BY AACHEN METHODS (with notes on Salvarsan), by Reginald Hayes, M.R.C.S. Fourth Edition, Revised. Price 4/6 net.

Both from the Press of Baillière, Tindall and Cox, 8 Henrietta St., Covent Garden, London.

RADIUM THERAPY, by Frank E. Simpson, M.D., Professor of Dermatology, Chicago Polyclinic; and Adjunct Clinical Professor of Dermatology, Northwestern University Medical School, Chicago. 166 original engravings. Price \$7.

THE PLACE OF VERSION IN OBSTETRICS, by Irving W. Potter, M.D., F.A.C.S., Buffalo, New York. 42 illustrations. Price \$5.

Both from the Press of C. V. Mosby Co., St. Louis, Mo.

NEWS NOTES.

The Hospital and Medical School of the Church Missionary Society at Hangchow, Chekiang, has recently received a gift of £10,000 for its educational work.

Dr. Claude M. Lee of St. Andrew's Hospital, Wusih, is sailing for America in August, with his family. During his absence the Hospital will be in charge of Dr. Mervyn C. Cooper of the American Church Mission, Shanghai.

Burroughs Wellcome & Co. are offering Oil of Chenopodium put up in capsules three minim size. Doctors will find in these a very convenient and desirable method of administering the oil in cases

of hookworm and the omnipresent ascaris.

Arrangements for the next general meeting of the C.M.M.A. at the Chinese New Year early in 1923 are well in hand, and a very interesting and profitable program is being planned, the details of which we hope to publish in the November number of the JOURNAL.

The American Church Mission Zangzok, Kiangsu, has recently opened medical work in that city. An Out-patient Dispensary, a building for In-patients and a residence are under construction. Dr. Walter H. Pott is in charge of this work.