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DYSENTERY IN SHANGHAI: RECENT RESEARCH.*

C. NOEL DAVIS, M.D., B.S., D.P.H., D.T.M. AND H., COMMISSIONER OF PUBLIC HEALTH, SHANGHAI.

This paper is given in fulfilment of a promise made to the Society last year and summarizes the recent work of my colleagues, Dr. Hill and his assistants, in the Municipal Laboratory,—work for which I myself am sincerely grateful, for it throws light on a problem which still remains to a certain extent obscure, and helps forward the campaign against disease in Shanghai, in which we all, in our varied capacities, are engaged.

It was intended to make a full examination of 150 freshly passed stools from cases of acute dysentery, and determine the relative prevalence of the two types: the bacillary and the amoebic. Unfortunately, it has not been possible to obtain the necessary material, and we have been obliged to content ourselves with a less satisfactory programme, and with results less conclusive, but still not without interest and practical importance.

Altogether 100 specimens of faeces were culturally examined between June 30 and October 20, 1922. As it was rarely possible to ascertain the age of the stools—a point of vital importance to the full success of the investigation—the specimens were divided into two series. The one, Series A, contained all specimens which had the typical appearance of acute dysentery—blood and mucus, with or without pus, free from faecal or bilious material, and not obviously stale or contaminated with urine. The other, Series B, included those which did not fulfil all these requirements, and a small number of which the naked-eye record was incomplete. All these were microscopically examined, and in addition 78 miscellaneous faecal specimens were examined for amoebae at the

* Read before The Shanghai Medical Society, November 16th, 1922
Central Laboratory, and 56 fairly fresh specimens were examined in the General Hospital. The total numbers were therefore 234 microscopical, and 100 cultural examinations.

The results of the microscopical examinations were as follows: out of the total of 234 specimens, *E. histolytica* was found 13 times, *E. coli* twice, and doubtful results were obtained 5 times; 214 specimens were negative.

These results need elucidation, a matter of some difficulty. In the first place, at least one-third of the specimens were unpromising, and in very few of the rest was there any note of the age of the specimen. The fundamental importance of this point is well illustrated by the following case. An acute dysenteric stool was thoroughly examined, 1½ hours after passage, with negative results. As the naked-eye and microscopical appearances were very suspicious, another specimen was examined within 5 minutes of passage, and several active *E. histolyticae* were found in two minutes' search. This is an extreme instance, but it shows how little reliance can be placed on a negative result, unless due precautions are taken to eliminate the chance of spontaneous disintegration, which may occur with great rapidity, especially in hot weather. Another weakness which tends to vitiate any conclusions drawn even from the examination of fresh stools, is the fact that it was found on enquiry in several instances that the patient had already been treated with emetine before the examination was asked for. The effect of this treatment is sometimes a dramatically swift disappearance of amoebae from the stools. Any conclusions drawn from this year's examinations must therefore be regarded as purely tentative, and undoubtedly the percentage of amoebic infections must be considerably higher than appears. The actual percentage of positive results was about six per cent. The number of infections may well have been double that percentage.

Taking only the results in Series A,—cases of typical acute dysentery—we are on somewhat firmer ground, for in addition to the direct evidence of the discovery of amoebae, it was often found possible to recognise the amoebic cases with the naked eye, and the microscopic appearances were still more characteristic. The total number of cases in this series was fifty, and the results divide themselves into two periods of time. From June 30 to September 15, 1922, no amoebae were found in any case, while dysentery
bacilli were isolated from sixteen out of the total of thirty specimens. No *E. histolytica* was found during the same period in the Series B cases, the miscellaneous cases, or in the specimens from the General Hospital. All the specimens of acute dysentery during this period had the same naked-eye and microscopical appearances which we now consider characteristic of bacillary dysentery; that is to say, opaque, grey mucus, with specks of blood showing under the microscope pus cells, endothelial macrophages, and rows of columnar cells. It is therefore considered fairly safe to say that in 1922, during this period, pure acute amoebic dysentery was the exception. While it is possible that in some cases amoebae may have been present originally and may have died out before examination or have been removed by emetine, the fact remains that the characteristic appearances of bacillary dysentery were present in every case, and the bacilli were found in more than half the cases examined culturally. If amoebae were present at all, these must have been cases of mixed dysentery. At any rate, the bacillary element was undoubtedly present in the majority.

After September 15, 1922, the picture changed. In the remaining twenty cases of this series *E. histolytica* was found four times, once associated with the Flexner bacillus. During this period it was also found once in twenty-two of the series B cases, six times out of seventeen in the miscellaneous faecal specimens examined, and three times in the specimens from the General Hospital. In all it was found fourteen times in about sixty-five examinations, which included an indeterminate number of unsuitable specimens, that is, about twenty-one per cent. Only five of these were cases of typical acute dysentery, and one of these five was a mixed amœbic and bacillary infection. The other nine were cases of mucous diarrhoea in which amœbæ in various stages were found.

Coming now to the figures of the cultural examinations. The results are fairly uniform throughout the period, except that in October, 1922, the percentage was somewhat lowered by the inclusion of the amœbic cases, and that at this time rather more positive results were obtainable from the non-typical specimens than at first. Possibly, to some extent, this was the result of improved technique. Out of 50 of the Series A cases, dysentery bacilli were isolated twenty-four times. Omitting the pure amœbic cases, the figure would be twenty four positive out of a total of forty seven—
practically fifty per cent. By far the larger number of these were Flexner bacilli; Shiga bacilli were found only three times. Four of our Flexner bacilli cultures and one Shiga culture were selected at random and injected into rabbits; the sera of these rabbits agglutinated the corresponding stock bacilli to high titres. Again, the absence of information as to the age of the specimens makes it impossible to say whether the negative results were really due to absence of infection. The dysentery bacilli, especially Shiga, are very delicate organisms. It has been shown that fifty per cent. of them are dead within four hours of the passage of the stool. Even under the most favourable conditions, during a recognised epidemic, it is unusual to get more than 75%-80% of positive results. It is therefore probable that our fifty per cent. represents a considerably larger proportion of infections, but how much larger it is not possible to say. In three cases in which negative results were obtained we were able to test the agglutination reactions of the patients’ serum for Shiga and Flexner bacilli, and in each case readings were obtained sufficiently high to be practically diagnostic of infection, once with Shiga bacilli, twice with Flexner bacilli. Moreover, in order to be on absolutely firm ground, we accepted as dysentery bacilli only organisms which gave good agglutination with a standard agglutinating serum and also gave typical fermentation reactions. It is known that about six per cent. of true dysentery bacilli are not agglutinable, at any rate on first isolation, and that occasionally the fermentation reactions may vary from the standard; it is probable therefore that some four or five specimens of bacilli rejected were true dysentery bacilli. At any rate it is certainly justifiable to say that a considerable proportion of cases of acute dysentery occurring in July, August and the first half of September in 1922 showed infection with dysentery bacilli; that the bacillary cases greatly exceeded the amoebic during that period; that after September 15th, bacillary infections continued to account for the majority of cases of acute dysentery, though amoebic and mixed cases increased in frequency and became fairly common in early October; and that amoebic diarrhoea, that is to say, diarrhoea in which the stools contained faeces as well as mucus and sometimes blood, was all the time commoner than acute amoebic dysentery.

The Series B specimens—those containing faecal matter or bile-stained, or suspected of being stale, or contaminated with urine,
or with incomplete records of naked-eye appearance—numbered fifty. Flexner bacilli were isolated from fourteen. One of these was a typical specimen of acute bacillary dysentery, but was contaminated with urine; three were from children with green mucous stools; one was from a faecal stool with microscopical appearances suggesting chronic bacillary dysentery, i.e., with strands of mucus showing numerous detached columnar cells; the other nine specimens, four of which were from children, were either not typical in appearance or the notes were incomplete. Among the negative cases was one of amoebic diarrhoea; the majority of the rest were unpromising semi-faecal specimens which were only examined because the examination had been asked for, and with only an off-chance of finding anything.

The incidence of acute amoebic dysentery, and even of amoebic bowel trouble, bears no relation whatever to the actual frequency of amoebic infection. This is a point which cannot be too strongly insisted upon. Dobell records the results of a series of artificial infections in human subjects. Twenty men swallowed living amoebae; eighteen of these became infected and remained so, apparently indefinitely; but only four developed any symptoms of intestinal trouble up to the end of the period of observation. The incubation periods in these four patients were 20, 57, 87, and 95 days. The observations of past years in Shanghai have shown that cysts and precystic forms of E. histolytica have been demonstrable in about ten per cent. of specimens submitted, most being found in the winter. As the passage of cysts is intermittent, probably seasonal, and they are often very scanty, these positive findings must represent a much greater percentage of actual infections among the population. In England an extensive investigation has shown that E. histolytica is present in about eight per cent of the population at the present time, not including those who have been living in endemic areas; and yet amoebic intestinal disease remains as uncommon as before.

This observation is of practical importance because it has a bearing on treatment; but before discussing treatment, which I shall only do in briefest outline, and in so far as pathology throws some light on general principles, it will be necessary to say a few words on the subject of the pathology of these two forms of dysentery.

Of the pathology of amoebic dysentery I need say very little. It was excellently described at a meeting of this society last year.
by Dr. Billinghurst and fully discussed. I wish particularly to emphasize the fact, already well-known to all of us, that dysentery is only an incident, and a comparatively uncommon incident, in amoebic infection. Amoebiasis is a very chronic and very widespread infection, and the essential lesion of it is typhlitis, i.e., inflammation of the caecum. It is generally held, though some dispute it, that *E. histolytica* is in all stages parasitic, except in the cystic stage, and never saprophytic. Its habitat is the caecum, and in all cases for most of the time, and in most cases for all of the time, the lesions produced, if any, are so slight as to be entirely negligible; the balance between host and parasite is maintained. But under certain circumstances, chiefly climatic, the organism and its lesions may spread from the original focus in the caecum. The typhlitis may become acute, producing signs and symptoms closely resembling those of appendicitis; the appendix itself may be invaded either by the amoebae, or undergo secondary infection with septic organisms; amoebae may travel by the portal vessels to the liver, producing hepatitis or abscess, or they may spread to the colon, producing mucous diarrhoea, or finally to the sigmoid and rectum, producing dysentery. To think of liver abscess, therefore, as a sequel of dysentery is something of a misconception. Liver abscess and dysentery are independent manifestations of amoebiasis, which may, and fairly often do, occur in the same patient when tissue-resistance to the organism has broken down; but Indian and other statistics show that nearly forty per cent. of patients with liver abscess give no history of dysentery; and in about twenty per cent. there is not even a history of memorable bowel trouble of any kind.

The bearing of this fact on treatment is, that so long as amoebic infection is widespread among the population there is always the possibility of a recrudescence of amoebic dysentery and other amoebic manifestations. Although for the past few years acute amoebic dysentery has not been very common, this is no guarantee that next year and the next it will continue to be uncommon. And even now it is worth while considering whether some of the less obvious manifestations of amoebiasis may not be commoner than is generally supposed. In particular we would like to make a systematic investigation of a series of appendices removed at operation, to see whether there is any evidence of an amoebic origin of the trouble.
Dysentery in Shanghai.

There is another point in which pathology has an indication for treatment. It is well-known that any disturbance of the bowel is apt to light up acute amoebic invasion in a chronic carrier. An operation for hernia may do so; but particularly is it a common event in various intestinal infections. In the early days of the war, the pathologists in Egypt reported that ulceration of the large intestine was a feature of paratyphoid, in contra-distinction to typhoid which only affected the small intestine. It was afterwards recognized that this ulceration was due to secondary invasion of a congested gut by the resident amoebae. Clinically, it was no uncommon thing for a man to have an attack of amoebic dysentery during the incubation period of paratyphoid. Many a patient admitted with amoebic dysentery developed typical paratyphoid within a few days of admission. In this connection it is interesting to note that this evidently occurred in one of our positive amoebic cases this year, a strong positive Widal reaction being obtained a week after unmistakable moving E. histolyticae had been seen in a mucous stool from the same patient. Secondary amoebic invasion is even more common in bacillary dysentery; indeed, where both are rife, the pathologists are often divided in opinion as to which is the primary cause of the prevailing dysentery. In one large hospital in the Mediterranean area, the bacteriologist found that over fifty per cent. were bacillary, and the protozoologist claimed that ninety per cent. were amoebic. The fact is, the majority of the cases, when once chronic amoebic infection had become common, were cases of mixed dysentery. In one of our four cases of acute amoebic dysentery we found Flexner bacilli as well, and the microscopic appearances of both types. It is therefore worth while to remember that in an endemic area like Shanghai a case beginning as pure bacillary dysentery may become mixed; and it is a question whether it would not be good practice to anticipate this possibility and eliminate it by emetine treatment at the outset. As a general rule forty-eight hours emetine treatment of two to three grains will put amoebae out of the way of doing mischief for at least ten days, by which time the bacillary condition will usually be mended or ended.

To turn now for a few minutes to the pathology of bacillary dysentery. It will be easiest to bring out the essential points by contrasting it with enteritis. The bacilli which produce enteritis, which are mostly close relations of the paratyphoid organisms, do their work by manufacturing a toxin in the iumen of the gut and
this toxin irritates and inflames the mucous membrane. Most of them can get no further than the lumen of the gut; a few strains of *Paratyphoid B* are able both to produce enteritis and also to invade the blood; some strains can do the one, some the other, some either or both. If the blood is not invaded, the bacilli and their toxins, and with them the capacity for further damage, can be removed by one or two good sound purges. Not so the dysentery bacilli.

The dysentery bacilli live in or on the mucous membrane; and their toxin is not directly irritant to it. The toxin does not act primarily at the site of its production, but only after it has reached the general circulation. Its mode of action is by producing a peri-arterial necrosis, which has a special affinity for the small arteries of the intestine, the action being, as a rule, more intense the nearer the rectum. This necrosis interferes with the nutrition of the mucous membrane and a general desquamation and necrosis results which may be more or less intense, and affect a larger or smaller area, according to the virulence and amount of the infection. These bacilli cannot be removed by one or two purges, and so long as they remain *in situ* they will continue to produce their toxin. The indication, on which the treatment used with such great success in S. Africa and afterwards in the Mediterranean was based, was to keep on removing the toxin as continuously as it was formed; and to this end sodium sulphate, in comparatively large and concentrated doses, was given every hour day, and night, till the stools showed signs of improvement, when the interval was gradually lengthened. This was the general principle. Individual cases sometimes called for modifications; the treatment was not nearly so drastic as it sounds, for the acute cases in which the treatment was specially indicated were mostly kept awake by the dysentery, and it was simply a matter of giving the doses. The relief was undoubtedly great, and the success of the treatment marked. The rationale is that the concentrated salts produce an osmotic current towards the lumen of the bowel, and so wash the toxin out of the mucous membrane away from the circulation, hinder its absorption, and finally remove it; and as fast as a fresh supply of toxin is manufactured a fresh dose of salts comes along to wash it away. So long as the toxin is not absorbed it can do no harm; consequently, the bowel is able to set about repairing itself at once.

I will not touch on the question of serum treatment, except to say that obviously the time for it is early, before the necrosis has
been accomplished. Once the arteries are damaged, and the gut necrosed, no amount of serum can repair the injury and after the third or fourth day, in most cases, the patient will have begun to manufacture his own anti-toxin, so that a few c.c. of serum from a horse will be, as it were, only a drop in a bucket.

I will conclude by mentioning a fact which may perhaps explain the evil reputation of emetine in Shanghai as a cause of paralysis, a sequel which I believe was never observed among all the thousands of cases treated in the Mediterranean area. Several cases of paralysis were observed there as sequelae of bacillary dysentery in patients who had never had any emetine; and some authors state that it is not at all uncommon, though its frequency, like that of the other common sequela, arthritis, varies in different epidemics. It seems not impossible that the cases developing paralysis after courses of emetine in Shanghai may have been really cases of mixed amoebic and bacillary dysentery and owed their paralysis to the toxins of the bacilli. One point in favour of this explanation is the comparatively slow effect of emetine reported by some physicians. In typical, pure amoebic dysentery nothing can be more dramatic than the effect of emetine treatment; and if in any case the patient is not practically convalescent on the third day, it is almost certain that some other infection is complicating the dysentery. A gradual recovery after seven to ten days is the usual event in bacillary dysentery, of moderate severity, without special treatment. Mixed infections, as one would expect, show a greater or less degree of improvement during the first two or three days of emetine treatment, and then further progress is slow; pure amoebic cases are convalescent in three days.

May I, in conclusion, thank you all for giving us your help in the past, and may I beg you to continue to do so in the future, especially in the matter of sending us the freshest possible specimens, carefully chosen, so that our investigations may continue to throw more light on the obscurer aspects of intestinal disease in Shanghai, especially the dysenteries.
I. THE PHYSICO-CHEMICAL BASIS.

To facilitate somewhat the discussion of this subject it may be advantageous to refer briefly to certain fundamental points in physical chemistry which form the basis of the mechanism which regulates the neutrality of the blood.

That all chemical reactions are theoretically reversible implies an equilibrium point. This can be exemplified in the case of H₂O, which breaks up into the ions H and OH and these as soon as formed immediately reunite. Thus in one direction it is a bimolecular reaction, while in the other it is a monomolecular reaction.

Ions are always electrically charged and every ion bears the same charge be it positive or negative, namely, one farad per gram ion. In other words it is necessary to pass 96500 coulombs of electricity (= 1 farad) through a solution of electrolytes to deposit 1 gram equivalent of ions on an electrode.

For example, one coulomb of electricity liberates 0.0011183 grams of silver, which figure represents the electro-chemical equivalent of silver; the atomic weight of silver is 107.88 from which it will be seen that to deposit 107.88 grams or 1 gram ion 96,500 coulombs of electricity are required. But it may be asked where does the electric charge come from?

Studies of cathode rays have resulted in the discovery that these rays consist of particles whose mass is \(8.8 \times 10^{-28}\) grams, or \(\frac{1}{1860}\) part of an atom of hydrogen, and with each mass is associated a negative charge. To these particles the name electron has been given, and because of their extreme minuteness they have a velocity far exceeding that of atoms or ions. The velocity of these minute particles approaches that of light, namely, \(3 \times 10^{10}\) cm. per second. The electrical charge on an electron is constant; the electron seems to be the ultimate and indivisible unit of electricity.
Fig 1.— Curve indicating calculated relationships between NaHCO₃ : H₂CO₃ and Na₂HPO₄ : NaH₂PO₄. Equilibrium at 18°C: [H][OH] = 1 × 10⁻⁷.
Fig 2.—The Regulation of the Neutrality of the Blood.

Buffer action of

NaHCO₃ : H₂CO₃

Maximum effect when

Ratio = 1.
It has been assumed by J. J. Thomson in his corpuscular theory of atoms that all atoms are spheres of positive electricity around which are grouped, as in a planetary system, the negatively charged electrons. In the elaboration of this theory, Langmuir and Lewis have suggested that the metal atoms consist of a positive nucleus, which forms by far the greater part by weight of the atom; and of a definite arrangement of electrons, one, two, three, or more of which can be given up by the atoms, which thereby develop a stable configuration.

Conversely the "non-metal" atoms can receive into their systems of electrons one, two or more electrons. Here then is an explanation of the development of electric charges of known sign by these "metal" and "non-metal" atoms. The loss of a negative electron leaves the metal atom positive, and it can be taken that the number of electrons which group themselves around the nucleus is a measure of the degree to which the "metal" atom can be electrically charged.

In the same way, by the addition of negative electrons the "non-metal" atom becomes relatively more negative. The number of electrons which can be taken up or given off by any atom is constant for that atom, and it is by means of this process of rearrangement or mutual adjustment between atoms that chemical combinations take place; it is by this means that these positive and negative electrical charges are produced which hold together the atoms composing molecules of acids, bases or salts.

The process whereby these atoms are separated or dissociated depends upon the fact that certain media such as water, alcohol, air, paraffin, have a certain definite dielectric constant. It is understood that in a condenser there is an electric field in the medium between the two conducting surfaces, and that the electrostatic charges persist simply because the medium is non-conducting. The force which is exerted between the two charges depends upon and varies according to the specific nature of the intervening medium or dielectric, and to this quantity is given the name dielectric constant or specific inductive capacity, which is usually represented by the letter \( k \).

For air at 760 mm. Hg pressure, \( k = 1 \), and this is taken as the standard; for paraffin \( k = 2.3 \), for glass 8.4, and for water it is 81.7. We see then that the greater the dielectric constant of the
medium separating ions bearing opposite electrical charges, the greater will be the resistance offered to their union or association. There exists, therefore, a direct relationship between the ionising power of a solvent and its dielectric constant. The higher the value of \( k \) the greater is the dissociating power of the solvent. The dielectric constant is thus a measure of the insulating capacity of the solvent. Dissociation then is a process whereby atoms bearing opposite charges are separated by the intervention of the molecules of a dielectric medium. Substances added to the solvent alter its dielectric constant, and the greater the amount of the solvent in comparison with that of the ions of the solute, the greater will be its dielectric effect. Thus it is that at high dilutions strong electrolytes are wholly ionised, their ions being kept apart by hydration; and on account of the great dilution the positive ions have their chances of colliding and uniting with negative ions reduced almost to a negative quantity.

It must not be forgotten that in ordinary chemical reactions the dilution is far from maximal, and a position of equilibrium is therefore reached in which association or attractive forces of positive ion for negative ion, and dissociation or disruptive forces, are equally balanced.

If two electrodes carrying an electrical current be dipped into a solution of ions the cations will migrate to the cathode or negative electrode, while the anions will pass to the anode, or positive electrode. It is seen therefore that a solution of ions will carry an electric current and that its efficiency in this respect depends upon the number of ions in solution; that is, upon the degree of dissociation of the substance. This function of ions affords a means for estimating the degree of dissociation of ions by determining the molecular conductivity of the solution. The conductivity of a solution, then, is an estimate of the degree of dissociation of the solute in a particular solvent, and in such an estimation the electrical resistance in ohms is actually measured, the reciprocal of the figure thus found being the measure of the conductivity. The electric resistance of solutions is measured by means of the Kohlrausch method, which requires the use of a standardised conductivity cell placed in one of the arms of a Wheatstone bridge.
Table I.—The relative ionic speeds and the speed in cm. per hour of a few of the principal univalent ions in dilute solution at 18°C.

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<th>Cations</th>
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<td>Relative speed</td>
<td>Centimeter per hour</td>
<td>Ion</td>
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<td>33.4</td>
<td>1.13</td>
<td>CH₃OOO</td>
<td>59</td>
</tr>
</tbody>
</table>

It has been stated that with the organic ions the longer the carbon chain the less the speed, but the decrease in speed is comparatively slight. The speed of an ion if it were not hydrated would be proportional to its mass; therefore any variation from this proportion is usually attributed to hydration of the ions. Hydration of an ion lessens its velocity; velocity is therefore minimal when hydration is maximal and this occurs only at infinite dilution.

Electrolytic Dissociation.—Generally we may divide electrolytes into two classes, strong and weak; the former are greatly dissociated, while the latter are poorly dissociated.

According to Arrhenius, to whom the theory of electrolytic dissociation is due, only those molecules which are dissociated play any part in conducting electricity; the undissociated molecules remain inactive. He it was who first measured the degree of dissociation of a substance by determining the conductivity of its solution. Since every univalent ion carries the same load of electricity, the degree of conductivity must depend upon the number of ions and the rate at which they move. Kohlrausch showed that the molecular conductivity of a salt in solution increases as the dilution increases, and that the rate of increase of conductivity becomes smaller as the dilution becomes greater, until finally it remains constant.
When the salt has been wholly dissociated and no further increase in the speed or the number of ions can be obtained, the increase in conductivity will cease. The molecular conductivity at complete ionisation is called the molecular conductivity at infinite dilution.

At finite dilutions therefore the degree of dissociation is equal to the quotient of the molecular conductivity at the dilution divided by the molecular conductivity at infinite dilution. The degree of dissociation or ionisation is expressed by the equation:

\[ a = \frac{m}{m} \frac{a}{m \infty} \]

For example, the degree of ionisation of 0.1 normal NaCl at a dilution of 10 litres is found by dividing the molecular conductivity at 10 litres, 92.5, by the molecular conductivity at infinite dilution, 109.2, which gives 0.843 as a quotient; that is to say, 84 per cent. of the salt has been dissociated. An increase in temperature will increase the conductivity, but since at 18°C. the salt is 84.0 per cent. ionised, it is evident that this increase in conductivity is due to the increased speed of the ions. The addition of non-conducting substances to salt solutions lowers the conductivity by first diminishing the speed of the ions, and then, as with high percentages of such a substance as alcohol, by diminishing the degree of dissociation.

The Dissociation Constant.—The law of mass action (Guldberg and Waage's Law of Mass Action) demands that the product of the concentration of the reacting substances be equal, or bear a direct relationship, to the mass of the resultant substance.

For example, acetic acid and methyl alcohol react to form methyl acetate and water, and this reaction, being reversible, proceeds until a condition of equilibrium is reached according to the equation:

\[ \text{CH}_3 \text{COOH} + \text{CH}_3 \text{OH} \rightarrow \text{CH}_3 \text{COOCH}_3 + \text{H}_2\text{O} \]

Before the law of mass action was formulated Ostwald devised an equation which was applicable to this type of reaction, and which is known as Ostwald's dilution law. If \( a \) represents the degree of dissociation of such an electrolyte dissolved in \( v \) litres of water, the concentration of the cations and of the anions is \( \frac{a}{v} \), and for the
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undissociated part it is \( \frac{1-a}{v} \). Now dissociation and association processes are going on at one and the same time; and the rapidity of dissociation depends upon the concentration of the molecules \( \frac{1-a}{v} \); while the rapidity of association depends upon the product of the concentrations of the two ions, \( \frac{a}{v} \times \frac{a}{v} \);

and at equilibrium we have, \( \frac{a}{v} \times \frac{a}{v} = k \frac{1-a}{v} \),

\[ k = \frac{a^2}{v(1-a)} \]

This equation indicates that the greater the dilution the greater will be the ionisation; that is to say, the further will the ions be removed from one another and therefore the less chance will they have of colliding and recombining to form molecules.

II. NEUTRALITY IN AQUEOUS SOLUTIONS

The strength of an acid depends upon the degree of dissociation of the acid in solution and therefore upon the concentration of hydrogen ions. While it is sufficient to define the acidity of a solution by stating the value of its concentration in hydrogen ions, it is also useful to compare the strength of different acids by numbers independent of concentration. This is usually done by means of a dissociation constant. A constant sums up into one factor the value of all kinds of conditions under which any reaction may take place, and in any calculation based upon such reactions the various constants can be used provided that the conditions which determine the constants remain unaltered. In reactions associated with equilibrium the ratio of the velocity constants of both sides of the equation is known as the equilibrium constant and is written \( k \), while the formulae in brackets represent the concentrations of the reacting substances.

It is known that certain salts are not neutral to indicators. Sodium fluoride in saturated solution is acid to phenolsulphophenolphthaleine, while a saturated solution of potassium oxalate is dis-
tinctly alkaline; and again sodium carbonate is alkaline to phenolphthalein while alum is acid. According to the theory of electrolytic dissociation, acidity is due to the presence of H-ions while alkalinity is due to OH-ions. The indicator effects obtained must therefore be due to a liberation from the solvent water of one of these ions in excess of the other, and that in a concentration sufficient to affect the indicators used.

This liberation of ions is a function of the salt which either possesses an additional H or OH-ion or upsets the balance between H or OH-ions in water. The original solvent, therefore, should be absolutely neutral if we are to gauge accurately the acidity or alkalinity of the solution of a salt. The solvent which is of greatest practical utility is water because it dissociates slowly and to a very minimal extent.

Ordinary tap water, however, is alkaline and has a considerable electrical conductivity due to the presence of impurities such as salts dissolved in it. Impurities are removed first by double distillation; the distilled water is then boiled and cooled under a soda lime tube to free it from carbon dioxide and any traces of ammonia, and is finally stored in pyrex or non-sol glass flasks which have been previously coated with paraffin. According to Kohlrausch the purest water obtained has an electrical conductivity of $0.36 \times 10^{-7}$ at $18^\circ\text{C}$. or $0.54 \times 10^{-7}$ at $25^\circ\text{C}$. This indicates a very low degree of dissociation and from such figures and knowing the ionic velocities of hydron and hydroxion, the concentration of the H and OH-ions has been calculated. The figure representing the concentration of H-ions in pure water is usually given as $1.0 \times 10^{-7}$ at $25^\circ\text{C}$.

This represents the fraction of the gram atomic weight of hydrogen in one litre of pure water, and it applies equally to the OH-ion in accordance with the equilibrium equation:

$$[\text{H}^+] \times [\text{OH}^-] = k \ [\text{H}_2\text{O}]$$

Since the active mass of the non-ionised water is so large in relation to the active mass of the ions as to be practically invariable, the non-ionised portion can be neglected and the equation written:

$$\text{H} \times \text{OH} = K_w, \text{ and } [\text{H}^+] = [\text{OH}^-] = \sqrt{K_w}.$$  

substituting for the ions the values for their concentrations we have:

$$K_w = (10^{-7}) \times (10^{-7}) = 10^{-14}$$

$K_w$ = the water constant.
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The ionisation constant is of importance because it holds good for water and for all dilute aqueous solutions. The product then of hydron and hydronion is the same in all dilute solutions whether they are acid, alkaline, or neutral. In pure water which is absolutely neutral the concentrations of $H^+$- and $OH^-$-ions are equal, and since the product of these ionic concentrations remains constant, it follows that all neutral solutions must contain the hydron and hydronion in concentrations equal to that obtaining in pure water, the temperature remaining constant. Thus we arrive at a definition of what constitutes an acid and an alkaline solution, namely, that in the former case the concentration of $H^+$-ions is greater than that of the $OH^-$-ions, while in the latter case the concentration of the $OH^-$-ions is greater than that of the $H^+$-ions. If in a solution the $H^+$-ions are in excess, then there must remain sufficient $OH^-$-ions to satisfy the equation. For example, if we have an alkaline solution with a concentration of $OH^-$-ions which is $0.1$ normal ($10^{-1}$), then the concentration of $H^+$-ions must be:

$$[H^+] = \frac{K_w}{[OH^-]} = \frac{10^{-14}}{10^{-1}} = 10^{-13};$$

or if we have $100$ c.c. of a solution with a $H^+$-ion concentration of $10^{-6}$ normal, it would be necessary to add $0.0001$ c.c. of a normal solution to neutralise it. Further, by making use of the water constant we may determine the number of $OH^-$-ions in a deci-normal solution of acetic acid. The dissociation constant of acetic acid is $1.82 \times 10^{-5}$ at $18^\circ C.$ and with a dilution of $10$ litres the degree of dissociation is $0.013$, or the $H^+$-ion concentration is $0.0013$ normal, from which we have:

$$(1.3 \times 10^{-5}) \times OH = 10^{-14};$$

that is, $OH = 0.77 \times 10^{-11}$.

The concentration therefore of the hydronion in $0.1$ normal; acetic acid is $0.77 \times 10^{-11}$ normal.

III.—Mathematical Methods of Expressing the Concentration of Hydrogen Ions

An acid of normal strength contains one gram of hydrogen capable of forming hydrogen ions, and its strength is expressed as $1$ N. If it is diluted ten times its strength is $0.1$ N; if it is diluted one ten million times, its strength is $0.000001$ N, which indicates that the amount of hydrogen in one litre is $1/10,000,000$
gram of hydrogen ions, the amount of hydrogen ions in pure water. There is in neutral solutions an equivalent amount of hydroxyl ions, that is \(1/10,000,000\) of the weight of hydroxyl ions forming a normal solution, namely 17 grams. To avoid using these large figures the logarithmic notation is always used, so that \(0.000001\) N becomes \(10^{-7}\) N.

The pH scale.—As a normal solution of an acid has been defined as one containing in one litre of the solution the equivalent of one gram atom of acidic hydrogen, so the normal solution of hydrogen ions was defined as one containing in one litre of the solution one gram atom of hydrogen ions.

The former unit expresses the total quantity of available acid; the latter the concentration of hydrogen ions and therefore the intensity of the acidity. This is admirably expressed when we use for hydrogen ion concentrations a mode of expression which links it with the potential of a hydrogen electrode. It so happens that in determining the hydrogen ion concentration by means of the hydrogen electrode the potentials of this electrode are put into an equation which reduces to the form:

\[
\text{Potential} = \frac{\text{Numerical factor}}{\log [H^+]^+} = -\log H. = 10^{-7}.
\]

Sörensen, in his *Enzyme Studies* published in 1909, used this form to express hydrogen ion concentration and he suggested that for convenience the 10 with its minus sign be dropped, and only the exponent of the power be retained. To indicate this new figure he used the expression \(P_H\), which has now, solely for typographical convenience, been altered to pH, so that \(\text{pH} = \log [H^+]^+\).

The relationship of \([H]\) or \(C_H\) to pH may be shown thus:

If \([H^+] = 2 \times 10^{-4}\) then \(\log [H^+]^+ = \log \frac{1}{2 \times 10^{-4}} = \log 5000 = 3.699\);

\(\text{pH} = 3.699.\)

While there are several advantages in this method of notation, it does not at a glance indicate the degree of variation in hydrogen ion concentration, as does the older and more cumbersome method.
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If the pH at 18°C is 7.3, and at 23°C it is 7.0, the fact that the H-ion concentration at 23°C is double what it is at 18°C is not numerically indicated; while if the negative exponent is kept as a whole number and the fraction be kept as a multiplier the relation is seen at once. For example:

18°C. pH = 7.3 = 0.5 \times 10^{-7} = \text{CH}.

23°C. pH = 7.0 = 1.0 \times 10^{-7} = \text{CH}.

or, as in the following Table:

Table II.—Showing H-ion concentration from one-tenth normal acid to neutrality:

<table>
<thead>
<tr>
<th>pH</th>
<th>Normal Acid Concentration</th>
<th>H-ion Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.1 N acid</td>
<td>10^{-1} = 1000000 \times 10^{-7} H^+ ions</td>
</tr>
<tr>
<td>2</td>
<td>0.01 N</td>
<td>10^{-2} = 100000 \times 10^{-7}</td>
</tr>
<tr>
<td>3</td>
<td>0.001 N</td>
<td>10^{-3} = 10000 \times 10^{-7}</td>
</tr>
<tr>
<td>4</td>
<td>0.0001 N</td>
<td>10^{-4} = 1000 \times 10^{-7}</td>
</tr>
<tr>
<td>5</td>
<td>0.00001 N</td>
<td>10^{-5} = 100 \times 10^{-7}</td>
</tr>
<tr>
<td>6</td>
<td>0.000001 N</td>
<td>10^{-6} = 10 \times 10^{-7}</td>
</tr>
<tr>
<td>7</td>
<td>0.0000001 N</td>
<td>10^{-7} = Neutrality</td>
</tr>
<tr>
<td>8</td>
<td>0.00000001 N</td>
<td>10^{-8} = 0.1 \times 10^{-7} H^+ ions</td>
</tr>
</tbody>
</table>

or = 0.000001 N alkali = 10^{-6} = 10 \times 10^{-7} OH^- ions

pH14 = .00000000000001 N acid = 10^{-14} = 0.0000001 \times 10^{-7} H^+ ions

or = 0.1 N alkali = 10^{-1} = 0.000000 \times 10^{-7} d=OH^- ions.

Thus one sees that the cumbersome array of figures gives us at once the degree of acidity, while with the other notation the smaller the exponent the greater is the acidity. Further, it should be remembered that the pH is a measure, not of the amount of acid present, but of its strength; it gives the number of H^+ ions per litre and not the number of c.c. of acid present, which latter can be determined by titration.

All normal solutions of acids are equal with regard to the amount of alkali which they can neutralise; that is, they have the same titratable acidity, but they differ with regard to their hydrogen-ion concentrations. For example:

0.1 N HCl at 23°C. = pH 1 or CH = 1 \times 10^{-1} = 100 \times 10^{-3}.

0.1 N CH₃COOH at 23°C. = pH 2.866CH=1.36 \times 10^{-3} 1.36 \times 10^{-3}.

This means that hydrochloric acid has 73.5 times the amount of hydrogen ions per litre that acetic acid has, which is equal to saying that 0.1N HCl is 73.5 times as strong as 0.1N CH₃COOH.
The reason for this is, decinormal hydrochloric acid at this
temperature is almost wholly dissociated; while decinormal acetic
acid is only 1.36 per cent dissociated. Therefore the hydrogen ion
conscentration is equal to $1.36/100 \times 10^{-1}$, i.e. $1.36 \times 10^{-3}$.

IV.—THE ACTION OF BUFFER SALTS

Much has been said for and against the use of the word buffer,
which is meant to denote any substance or substances which can
absorb ions. The action of absorbing or of soaking up ions was
first expressed by Fernbach and Hubert in 1900 by the word
tampon. This word was used by Sørensen in 1909, being rendered
into German by the word Puffer, and from that into the English
word buffer. While it fails to describe what actually occurs,
nevertheless the word does give the idea of protection by absorption
of a force which would otherwise be injurious.

There are certain types of chemical reactions a knowledge of
which is fundamental to an understanding of this subject of neutral­
ity regulation.

Fundamental Chemical Reactions.—The first is the action of
a strong base on a weak acid; a strong base such as NaOH is
highly ionized, while a weak acid such as acetic acid is slightly
ionized. These react to form water, which is very slightly ionized;
and sodium acetate, which is very highly ionized. If we mix equal
amounts of normal sodium hydrate and normal acetic acid, we find
that the resulting solution is alkaline to litmus, whereas if the
reaction were complete the solution would be neutral, that is to say,
there are still hydroxyl ions present. The cause of this condition may
be indicated by the following arrangement of the compound equation :

\[
\begin{align*}
\text{CH}_3\text{COOH} & \rightleftharpoons \text{H}^+ \text{CH}_3\text{COO}^- \\
\text{NaOH} & \rightleftharpoons \text{OH}^- \text{Na}^+ \\
\text{H}_2\text{O} & \rightleftharpoons \text{CH}_3\text{COONa}
\end{align*}
\]

Upon mixing the solutions, the sodium hydrate immediately
dissociates into many Na and OH-ions; the acetic acid dissociates
into a very small number of H and CH$_3$COO-ions. As a result,
H$_2$O and a small amount of CH$_3$COONa are formed, the former
being very slightly ionized, the latter almost wholly ionized. The
formation of water reduces the number of H-ions, and the OH-ions
being in excess, the result is that, since more H-ions are required
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to satisfy the equilibrium equation for water, these hydriions are produced by the further dissociation of the acetic acid molecules into H and CH₃COO-ions. The former unite almost completely with OH-ions; the latter are free and because of their tendency to unite with H-ions they reduce still further the H-ion content of the solution. Since water is much less ionized than acetic acid the majority of the H-ions take part in the formation of water. The compound reaction proceeds until almost all the acetic acid has been dissociated and the maximal amount of water formed. The hydroxyl ions left are those due to the small degree of dissociation of water; the equivalent amount of H-ions which are also left in solution are taken up by the acetanions to form the small amount of acetic acid which is ultimately present in the solution. Thus there is left in the solution an excess of OH-ions over the H-ions:

Another reaction of importance is that of the salt of a strong base and a weak acid upon water, which is indicated to a certain degree by the equation:

$$\text{CH}_3\text{COONa} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{COOH} + \text{NaOH}$$

When sodium acetate is dissolved in water it dissociates to form many Na and CH₃COO-ions. Water contains a few H and OH-ions and occasional collisions of H-ions with CH₃COO-ions result in the formation of CH₃COOH molecules, which have little tendency to ionize. This disturbs the equilibrium of the dissociation of water, and occasions a further production of H and OH-ions. Few of the OH-ions unite with Na ions, but the acetanion takes up practically all the free H-ions leaving the reaction of the solution alkaline. This double decomposition reaction in which water plays a part is termed hydrolysis, and the degree of hydrolysis and the alkalinity of the solution depend upon the dissociation constant of the acid. The weaker the acid the greater the degree of hydrolysis and the greater the alkalinity of the final solution.

This production of alkalinity by the salt of a strong base and a weak acid is of physiological importance, as most of the salts of the body are composed of organic acids combined with the strong bases sodium and potassium.

The reaction of a comparatively weak acid and weak base results in the formation of water and of very minimal and balanced amounts of H and OH ions. The degree of hydrolysis depends upon the strength or weakness of the acid and base.
Physiological Reactions.—The fact that blood can withstand the addition of considerable amounts of free acid or alkali without any marked change in its reaction is due to the presence of carbonates and phosphates. In the case of the carbonates we are dealing with a base and a weak acid in which the dissociation results in a loss of free carbonic acid gas.

The dissociation of NaHCO₃ and H₂CO₃ takes place according to the following equations:

\[
\begin{align*}
\text{NaHCO}_3 & \rightleftharpoons \text{Na} + \text{HCO}_3^- \\
\text{H}_2\text{CO}_3 & \rightleftharpoons \text{H} + \text{HCO}_3^- \\
\text{H}_2\text{O} & \rightleftharpoons \text{H} + \text{OH} \\
\text{HCO}_3^- + \text{H}_2\text{O} & \rightleftharpoons \text{HH}_2\text{CO}_3 + \text{OH} \\
\end{align*}
\]

The sodium bicarbonate, as a weak base, produces few OH⁻ ions; but as a sodium salt it produces a considerable number of HCO₃⁻ ions. If CO₂ is added to a mixture of a bicarbonate and carbon dioxide, H₂CO₃ is formed and this increases the amount of HCO₃⁻ ions; with the result that there is an increase in the non-dissociated NaHCO₃.

The phosphate system consists of acid sodium phosphate (NaH₂PO₄). Mono-sodium phosphate, as a sodium salt, dissociates with the production of many Na and H₂PO₄⁻ ions, while as a weak acid it gives rise to very few H and HPO₄⁻ ions, according to the following equations:

\[
\begin{align*}
\text{NaH}_2\text{PO}_4 & \rightleftharpoons \text{Na} + \text{H}_2\text{PO}_4^- \\
\text{H}_2\text{PO}_4^- & \rightleftharpoons \text{H} + \text{HPO}_4^- \\
\end{align*}
\]

The di-sodium salt as a weak base gives rise to very few OH⁻ ions:

\[
\begin{align*}
\text{Na}_2\text{HPO}_4 & \rightleftharpoons \text{Na} + \text{NaHPO}_4^- \\
\text{NaHPO}_4^- & \rightleftharpoons \text{Na} + \text{HPO}_4^- \\
\text{HPO}_4^- + \text{H}_2\text{O} & \rightleftharpoons \text{H}_2\text{PO}_4^- + \text{OH}.
\end{align*}
\]

In a mixture of these two salts the alkalinity of Na₂HPO₄, due to the production of OH⁻ ions as a result of hydrolysis, is reduced by the presence of an excess of H₂PO₄⁻ ions, dissociated from the acid salt. The acidity of the latter is, on the other hand, reduced by a small amount of the di-sodium salt because of its dissociation into numerous HPO₄⁻ ions; these combine with H⁻ ions and thus suppress the dissociation of H₂PO₄ which occasions the acidity.

For the elucidation of the mechanism whereby these reactions maintain a normal hydrogen ion concentration we are indebted to Lawrence J. Henderson (1909). We have already referred to the
simple equilibrium equation for the ionisation of water. In the case of the formation of an ester from an acid and an alcohol we have:

\[
(alcohol) \ (acid) = k \ (ester) \ (water)
\]

or

\[
k = \frac{(alcohol) \ (acid)}{(ester) \ (water)}
\]

If the water is increased the value of \( k \) will be kept constant provided there is an increase in either alcohol or acid, but neither of these can occur without hydrolysis of part of the ester.

Take acetic acid in water: the reversible reaction is,

\[
[\text{HA}] \rightleftharpoons [\text{H}] + [\text{A}]
\]

\[
[\text{CH}_3\text{COOH}] \rightleftharpoons [\text{H}] + [\text{CH}_3\text{COO}];
\]

and by the law of mass action,

\[
k \ [\text{HA}] = [\text{H}] \times [\text{A}]
\]

or

\[
k = \frac{[\text{H}] \times [\text{A}]}{[\text{HA}]}
\]

or

\[
[H] = k \frac{[\text{HA}]}{[\text{A}]}
\]

If an aqueous solution of a weak acid be mixed with a solution of its salt, the salt ionizes greatly, the weak acid ionizes only to a very small extent. The result is, the ionization of the weak acid is suppressed and the amount of non-ionized acid present is equal to the total amount of acid. In fact, the proportion of the mass of undissociated acid to the mass of its ions is in the latter case less than it is in the former, but for all practical purposes the mass of non-ionized acid can safely be taken as equal to the total amount of acid originally present. The concentration of the anion of the acid will be equal to the concentration of Na salt multiplied by its degree of dissociation, a factor which varies with the acid, its dilution, and the presence of other salts in solution.

From the low value of the dissociation constant of \( \text{H}_2\text{CO}_3 \), we can assume that when \( \text{H}_2\text{CO}_3 \) and \( \text{NaHCO}_3 \) are present together in a solution, that the concentration of the \( \text{H}_2\text{CO}_3 \) is exactly the same as that of the dissolved \( \text{CO}_2 \), and that practically all the \( \text{HCO}_3^- \)-ions come from the strongly dissociated \( \text{NaHCO}_3 \) and that this concentration is proportional to the degree of dissociation of the salt, which in decinormal concentration is approximately 0.8. The degree of dissociation of \( \text{NaH}_2\text{PO}_4 \) is also 0.8, while that of \( \text{Na}_2\text{HPO}_4 \) is 0.64. The dissociation constant of \( \text{H}_2\text{CO}_3 \) is \( 3 \times 10^{-7} \)
hence the equations for the hydrogen ion concentration in
decinormal solutions are \[ [H] = \frac{k \times HA}{a \times NaA}, \]
which becomes \[ [H] = 3 \times 10^{-7} \times \frac{H_2CO_3}{0.8 \times NaHCO_3}, \]
for phosphates, \[ k = 2.0 \times 10^{-7}; \]
\[ [H] = 2 \times 10^{-7} \times \frac{NaH_2PO_4 \times 0.8}{0.64 \times Na_2HPO_4}, \]
for which we have : \[ [H] = 3.75 \times 10^{-7} \times \frac{NaH_2PO_4}{NaHCO_3} \]
and \[ [H] = 2.5 \times 10^{-7} \times \frac{NaH_2PO_4}{Na_2HPO_4}. \]

According to the principle of isohydric solutions, when two
solutions possess a common ion in the same concentration, mixing
the solutions cannot change the concentration of the common ion.
With the aid of this principle it is possible to calculate the
equilibrium at \( 15^\circ C \) between the four substances—carbonic acid,
sodium bicarbonate, mono-sodium phosphate, and di-sodium
phosphate. Thus at the hydrogen ionization of neutrality, namely
\( 1 \times 10^{-7} \), we may write the equations :
\[ \frac{H_2CO_3}{NaHCO_3} \times 3.75 \times 10^{-7} = \frac{NaH_2PO_4}{Na_2HPO_4} \times 2.5 \times 10^{-7} = 1 \times 10^{-7}; \]
whence \[ \frac{H_2CO_3}{NaHCO_3} = \frac{1}{3.75} \quad \text{and} \quad \frac{NaH_2PO_4}{Na_2HPO_4} = \frac{1}{2.5} \]
That is to say, a solution of the hydrogen ion concentration of \( 1 \times 10^{-7} \), made up of these four substances, must contain 3.75 times as
much sodium bicarbonate as carbonic acid, and 2.5 times as much
di-sodium phosphate as mono-sodium phosphate. The concentr­
ations of these substances may vary greatly without altering the
hydrogen ion concentration, provided the ratios are kept constant
and these latter can only change if the dissociation constants
change.

If a system which contains a total CO\(_2\) concentration of
decimolar strength in respect to total carbonic acid and to total
phosphate acid and has a hydrogen ion concentration of \( 0.5 \times 10^{-7} \),
we can find the ratios of the various salts and acids in the following
manner :
\[ \frac{H_2CO_3}{NaHCO_3} \times 3.75 \times 10^{-7} = \frac{NaH_2PO_4}{Na_2HPO_4} \times 2.5 \times 10^{-7} = 1 \times 10^{-7} = [H^+] \]
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and the ratios \( \frac{\text{H}_2\text{CO}_3}{\text{NaHCO}_3} = \frac{1}{3.75} \) and \( \frac{\text{NaH}_2\text{PO}_4}{\text{Na}_2\text{HPO}_4} = \frac{1}{2.5} = 1 \times 10^{-7} \); then for a hydrogen ion concentration of \( 0.5 \times 10^{-7} \) the ratio of the weak acid to the base must be increased:

\[
\frac{\text{H}_2\text{CO}_3}{\text{NaHCO}_3} = \frac{1}{7.4} \quad \text{and} \quad \frac{\text{NaH}_2\text{PO}_4}{\text{Na}_2\text{HPO}_4} = \frac{1}{3}.
\]

Here the concentration of \( \text{H}_2\text{CO}_3 \) is 0.0118 molar, and that of \( \text{NaHCO}_3 \) 0.0882 molar, while the \( \text{NaH}_2\text{PO}_4 \) and the \( \text{Na}_2\text{HPO}_4 \) are 0.017 and 0.083 molar respectively. From this we find that if the concentration of the carbonic acid is kept constant, the concentrations of the \( \text{NaHCO}_3 \) and the \( \text{Na}_2\text{HPO}_4 \) obtaining with a hydrogen ion concentration of \( 1 \times 10^{-7} \) are 0.046 and 0.072 molar. There must then have been added to the solution 0.0422 gram molecules of \( \text{NaHCO}_3 \), or \( \text{CO}_2 \) (0.0882—0.046), and of disodium phosphate 0.012 gram molecules, making a total of 0.047 gram molecules of acid per litre, or about half as much acid as there was sodium bicarbonate present.

By a similar calculation the ratios obtaining with a hydrogen ion concentration of \( 0.2 \times 10^{-7} \) are:

\[
\frac{\text{H}_2\text{CO}_3}{\text{NaHCO}_3} = \frac{1}{19} \quad \text{and} \quad \frac{\text{NaH}_2\text{PO}_4}{\text{Na}_2\text{HPO}_4} = \frac{1}{12.5}.
\]

Here the concentration of \( \text{NaHCO}_3 \) is about 0.228 molar, and disodium phosphate 0.093 molar, thus adding 0.150 gram molecules of alkali per litre, or about twice as much alkali as there was sodium bicarbonate present.

V.—THE APPLICATION OF THE FOREGOING PRINCIPLES TO BLOOD

The blood contains a definite amount of carbon dioxide in solution; that is, in a purely physical state, and this amount is usually indicated in terms of millimetres of mercury pressure. This \( \text{CO}_2 \) pressure varies with the \( \text{CO}_2 \) tension of the alveolar air and it has been shown by A. and M. Krogh (1910) that the arterial blood, in respect to its carbon dioxide tension, is in equilibrium with the carbon dioxide of the alveolar air. The concentration of the carbon dioxide of the alveolar air is directly proportional to the amount of free carbonic acid in the blood, and in the mechanism of neutrality regulation the concentration of free carbonic acid of the blood is maintained proportional to that of the sodium bicarbonate of
the blood. Thus by means of the respiratory mechanism the balance of salts and acids constituting body neutrality is largely maintained.

The acids of the blood are neutralised thus: the non-volatile acids are neutralised by the bases present, and all bases not so taken up are converted into bicarbonates by the free carbonic acid in the blood. The bicarbonate concentration is a measure of the reserve alkali; as all the carbonic acid of the blood, except that which is held in the physical state of solution, is bound as a bicarbonate, it is therefore correct and incidentally very convenient to regard all the bicarbonate of the plasma or the blood as equivalent to the entire alkali reserve.

The value of an estimation of the bicarbonate concentration lies in the fact that it is an accurate indication of variations in the acid base balance. It is well known that the normal value for the hydrogen ion concentration of the blood is maintained by the normal organism under the most varying proportions of acids to bases, and the bicarbonate content indicates at once any alteration in the normal ratio of acid to base. It is thus a sensitive indicator of change in neutrality, and it is because of these bicarbonate changes that the hydrogen ion concentration is maintained so tenaciously by the organism at its normal value of $0.4 \times 10^{-7}$.

Reference has already been made to the ratios which are established between weak acids and their salts in neutral, acid, and alkaline solutions. Since these ratios alter markedly with slight changes in the hydrogen ion concentration, and since in blood the hydrogen ion concentration is practically a constant, it is necessary to discuss the method whereby the ratio of $\text{H}_2\text{CO}_3$ to $\text{NaHCO}_3$ is kept constant. From the diagram (Fig 1.) it will be seen that with a considerable variation of the hydrogen concentration of from pH 6.72 to 7.69, there is an alteration in the $\text{H}_2\text{CO}_3$ $\text{NaHCO}_3$ ratio of from 1:2 to 1:20. The pH range 7.22 to 7.69 is one which covers the numerous variations that are to be met with in the human organism. Since the molecular acid-base ratio varies directly with changes in the hydrogen ion concentration of the blood, it is regarded as a very accurate means of determining blood hydrogen ion concentration.

The normal ratio of $\frac{\text{H}_2\text{CO}_3}{\text{NaHCO}_3}$ for plasma is usually given as $\frac{1}{20}$. 
Regulation of Neutrality of the Blood.

The amount of free carbonic acid in the blood is calculated by taking the average tension of CO₂ in arterial blood as equal to 42 mm. Hg, and the coefficient of solubility for CO₂ in plasma as 0.54. This gives \( \frac{42}{760} \times 100 \times 0.54 = 3.0 \) volumes CO₂ per cent. At normal CO₂ tension the amount of plasma CO₂ bound as a bicarbonate is about 60 volumes per cent. Therefore the normal ratio is approximately:

\[
\frac{H_2CO_3}{NaHCO_3} = \frac{3}{60} = \frac{1}{20}.
\]

A ratio \( \frac{1}{20} \) will not be obtained if the constants which were used in calculating the results shown in diagram (Fig. 13.) are employed. Here we must make use of the dissociation constant for \( H_2CO_3 \) in blood at 38°C which, according to Michaelis and Rona, is \( 4.4 \times 10^{-7} \); the degree of dissociation of \( NaHCO_3 \) under similar conditions is 0.605. An example comparing the two results will suffice.

In a solution of carbonic acid and sodium bicarbonate at 18°C, with \( k \) for \( H_2CO_3 = 3.04 \times 10^{-7} \), and \( a \) for \( NaHCO_3 = 0.8 \), we get a ratio at neutrality of \( \frac{1}{3.8} \). To obtain the ratio for a hydrogen ion concentration of \( 0.4 \times 10^{-7} \) we have:

\[
\frac{H_2CO_3}{NaHCO_3} \times 3.8 \times 10^{-7} = 1 \times 10^{-7} = \frac{1}{3.8}
\]

\[
\frac{H_2CO_3}{NaHCO_3} \times 0.4 \times 10^{-7} = 0.4 \times 10^{-7} = \frac{1}{9.5}.
\]

For blood, using the constants of Michaelis and Rona, we have from the equilibrium equation:

\[
\frac{H_2CO_3}{NaHCO_3} \times 7.2 \times 10^{-7} = 1 \times 10^{-7} = \frac{1}{7.2}
\]

\[
\frac{H_2CO_3}{NaHCO_3} \times 0.4 \times 10^{-7} = 0.4 \times 10^{-7} = \frac{1}{18}.
\]

and if we calculate the ratio for a hydrogen ion concentration of \( 0.35 \times 10^{-7} \) we get a ratio of \( \frac{1}{20.6} \). It is seen, therefore, that at the normal \( C_H \) of blood the ratio \( \frac{1}{20} \) is a very good approximation.

If there is an increase in the production of CO₂, or a breakdown of \( NaHCO_3 \) by acid bodies in the blood, the ratio
is increased and the hydrogen ion concentration is also proportionately increased. The result of this increase is a stimulation of the respiratory centre causing increased pulmonary ventilation and thus, by removal of the CO₂, the normal ratio is restored.

That the respiratory centre forms part of a delicate mechanism is indicated by the fact that as small an increase as 1 mm. in the CO₂ tension causes an acceleration of pulmonary ventilation amounting to 60 per cent. an increase in activity with which the heart also is associated.

CHEMICAL REACTIONS IN THE BLOOD BETWEEN H₂CO₃, NaHCO₃, NaH₂PO₄, Na₂HPO₄ AND HAEMOGLOBIN.

In maintaining the pH at the physiological point the organism makes use of two factors; first, the buffer action of the bicarbonate of the plasma and plasma proteins, and of the phosphates and proteins in the red blood cells; second, the fact that haemoglobin when it is oxidized changes from a relatively weak to a relatively strong acid. The interplay between these factors is the means whereby the body protects itself against the harmful effects of acid produced within itself, or it is the means whereby the CO₂ and other acids are carried by the blood with a very slight though measurable change in the hydrogen ion concentration of the blood. On the basis of the chemical evidence it is assumed that all the carbon dioxide which is not bound as a bicarbonate is free in the plasma as H₂CO₃, and the concentration of H₂CO₃ in the blood is such that all the bases left after neutralising non-volatile acids, are combined with the H₂CO₃ in the form of bicarbonates. If all the carbon dioxide were free in the blood as H₂CO₃ the blood would be acid to a degree incompatible with life; on the other hand, if all the carbon dioxide were in the form NaHCO₃, the degree of alkalinity would also be dangerously excessive.

The buffer salts in blood with which we are concerned consist of the salts of weak acids and strong bases and the hydrogen ion concentration is determined by the relative proportions of salt and free acid.

The neutralisation of carbon dioxide or any acid which may enter the blood is effected by the liberation from the buffer salts of
Regulation of Neutrality of the Blood.

a portion of their alkali. As has been pointed out the degree of
dissociation of most salts in .1 normal to .01 normal solution, is
about 70 to 90 per cent. and on account of this dissociation the
weak acid has its ionization suppressed. Since most of the anions
come from the dissociated salt, and the concentration of the anions
is therefore equal to the degree of dissociation of the salt multiplied
by the mass of the salt, and since the degree of dissociation is
almost maximal, and varies very slightly over the normal ranges of
concentrations of blood constituents, one may state as a close
approximation that \( \frac{k}{a} = k \). This gives us a modification of the
equation already discussed:

\[
[H] = k \frac{[HA]}{[NaA]}
\]

In terms of pH, since \( pH = \log \frac{1}{H} \), the equation becomes:

\[
pH = \log \frac{1}{H} = -\log k + \log \frac{\text{salt}}{\text{acid}}
\]

\[
pH = pk, + \log \frac{\text{salt}}{\text{acid}}
\]

This latter form was first introduced by Hasselbalch in 1916.
The value of the expression \( pk \), for \( Na_2HPO_4 + NaH_2PO_4 \) mixtures
is 6.8, and for \( NaHCO_3 + H_2CO_3 \) solutions at 38°C it is 6.18.

It can be shown that the maximum efficiency of a buffer is
attained when the ratio \( \frac{\text{salt}}{\text{acid}} = 1 \), in which case \( pH = pk \). If
one takes a solution of sodium bicarbonate at 0.03 molar concen-
tration, which is approximately the concentration of the salt in
normal blood plasma, adds acid in varying proportions and, in
graphic form, relates pH to the percentage of total CO_2 as bicar-
bonate, the curve is obtained (Fig. 2). This curve is calculated from
the formula \( pH = 6.18 + \log \frac{NaHCO_3}{H_2CO_3} \). The value \( pk \), changes
with variations in the \( H_2CO_3 \) tension but these changes are so very
small that here they can be safely ignored. From inspection it
will be seen that the curve is steepest in the middle over a range in
which the amounts of the salt and acid are equal or approximately so. This indicates that on this part of the curve the addition of acid or alkali to change a given amount of CO\textsubscript{3} from NaHCO\textsubscript{3} to H\textsubscript{2}CO\textsubscript{3}, or vice versa, causes less alteration in the pH than at points near either end of the curve. For example, changing the percentage of CO\textsubscript{3} as NaHCO\textsubscript{3} from 50 to 60, alters the pH from 6.10 to 6.26, a change of 0.16; while changing the percentage from 85 to 95, raises the pH from 6.85 to 7.40, a change of 0.55.

The figure for the pH may be obtained from Henderson's equation. If the neutrality ratio is \(\frac{7.2}{1}\), that is, if \(R \times 7.2 \times 10^{-7}\) = 1 \(\times\) 10\(^{-7}\), then with a ratio \(\frac{20}{1}\) the pH = 7.44 (1.36 \(\times\) 10\(^{-7}\)), or with a ratio of 1 the pH = 6.14 (7.2 \(\times\) 10\(^{-7}\)).

By the equation of Hasselbalch these are:
- Ratio = 20: pH = 6.18 + log of R.
  = 6.18 + 1.301.
  = 7.48.
- Ratio = 1: pH = 6.18 log of R.
  = 6.18 + 0.
  = 6.18.

Clearly, then, at a pH of 7.44, the reaction of normal blood plasma, when the ratio is 20:1, the buffer is not acting at its most efficient point. The phosphates, with the ratio \(\frac{NaH_2PO_4}{Na_2HPO_4} = 1\), and the pH = 6.8, are more efficient at the hydrogen ion concentration of the blood, than are the carbonates. In the plasma, the phosphates are present to such a small extent that as buffers they may be practically disregarded. In the cells, however, their concentration being about 0.05 molar, they play a very important part.

It has been stated by Henderson that of all the organic and inorganic acids, with the exception of proteins such as haemoglobin, the carbonic and phosphoric acids most nearly approximate maximal efficiency at the hydrogen ion concentration of the blood, although the pH of the blood is not very near that at which these acids exert their maximal effect. A point of note is, that as the hydrogen ion concentration of the blood increases, as it does in the progress of many diseases, and a point incompatible with life is approached, (pH = 7.0) these buffers oppose the change more and more effectively.
Regulation of Neutrality of the Blood.

THE BUFFER EFFECT DUE TO THE REDUCTION OF OXYHAEMOGLOBIN.

It has been shown by several investigators that the normal difference between the carbon dioxide content of arterial blood and that of venous blood is about 4.0 to 4.5 c.c. The change in hydrogen ion concentration resulting upon the addition to the blood of these 4 to 5 c.c. of carbon dioxide, is a very minimal one amounting to between pH .01 to .05.

That oxygen plays as important a part in determining the configuration of the dissociation curve of CO₂ for blood, as does carbon dioxide with regard to the dissociation curve of oxyhaemoglobin, was first demonstrated by Christiansen, Douglas, and Haldane, in 1915. It was shown that at any given tension of CO₂ within the physiological range of 30-60 mm. Hg. the blood absorbed 5 to 6 volumes per cent. more carbon dioxide, if the gas mixture with which the blood was equilibrated was devoid of air or oxygen. Here then was the clue to the mechanism whereby the blood could take up its proper load of CO₂ at the small difference of CO₂ tension (5-6 mm.) obtaining between arterial and venous blood.

It is possible to demonstrate that the blood can not only take up 5 to 6 volumes per cent of carbon dioxide, but in so doing will maintain constant its hydrogen ion concentration, or even increase its alkalinity by the formation of bicarbonate. From Table II it is seen that during the process of reduction of oxyhaemoglobin the blood must take up H₂CO₃ otherwise it would become alkaline.

<table>
<thead>
<tr>
<th>Total CO₂ at 40 mm. tension</th>
<th>CO₂ as H₂CO₃</th>
<th>CO₂ as NaHCO₃</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygenated blood</td>
<td>57.5</td>
<td>2.69</td>
<td>48.8</td>
</tr>
<tr>
<td>Reduced blood</td>
<td>57.0</td>
<td>2.69</td>
<td>54.3</td>
</tr>
</tbody>
</table>

With regard to the part played by oxyhaemoglobin two considerations must be taken into account; first, the liberation of alkali
due to the changes in the hydrogen ion concentration of the blood; and secondly, the liberation of alkali due to the partial reduction of oxyhaemoglobin.

Normally, only about one third of the oxyhaemoglobin is reduced in passing from the arteries to the veins, and the amount of alkali which is thus liberated is equivalent to about 3.0 c.c. of CO₂. To this must be added the amount of CO₂ combined by the liberation of alkali between the limits of the normal pH change and also the increase in free H₂CO₃ due to an increase in base. The buffers other than oxyhaemoglobin must be taken into account and, generally speaking, we assign to these a buffer value about half of that of oxyhaemoglobin. It should be noted here that in referring to the buffer value of oxyhaemoglobin one refers only to the value assessed by the amount of base liberated within the limits of the pH change under observation, and not to the buffer value due to the reduction of oxyhaemoglobin.

Summing up these statements on a numerical basis we may state that the buffer power is distributed as follows:

(a) Base yielded by oxyhaemoglobin under normal pH change ... ... ... = 1.1 c.c. CO₂.
(b) Base yielded by oxyhaemoglobin on reduction by one third ... ... = 2.83 c.c. CO₂.
(c) Base yielded by buffers other than haemoglobin ... ... ... = 0.55 c.c. CO₂.

\[ \text{Total} = 4.48 \text{ c.c.} \]

(d) CO₂ taken up as H₂CO₃ with ratio
\[ \frac{\text{NaHCO}_3}{\text{H}_2\text{CO}_3} \text{ at pH 7.33 = 17.0} \ldots \ldots \quad 0.26 \text{ c.c. CO}_2 \]
\[ \text{Total} \quad 4.74 \text{ c.c. CO}_2 \]

With regard to item (b), it need only be mentioned here that while maintaining the respiratory quotient at about 0.8, if the carbon dioxide increase is accompanied by an oxygen loss 1.25 times as great, the increase in carbon dioxide will be 78 per cent. over that which would be found had no such oxygen loss occurred. The important point with regard to haemoglobin as buffer is that, by virtue of its loss of acidity on reduction, it liberates an amount of reserve alkali which makes this process alone responsible for some 70-80 per cent. of its buffer value.
A considerable amount of work has been carried out recently upon the part played by oxyhaemoglobin as a buffer. It need only be mentioned here that the progressively increasing power of oxyhemoglobin to absorb carbon dioxide as it loses its oxygen, or as it becomes less acid, is a buffer action of the greatest importance. Haemoglobin, on account of its ability to give up alkali upon reduction, plays as important a rôle in the transport of carbon dioxide in the blood as it does in the transport of oxygen.

The haemoglobin furnishes some 80-90 per cent. of the total alkali liberated by buffer salts for the neutralisation of the carbon dioxide which passes from the tissues into the venous blood. As the chlorine ions, formed by the reaction of $\text{H}_2\text{CO}_3$ and $\text{NaCl}$, pass from the plasma into the cell, there is also a passage of $\text{H}_2\text{CO}_3$ ions into the cell, where they unite with the reserve alkali held by haemoglobin. The carbonates of the plasma, it is evident, play a very minor part, while the cells, in virtue of their permeability to $\text{HCl}$ and $\text{H}_2\text{CO}_3$, are able to utilise their reserves of buffer alkali in maintaining that constancy of the hydrogen ion concentration of the blood which forms probably the most delicate mechanism of the mammalian organism.

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**SOME RECENT CASES OF PATHOLOGICAL INTEREST.**

R. Howard Mole, B.A., M.D., Ch.B., Moulkden

1. **Syphilitic Granuloma.**

The patient was a young man whose external genitals, penis and scrotum, were entirely replaced by a fungating granulomatous mass (Fig. 1). The history of the case was very difficult to obtain, but the condition had been present for a very long time.

A smear made by removing a small piece of granuloma and examining its deep surface revealed great numbers of *Spirochaeta refringens* and *S. pallida* (Fig. 2). A paraffin preparation made by Levaditi’s method showed the spirochaetes to be massed in a feltwork in the connective tissue between the groups of epithelial cells (Fig. 3). The spirochaetes did not penetrate the epithelial groups and were not seen within the epithelial cells.
Six injections of neosalvarsan at weekly intervals made apparently no difference in the granulomatous mass, neither did mercury by mouth or by inunction make much impression. The patient was ultimately lost sight of.

2. MYELITIS: DORSAL CORD.

The patient, a soldier, was shot through the chest in the recent war in North China. He was brought to Moukden some days after the wound had been received. On admission to hospital, the wounds of entrance and exit were found at opposite sides of the chest in the mid-dorsal region, and approximately in the same plane. The patient was completely paralysed in the lower part of the body with complete absence of reflexes, superficial and deep, and with complete anaesthesia extending to about two inches above the umbilicus; there was no control over bladder or rectum.

A laminectomy revealed that the cord and vertebral arches in the region of the injury had sustained no anatomical lesion, nor was any evidence of haemorrhage found in the vertebral canal or beneath the meninges.

After some days the patient died. The cord in the laminectomy region was removed within an hour after death, and celloidin preparations made by the Weigert method. Multiple areas of softening were found scattered through the cord, partly in the white matter, to a less extent in the grey matter, and especially in the lateral column of one side. The nerve cells of the anterior horn showed both diminution and degenerative changes. The microphotograph (Fig. 4) shows the numerous areas of softening which appeared as empty spaces in the neighbourhood of the anterior and posterior horns. The microphotograph (Fig. 5) shows the very much more numerous vacuoles in the lateral column of one side.

3. PERFORATED GASTRIC ULCER; ENTERITIS

The patient came to the hospital with the following history. He had suffered for years from pain and discomfort after taking food. Four days previously, when eating meat dumplings, he had a severe pain which prevented him from further eating. During these four days he had eaten nothing and had passed nothing by the rectum. On admission, his abdomen was very protuberant, but moved on respiration, and the muscles of the abdominal wall were not rigid. His temperature was 100° F. and
Fig 1.—Syphilitic Granuloma.

Fig 2.—Syphilitic Granuloma: Numerous Spirochaetes.

Fig 3.—Syphilitic Granuloma: Spirochaetes between Groups of Epithelial Cells.

RECENT CASES OF PATHOLOGICAL INTEREST (Mole).
Fig. 4.—Myelitis of Spinal Cord, Dorsal Region, showing areas of softening near Anterior and Posterior Horns.

Fig. 5.—Myelitis of Spinal Cord, Dorsal Region, Showing Vacuoles in Lateral Column of One Side.

RECENT CASES OF PATHOLOGICAL INTEREST (MOLLE).
Fig. 6.— Ascites: Chronic Pancreatitis. P, duodenum; A, nodule; V, superior mesenteric vein and tributary; H, head of pancreas; T, splenic vein.

Fig. 7.— Dermoid Cyst of Ovary.

Fig. 8.— Abnormal Enlargement of Foot.

RECENT CASES OF PATHOLOGICAL INTEREST (MOLE).
Fig. 9.—Tuberculosis of Guineapig:
Regeneration of Cells of Bile Ducts.

Fig. 10.—Atrophic Hepatic Cirrhosis in Rabbit.

Recent Cases of Pathological Interest (Mølé).
his pulse, 120. A diagnosis of intestinal obstruction was made. A turpentine enema brought some solid faeces away: a second enema after an hour’s interval brought away neither faeces nor flatus.

The patient was in extremis. As a last resource his abdomen was opened under local anaesthesia; the intestine was extremely dilated, there was no peritonitis and nothing in the way of an obstruction was found. He died a few hours afterwards. On post mortem examination an ulcer was found in mid-stomach on the posterior wall, firmly adherent to the pancreas which had been in a condition of chronic inflammation as demonstrated by subsequent microscopical examination. The adhesions were much older than could be accounted for by the four days of the patient’s history. Further, the lower six feet of the ileum viewed from without were very congested. On opening the gut this part showed ulceration of one Peyer’s patch and of two solitary nodules; the former contained multiple small ulcers and the mucous membrane of the remainder was much congested. The spleen was small and not congested. Unfortunately, no cultures were made or agglutination tests carried out.

The simultaneous occurrence of ulcer of the stomach and pathological changes in the intestine was noted in a previous case reported by the writer (China Medical Journal, January, 1918). That patient also was operated on for intestinal obstruction, but there the obstruction was due to anatomical causes rather than to acute dilatation and paralysis. Nevertheless, the simultaneous occurrence of ulcer of the stomach and intestinal obstruction is suggestive of a relationship between the two conditions.

4. ASCITES: CHRONIC PANCREATITIS.

Ascites has a special pathological interest in China and its causation is often obscure.

In the case of the patient under consideration, ascites had commenced a month before admission. He had noticed that simultaneously his urine was scanty and his bowels constipated. Loss of appetite and indigestion had also been present. Only recently had there been oedema of the limbs. The patient on admission was very emaciated, with great swelling of the abdomen and oedema of the lower limbs. A diagnosis of cirrhosis of the liver was made. The patient died a few days after coming to hospital.
On post-mortem examination the abdomen was found to contain much fluid; the liver was more or less normal in size; its superficial parts were congested and in a "nutmeg" condition. The peritoneal ligaments of the liver and spleen were thick and short. The capsule of the kidneys was adherent to the peritoneum as well as to the kidney substance. The pancreas was hard and definitely prismatic in section, and the lymph glands in the neighbourhood of the pancreas were enlarged and congested, and microscopically showed marked sclerosis. The spleen was large and congested. Neither stomach nor duodenum showed any abnormality. The small and large intestines, especially the latter, were oedematous. There was fluid in the pericardial sac, the heart was small and the right heart dilated, though not markedly so. It seemed very unlikely that the very considerable ascites could be due to the condition of the heart, especially as ascites had appeared some weeks before the legs began to swell. In microscopical sections the fibrous tissue of the liver was increased, but there was no anatomical cirrhosis.

Microscopically, the pancreas showed typical well marked chronic pancreatitis. On superficial inspection, apart from the general enlargement and firmness of the organ, there was nothing peculiar. On palpation, however, a firm large nodule (Fig. 6A) was discovered at the junction of neck and body, covered over by a layer of comparatively unchanged pancreatic tissue. The nodule had a diameter of 2 cm. and was situated immediately in front of the superior mesenteric vein and its first large tributary. It was composed of pancreatic tissue in a condition of chronic sclerosis in no way different from the other parts of the pancreas. In the photograph, (Fig. 6) rubber tubing is inserted into these two veins. It seemed likely that this nodule was in part responsible for the ascites.

No cause for the pancreatitis could be found. Stomach, duodenum, common bile duct and pancreatic duct revealed no abnormality. If the nodule in question can be assumed to have occurred early in the history, it may have pressed on the bile duct in such a way as to cause regurgitation into the pancreatic duct.

5. MALIGNANT ENDOCARDITIS.

The patient, a young man, was admitted to hospital in a semi-comatose condition with fever and with pain and swelling in the right hepatic region. There was a doubtful history of
dysentery. He had been ill, it was said, for ten days. There was a slight localised protuberance of the chest about the level of the seventh rib, on the right mid-axillary line, and the percussion note over the protuberance and over the lower part of the right chest was dull. The swelling was tender on palpation. No abnormality nor bruit was noted in the heart, and no abnormality in the lungs. The blood picture did not reveal any striking abnormality. No blood culture was made. A provisional diagnosis of hepatic abscess was made. Exploratory puncture of the liver in several places was carried out; no pus was found. Finally, a small abscess was found above the diaphragm and to the outer side of the base of the lung. This was opened and drained. The patient died the following day and a partial post-mortem examination was made through the operation wound. The chest wall in the neighbourhood of the abscess showed several miliary abscesses. The pleura of the right lung was very thick and fibrosed, and near the abscess had a superimposed acute pleurisy. The heart had well marked malignant endocarditis, particularly of the mitral valve, showing microscopically colonies of cocci attached to the valve segments; the aortic valve was involved to less extent. There were pyaemic abscesses in liver and kidney.

6. SUB-PERITONEAL TERATOMA OF ABDOMEN.

The patient, a man of 60, had had for 20 years a slowly increasing abdominal swelling. On admission, his abdomen resembled in appearance that of a pregnant woman. The tumour grew from the left lumbar region below the kidney. Apart from the inconvenience of size and weight, there had been no symptoms. The tumour weighed 25 lbs and was composed for the most part of fat: in one part, however, tissue was fibrous and contained large plaques of bone, showing microscopically, Haversian systems.

7. DERMOID CYST OF OVARY IN GIRL AGED SIXTEEN YEARS.

The microphotograph (Fig. 7) shows the sebaceous and sudoriparous glands in the walls of the cyst.

8. ABNORMAL ENLARGEMENT OF FOOT OF BOY.

The illustration (Fig. 8) is shown as a curiosity only. No diagnosis was made of the cause of the abnormality. One foot was
enormously hypertrophied and the corresponding leg to a less extent. The boy came to the Out-patient Department once and did not return again. The condition may have been due to a disturbance of embryonic development or to a pituitary derangement. The boy had no other abnormalities.

9. GUINEA-PIG TUBERCULOSIS: BILE DUCT REGENERATION IN LIVER.

A guinea-pig had been inoculated three months previously with urinary sediment containing human tubercle bacilli. The microphotograph (Fig. 9) shows very considerable regeneration of the bile ducts of the liver. In places this is so marked that the condition simulates a malignant growth. It is stated that liver regeneration takes place from both the remaining liver cells and the bile-duct cells. In this case there was apparent no regeneration of the liver cells, but the amount of regeneration of the bile-duct cells was remarkable.

10. ATROPHIC HEPATIC CIRRHOSIS IN A RABBIT.

This animal ate her food well but her skin was extraordinarily thin; her excreta were not the smooth rounded pellets ordinarily passed, but had a very shrivelled appearance. An interesting point is that she had a persistently high leucocyte count, especially of the mononuclear cells.

The photograph (Fig. 10) shows the liver to be typically "hobnail". The spleen was the large fibrotic spleen associated with hepatic cirrhosis. No cause for the condition could be found.

DIRT AND VERMIN AS CAUSES OF DISEASE.—The outstanding lesson of the war is to be drawn from some figures collected by Colonel Soltau in France in 1917, figures which were corroborated again and again by all observers. The total admissions for sickness in one army during a year numbered 106,267; of these 26,879 were due to what were commonly called "skins and scabies"—that is to say, 25 per cent. of the sick wastage was due to some form of pyodermia very largely preventable by careful inspection and personal cleanliness of the men. In addition to the group "skins and scabies," there was a group consisting of pyrexia of uncertain origin, trench fever, myalgia, and rheumatism, which was undoubtedly composed in the main of cases of trench fever, and therefore louse-borne; that accounted for another 26,000 admissions, so that of all the casualties from sickness nearly 50 per cent. were attributable to dirt and vermin. Medical History of the Great War.
Fig 1.—Spindle-cell Sarcoma of Neck (Ludlow).
Fig 2.—Patient after removal of Spindle-cell Sarcoma of Neck (Ludlow).
Fig 3.—Congenital Papilloma (Ludlow).

Fig 4.—Congenital Papilloma after removal (Ludlow).
SURGICAL CASE REPORTS; (1) SPINDLE-CELL SARCOMA OF THE NECK; (2) CONGENITAL PAPILLOMA OF BUTTOCK

A. I. Ludlow, M.D., F. A. C. S., Seoul, Chosen (Korea).

SPINDLE-CELL SARCOMA OF THE NECK.

CASE NO. 12. Clinical history of patient: Korean, female, married, aged 29 years. Was admitted to the surgical service of Severance Hospital, March 28, 1922.

The family and personal history, aside from that noted later, has no special bearing on the case. In July, 1920, the patient noticed a small nodule about 1 cm. in diameter on the right side of the neck, just below the angle of the lower jaw. This increased rapidly in size until it reached the diameter of about 6 cm. It was removed by operation in March, 1921, in another hospital. There was a recurrence of the tumor in June, 1921, and it grew rapidly to the size indicated in the photograph (Fig. No. 1.) The growth was nodular, hard in some places and soft in others. It was slightly movable over the underlying structures. At the lower portion of the tumor was a large ulceration. The general examination revealed nothing abnormal aside from the tumor and a marked anemia. The patient was five months pregnant.


Previous to the operation (April 3, 1922) the patient was given two subcutaneous infusions of 1000 c.c. normal saline solution, one the day before and the second on the day of operation.

Under general anesthesia the growth was removed by an incision about its base and enucleated from the structures of the neck. The tumor was surrounded by a capsule except at its deepest portion under the angle of the jaw. The wound was closed for the most part by skin flaps, leaving an opening for direct application of the X-ray over the deepest portion. Aside from a miscarriage the third morning after operation, the patient made an uneventful recovery.


* (Article No. 31, Research Department of the Severance Union Medical College.)
COMMENT

Malignant growths of the neck of the size taken from this patient are seldom favorable for operation. We had little hope of enucleating the tumor completely, but undertook the operation with the purpose of excising all the macroscopic portions of the growth, and destroying any tumor cells which might remain with direct application of the X-ray.

The X-ray treatment was administered by my colleague, Dr. C. C. Hopkirk. One treatment was given on the fourteenth day and the other on the twenty-sixth day after operation. Each treatment, 50 milliampere minutes with 3 mm. aluminum filter.

The wound was purposely kept open until after these treatments when it closed by granulation. The patient left the hospital May 2, 1922, in good condition. (Fig. No. 2. Photo taken the day before patient left the hospital.) In connection with this case we wish to call attention to the value of giving large amounts of water, not only by mouth, but also by saline infusions before operation. Not infrequently infusions are withheld until the patient shows signs of shock during or following some serious surgical procedure and then it is often too late. We now make it a rule to give saline infusions the day before as well as the day of operation, thus preparing the patient to meet any special need which may arise. In such a case as the one here described the preliminary infusions prove of great value.

CONGENITAL PAPILLOMA OF THE BUTTOCK


Family and personal history of no special bearing on the case. Patient has always been in good health.

Tumor growth. At birth there was a small papilloma about 2 cm. in diameter on the right buttock. This increased very slowly in size so that at the age of 20 years it was about the size of the patient’s hand. Since that time the growth has been extending continuously to its present dimensions. There has been no pain, only the discomfort and weight of so large a tumor. Aside from the growth the patient’s physical examination reveals nothing of special note.
Drug Cultivation in China.

The tumor, a cauliflower-like mass, measures 40 cm. in length, 35 cm. in breadth, and is elevated 4 cm. to 12 cm. above the surrounding surface. One photograph (Fig. No. 3.) shows the tumor before excision, while the other photograph (Fig. No. 4) shows the mass after excision with the area of attachment, $18 \times 14$ cm. The weight was 3000 grams.

The operation consisted of an incision about the base of the tumor followed after its removal by skin grafting.

Pathological report: Papilloma.

The patient made an uneventful recovery and left the hospital May 18, 1922.

COMMENT

Many large tumors are seen in the Orient but a papilloma of this size seems worthy of record. Korean patients sometimes refuse or defer operation for tumors because of superstition, fearing some greater calamity will befall them if the growth is removed.

Modesty no doubt had much to do with delay in this case for the patient objected to a photograph and it was only secured after the anesthetic was given.

DRUG CULTIVATION IN CHINA.

Professor B. E. Read. Peking Union Medical College, Peking.

With the kind permission of the Director of the Peking Union Medical College, we were able this last spring to make a start in opening a small garden for the cultivation of medicinal plants. For reasons of convenience and economy, we have had this subject in mind for the last twelve years, but owing to lack of ground and other general facilities, we have been unable to further the project. The success of this year's experiment leads us to write a few lines to encourage others in the China field to take up this useful work.

REASONS FOR DEVELOPMENT.

Those in touch with work in India are reminded from time to time of the need for the cultivation of drugs, both by articles appearing in the Indian Medical Gazette,¹ and occasional bulletins which appear on the subject. During the great war, emphasis was laid upon its economic value. In India, one can cultivate practically all the pharmacopeial drugs and there seems little
reason why in China, with its great variation in climate, we should not be able to do the same. It stands to reason that, cultivated on the spot, the crude drugs would be cheaper in price than when bought abroad. When the latter plan is adopted the drugs may be old, and in any case, they do not reach our hands until many months after collection, during which time they may have been seriously affected by heat, moisture and insect pests. Those experienced in the handling of crude drugs can readily realize the importance of this observation.

For the development of home industry, drug collection furnishes good scope. We already have in China a large number of crude drugs official in our foreign pharmacopeias. If cultivated here under our supervision they are ready to hand with a personal guarantee of standard purity. It is an astounding fact that in spite of China being the home of such a drug as rhubarb, it is shipped out of China to be prepared for medicinal purposes in Western countries, where it is made up into various preparations and shipped back to China to be sold in the form of powdered rhubarb, tincture of rhubarb, etc. It should considerably cheapen the cost if the crude drug, even if not cultivated by ourselves or under our direction, were made up into its preparations on the spot in China.

Again, we have a number of drugs which, when stored, seriously deteriorate. Digitalis is a well-known example. It has been cultivated in India in the Miljires and Darjeeling district. Digitalis is not indigenous to China and, as far as we know, no effort has been made to extensively cultivate it.

There is a further reason why an effort should be made for developing experimental drug farms. In all Oriental countries there exist systems of native medicine for which the most extravagant claims are made. It would be very easy to discuss at great length some of the many preposterous claims made by Chinese native practitioners. We prefer to emphasize the unknown potenti­alities of the native medicines which remain to be investigated by modern science. Dr. Ghose (4) makes a strong plea for the study of indigenous drugs in India and their local scientific cultivation and manufacture in a pamphlet issued some four years ago. The various phases of the subject are well discussed in a most convincing way. What he has to say concerning India applies equally well to our needs in China.
Drug Cultivation in China.

PROCEDURE OF CULTIVATION

The cultivation of drugs is generally conceded as being a matter of value and importance. However, its particular value and relative importance has not been brought out sufficiently well to induce men to start this cultivation. If it were merely a commercial project, we might expect drug firms to eventually develop good drug farms. Yet experience all over the world shows that the collection of crude drugs has never received the scientific attention which it deserves. Any person interested in the subject and desirous of developing this necessary industry can immediately proceed to cultivate a few drugs on a piece of land of one or more mou (畝) in extent. In China, more often than not, missionary and hospital compounds have a regular gardener who, with very little trouble, can add the work of this garden to his regular duties. With but a small amount of personal supervision and the expenditure of less than a dollar, one may grow from seed a number of well-known drugs.

Where it is impossible for one to personally develop such a garden, it is often possible to secure the co-operation of modern schools of agriculture or of the ordinary Chinese farmers. If the American farmer with high wages and expensive implements can find it profitable to plant a crop of ginseng, surely in China it should prove to be much more so. In our schools of agriculture much work is undertaken for experimental purposes. It should not be difficult to establish along co-operative lines the planting and collection of plants of medicinal value.

THE NEED FOR STANDARDS

Much has already been said of the need for standard preparations of such a drug as digitalis. There are four drugs of primary importance in our western Materia Medica which are not indigenous to China: digitalis, belladonna, ipecacuanha, and santonin. They are typical of others which we might mention. Such drugs should be systematically grown in China under studied conditions of soil, climate, and horticultural treatment. The plants need to be picked and dried under standard conditions, and, most important of all, assayed for content of active principles as found when the plants are grown in China.

Adulteration of commercial samples of all four drugs is a most common occurrence. For example, take Datura stramonium which
we have grown this summer in Peking. It occurs in commerce sometimes freely mixed with leaves of *Carthamus helenioides* and *Xanthium strumarium*. In regard to belladonna the commercial article may contain as much as 75% of foreign material.

For methods of cultivation of digitalis and belladonna see the writings of Newcomb, Miller, and Borneman.

Ipecacuanha has been successfully cultivated on the Darjeeling Hills in Indian. Santonin is ordinarily prepared from *Artemisia maritima* var. *Stechmanniana*. It is also obtained from *Artemisia pauciflora*. Recent investigations on the Indian plant show that quite a fair yield is obtainable from *A. brevifolia*. In Peking we have carefully extracted various artemisias found growing in China. Extractions were made of: *Artemisia vulgaris* (白芷); *Artemisia keiskiana* (羌薊); *Artemisia capillaris* (茵薊蒿); *Artemisia annua* (黃花蒿), by both the standard lime method, and by chloroform as adopted by Greenish. Not even a trace of santonin was obtained in our residues or extraction fluids. Other artemisias have been examined by home laboratories with little success. We suggest cultivation of the Levant wormseed or the Indian plant from Calcutta.

**CHINESE DRUGS**

There already exists in China a large number of vegetable drugs in common use by Western physicians. The following are examples:

- Peppermint (薄荷)
- Aconite (烏頭)
- Indian hemp (大蔘)
- Ginseng (人參)
- Chenopodium (藜, 灰薊)
- Orange (陳皮)
- Capsicum (辣椒)
- Rhubarb (大黃)
- Stromonium (曼陀羅)
- Cardamom (白豆蔻)
- Mustard (芥末)
- Lemon (香桃)
- Henbane (青草藥)
- Licorice (甘草)

Also a large number of umbelliferous and labiate plants which supply us with the many volatile oils of the pharmacopeia.

For details concerning the cultivation of common labiate and other plants the reader is referred to the individual monographs on Peppermint, etc., to be found in the U. S. Dispensatory, where abundant reference is made to cultivation of such plants in all parts of the world—Britain, U.S.A., Japan, Germany and Russia.
Drug Cultivation in China.

What has been already said concerning the need for a standard in the growing, collecting, and preparing of drugs applies to each and all of these, and in connection with the development of drug farms considerable attention is required for the development of marketing the drugs. The China Medical Journal should prove a suitable medium for advertising their sale and for the securing of a large number of customers needing these drugs.

Scientific Investigation of Medicinal Properties of Plants.

With the development of modern pharmacology in China we need to develop experimental drug gardens in connection with all our medical schools; such gardens should provide for the above mentioned requirements, in the cultivation and development of native drugs and in the establishment of standard conditions for growing important Western drugs, thereby supplying the needs of local pharmacies and helping nearby country hospitals. There is a much larger field of service which may be developed in the investigation of native drugs. The ordinary pharmacological student of native medicine requires the use of a drug garden. For example, take one of the problems we have been studying this year. Native druggists claim that of the two varieties of castor oil seeds, those from the prickly pods are of a poisonous character, while those with smooth pods are non-poisonous. Before undertaking chemical examination for the presence of the poison principle, (ricin), in both types of seed, one needs to procure pure strains of each species. In some cases one must first establish which is the dominant and which the recessive character. It has been shown that the prickly variety is dominant and the smooth recessive. We have found that pure strains of seeds of both varieties are equally poisonous.

A number of native remedies lend themselves to botanical investigation. A parcel of liliaceous roots was sent to this laboratory for investigation of their properties to see if they were of value as a cure for snake bite. No information could be obtained as to their exact foreign name. On planting the roots, we were able to establish their identity conclusively as being roots of the well-known plant Heterophyllum. To go further into the opportunities for scientific research in China would quite overshadow the value of drug cultivation as applied to the efficient and economical.
administration of our missionary hospitals. One might go much further into the subject and show that drug cultivation alone is not sufficient, because modern medicine tends more and more to the use of active principles the physiological and therapeutic action of which can be scientifically established. We need the co-operation of expert chemists for their extraction or manufacture. We recommend that our Association should give this subject its serious consideration so that the larger institutions may be encouraged to take up this work and that much more be done in the way of issuing scientific bulletins and publications to keep our profession informed of the material available for regular hospital work. The United States Department of Agriculture in their farm bulletins and those from the Department of Chemistry and Pharmacology give us a fair working model for the development of this subject.

References concerning the Cultivation of Drugs.

1.— Editorial, 1919, Indian Medical Gazette, LIV. 101.
7.— Miller : A. J. P. p. 531, 1914.
8.— Borneman : A. J. P. p. 547, 1912.
10.— Greenish and Pearson : P. J. 106. 2, 1921.
11.— " " " P. J. 109. 85, 1922.

Adulteration of Drugs.—Adulteration of drugs is made easier and the detection of adulterants is more difficult when the drugs are reduced to powders. Great skill is required in the identification of adulterants; for the art of adulteration is an old one and the materials employed have been selected, often ingeniously, on account of their very close resemblance to the true articles they replace. In the case of whitish powders, foreign starches, especially the common cereal starches, have been used, and not infrequently have the “scrapings” from bakeries been parched or browned to the proper degree and employed in drug adulteration. The endocarp of the olive, coconuts, and walnuts; exhausted coffees; cocoa shells; and other similar substances which are composed chiefly of stone cells, have been employed to a large extent in admixture with brownish powders. The use of wheat bran or middlings in ginger has been a common practice. Sometimes inorganic substances such as talc, chalk, clay, sand, etc., are employed. One of the most difficult means of adulteration to detect is the use of exhausted powders, the dregs left from drugs extracted by percolation. Sayre.
Bronchial Spirochaetosis.

BRONCHIAL SPIROCHAETOSIS.

Lee S. Huizenga, M.D., Taichow, Ku.

Bronchial spirochaetosis is an inflammatory condition of the bronchi and alveoli caused by *Spirochaeta bronchialis*, or at least accompanied by this organism in large numbers.

**History.**—In 1905 Castellani described the disease and in 1907 he found the *Spirochaeta bronchialis* and looked upon it as the cause. In 1915 Fantham published a description of the spirochaete. Later investigators in Asia, Africa and Europe published short treatises on it. During the war the disease was found in Europe, probably due to troops coming from countries where the disease is prevalent.

It is found in the tropics girdling the earth, and was recently also discovered in Italy, Switzerland, France and England. Reports of this disease have come from only a few places in China, hence we suspect that it is not generally prevalent throughout the country. In and about Nanking are many cases and it is largely upon the experience gained in our clinic and from in-patients suffering from this disease that we base the following information. Although several articles have been published on the subject, in China we were able to get very little material for reference.

**Etiology.**—From the histories of our patients we believe that the predisposing cause is catching cold. Anemia and generally lowered vitality have also undoubtedly a great deal to do with the cause of the trouble. A very large percentage of the cases developed their cough after they caught cold.

The direct cause of the disease is without question the bronchial spirochaete. Like other spirochaetes, it is spiral-shaped. Some of these organisms have five, others have four, while again others have as many as eight spirals. They vary in length from 5 microns to 30 microns and from 0.2 microns to 0.6 microns in width. All sizes may appear on the one slide. In a fresh specimen we have seen movements of the spirochaete. After a period of motility the spirochaete develops into a coccoid state, from which the new spirochaetes develop. By laboratory methods the bronchial spirochaete can be distinguished from *Spirochaeta pallida*, *S. buccalis*, *S. pertenuis*, and the spirochaete of Vincent's Angina.
It is well to remember that *Spirochaeta buccalis* may be found in a normal person, but in all cases of true bronchial spirochaetosis the clinical picture readily leads to the identification of the bronchial spirochaete.

Infection by the spirochaete probably takes place directly from an infected patient. Several of our nurses in the University Hospital, Nanking, contracted the disease, evidently from contact with patients. The disease is probably contracted similarly to tuberculosis by the droplet method.

*Varieties.*—Two clinical varieties of the disease are fairly easily distinguished. Cases lasting less than than four weeks we classify as the acute, the others as chronic. We realize this division is somewhat arbitrary, but we found that within four weeks the acute symptoms generally gave way to the chronic. The chronic cases may take a very prolonged course. One patient told us he had suffered from the disease for three years. Of course, we had to take the patient's word for the correctness of this statement. Other chronic cases had lasted for several months and even a year before they came to the hospital. Most of the cases, however, were acute.

*Symptoms.*—In the acute form the patient first complains of chills, says he has caught cold, develops a fever which is usually low but the temperature may run as high as 104° F. He complains of pain in the chest and of almost constant cough, usually worse at night. Occasionally there is a loss of voice and some patients complain of night sweats. The sputum is much increased, is frothy, frequently blood-stained, and is mucilaginous and stringy. In all our cases the cardinal symptoms were cough, increased and frothy sputum, fever, and pain in the chest. Some patients complained only of cough. The quantity of sputum in some cases was enormous.

The chronic form results from several acute attacks or from neglected acute attacks, or probably from a weak strain of spirochaete. In connection with the last statement, however, we wish to say, that as far as our experience goes in these chronic cases the microscope has shown no difference in size of the spirochaete, or in the number of spirals, or gives any other visible indication of a weak strain. The main symptoms in the chronic
form are cough of long standing, worse at night, with much frothy sputum. The quantity of sputum is less than in the acute cases. There is usually no fever, on the contrary, a subnormal temperature is common. There may be blood in the sputum, and often there is active hemorrhage.

Physical examination shows signs very much like those in bronchitis. In fact, bronchial spirochaetosis is a form of bronchitis, due to a specific cause. The findings are, however, by no means constant and are often hard to detect. Dry or moist râles may be heard usually over the larger bronchi, especially on inspiration. The pulse shows no peculiarity. It rises with the temperature. Respiration shows a slight increase, as one would expect, and is more rapid in the acute than in the chronic cases.

The general appearance of the patient is not so much like that of the sufferer from pulmonary tuberculosis with his stoop-shoulder, as that of a patient with chronic bronchitis. He is pale and the hemoglobin is usually below normal.

Pathology.—We have not been able to make a single post-mortem examination.

Season.—Although cases were found in every month of the year, the greatest number were treated in the spring. Some patients reported that they had similar attacks in previous years during the same season. We treated the greatest number of patients suffering from this disease during the months of April and May.

Sex and Age.—Of the in-patients thirty-nine were males and only one a female. Among the clinic patients there was a much higher percentage of girls and women. From January 1st, 1922 to September 22nd, 1922, we treated in the clinic 7,121 males and 1,774 females; thus about twenty per cent. of all our patients were females. Of the total bronchial spirochaete cases coming to the clinic, thirteen per cent. were women and eighty-seven per cent. were men. In all we treated in the clinic 166 cases (145 men and 21 women) as uncomplicated cases of bronchial spirochaetosis. In 97 other cases, not primarily bronchial spirochaetosis, the spirochaete was found in the sputum. While this paper is being finished, a foreigner, who came to China about one year ago, came to the hospital with definite symptoms of bronchial spirochaetosis and on examination his sputum
showed the spirochaete. A few other foreigners were found to have the spirochaete. From the above it seems as though men are slightly more liable to the infection than women; this may be partly due to the greater seclusion of Chinese women.

As to age there is no doubt that the spirochaete prefers the young. The age of the oldest patient we treated was 53 years; that of the youngest only 7 years. More than half the cases were between 20 and 30 years of age and about 85 per cent. were between 20 and 40 years of age.

**Occupation.**—Evidently the occupation did not have very much to do with the disease, except that where people crowd together, as in schools, dormitories, and barracks, the number is greater than in the open air occupations. Of the forty inpatients thirteen were soldiers, eight were students, and the occupations of the others were as follows: cowherd, business man, coolie, housewife, farmer, peddler, rickshaw coolie, officer, Indian police, servants. Except for soldiers and students practically all our patients were natives of Kiangsu and Anhwei and of districts near Nanking.

**Complications.**—About half of our cases were uncomplicated. Of the clinic cases about two-thirds were reported as uncomplicated. The complications in the frequency of their occurrence were pneumonia, syphilis, tuberculosis, hookworm, malaria, and relapsing fever. The relapsing fever case came to us because of the accompanying bronchial spirochaetosis. He received salvarsan treatment and recovered from both diseases.

**Laboratory Findings.**—All the cases from which we drew our information were diagnosed in our laboratory under the supervision of Miss Grace Bauer, foreign laboratory technician of the University Hospital. Owing to her careful work, as well as to the interest of the foreign nurses in the hospital, this study has been made possible. In all cases the bronchial spirochaete was definitely diagnosed and the gradual decrease in the number of the spirochaetes was recognized in most cases after treatment.

The blood examination in bronchial spirochaetosis shows high white cell count in the acute form. Dr. Wassel, of Wuchang, lays special stress on high eosinophilia. Our cases did not show this particularly.
Staining.—The following method used in the University Hospital laboratory is very simple: Fix sputum in flame, stain with gentian violet for three minutes, wash and dry with blotting paper. Examine under oil immersion lens and the spirochaetes are seen as violet coloured spirals in the sputum. Fresh sputum unstained can be examined under high power for motility of the spirochaete.

Prognosis.—From our experience we conclude that the disease responds fairly well to treatment. All uncomplicated cases gave evidence of improvement very quickly. Five patients left the hospital unimproved; in two of these the disease was complicated by tuberculosis, in one by pneumonia, and in one patient the symptoms all pointed to typhoid fever but he left before the typhoid test could be made. This last patient, whose spirochaetosis was of eighteen month's duration, left seven days after treatment was started. The average stay of the patients in the hospital was two weeks. Practically every patient whose disease was uncomplicated left the hospital hopeful of a complete recovery.

Treatment.—Following the suggestions of others, we used arsenic in some form, usually and with the greatest success as Fowler's Solution, giving four drops three times a day. Salvarsan injections were also given, and a quicker response was obtained, but most of the patients were unable to pay for them. When the sputum contained blood, we added to the treatment calcium lactate in five grain doses three times a day. Rest in bed, especially during the first week, was insisted upon. For the cough a mixture was given, and if the pain in the chest was great aspirin was prescribed.

Our clinic patients were also put on arsenic with similar improvement; when necessary we added to the arsenic a stock cough mixture.

In the last edition of Castellani's work he recommends the use of tartar emetic combined with arsenic.
TARTAR EMETIC IN SCHISTOSOMIASIS JAPONICA.
(A PRELIMINARY REPORT.)

W. E. LIBBY, M. D., Wuhu.

In 1918, Christopherson discovered that tartar emetic was effective in the treatment of bilharziasis. He gives 1/2 grain dissolved in 20 minims of distilled water and further diluted with two volumes of normal saline at time of use. The dose is increased by 1/2 grain every other day until two grains are reached, and this dose is continued until thirty grains in all have been injected. In children he began with 1/4 of a grain for a boy of ten years. Care has to be taken to avoid acute or chronic antimony poisoning. The maximum dose for a boy of ten years is given as one grain; for an adult two to three grains. The drug appears to have a cumulative action.

This work of Christopherson's was confirmed by Low, Taylor and others. Cawston has obtained the best results with freshly prepared solution given on alternate days shortly after a light breakfast. The dose is gradually increased but a dose of over two grains is unnecessary. He has never seen recurrence when injections were continued over a period of 28 days and given regularly at least three times a week. Treatment should not be discontinued before the 28 days, however, nor should the regularity be interrupted, even if the total dosage is the same. The drug is prepared immediately before use by dissolving it in from 4 to 12 mils (c.c.) of boiling distilled water. He also used other preparations of antimony but has not found them less toxic than tartar emetic. Cawston further reports a series of twenty-five cases of bilharziasis treated with tartar emetic and concludes that twelve grains is sufficient to destroy the parasites if the technique is the same as above given. In some cases it may be necessary to give more of the drug and as high as twenty grains can be given if no single dose exceeds two grains.

Baujean uses a modification of Christopher's technique. He makes the solution so that each mil of physiological salt solution contains .02 grams of tartar emetic. This is then put in a small flask and sterilized. Injections are given as follows: 1.5 mils (1/2 gr.) for 2 days; 3 mils (1 gr.) for 2 days; 4-5 mils for 2 days;
then 6 mils (2 gr.) given and repeated at intervals of 48 hours until the necessary amount is given which is usually 1.2 gm. (20 gr.) But 1.06 gm. or 1.9 gm. may be given. The duration of the treatment is usually 19 days in ordinary cases, but may extend over 25-29 days where more intensive treatment is indicated. In this series there were both types of cases, six vesical and nine intestinal; good results were obtained in both types. In two cases the treatment was stopped because of the poor condition of the patient. In one case the patient showed a severe reaction to each injection, and it was discontinued. In two cases because of severe reaction the intervals between doses were lengthened.

Christopherson5 and Day6 conclude that the treatment is so effective that Egypt can be freed from this disease by field work such as has been carried on in the campaigns against hookworm.

These good results, however, are obtained in the cases infected with *Schistosoma haematobium* and *Schistosoma mansoni*. How about the infection with *Schistosoma japonicum* which concerns us here in China? Christopherson1 reports a case from Hunan in which the diagnosis was made in 1914, but treatment was not begun until 1920. It was commenced by giving 1/2 grain of tartar emetic daily at first, later every other day, the dosage being increased to 1/2 grains. The whole treatment took 31 days and a total amount of 21 grains was given. Six months later the patient came under the author's observation. All symptoms of pain and diarrhoea disappeared, the bowels moved regularly once a day and the faeces were normal and contained no blood or mucus. He concludes that tartar emetic is as effective in the Japanese as in the Egyptian bilharziasis. Sanders and Preston8 report a series of seven cases, three of which received from 21 to 24 1/2 grains each. The most severe case was much improved and gained weight. The other two patients were in good health when reported.

It is not because of the number of cases of *S. japonicum* infection we treated with tartar emetic, which is small, but chiefly because of the death of one of our patients which was perhaps due to the treatment that we report this series. It is too small and the treatment has not been carried for enough to draw any conclusions. We hope to make further observations in the future.

The solution of tartar emetic we used was made up in distilled water so that each mil (c.c.) contained 1/2 grain of the drug.
About 30-50 mils were put in a flask and sterilized. At time of injection the amount given was diluted with twice the volume of normal saline. Injections were begun with 1/2 grain and increased 1/2 grain every other day until 2 grains were reached. This amount was then given every other day.

SUMMARY OF CASES.

Total number of patients, eight. They were under treatment at various times from June 1st to November 1st 1922, a period of six months. They came from various parts of the territory about Wuhu; roughly, from 200 li (66 miles) south to 100-500 li (33-50 miles) north of Wuhu.

CASE No. 354.—Male. Aged 15 years. Occupation a fisher boy.
Past history.—Negative except for small pox and malaria.
Present illness.—Noted enlargement of the spleen about a year ago. No chills or fever or diarrhoea. For the past year his general health has gradually failed and his appetite is poor.
Examination: a thin and very poorly developed boy. Tongue is coated, but otherwise except for abdominal condition nothing noted. Abdominal veins dilated. Spleen greatly enlarged and occupies about one-half of the abdomen. It extends from the loin to the navel and from the 5th rib to the crest of the ilium. Its greatest measurements are 9 1/2 inches x 9 1/2 inches. It is very hard and the notch is so prominent that it almost forms a tumor itself. The liver extends two inches below the costal border and seven inches below the ensiform, mostly the left lobe, and occupies most of the epigastrium. Laboratory Findings: Urine negative. Stool contained hookworm and ova of Schistosoma japonicum. Blood: W. B. C. 7,250; R. B. C. 1,900,000; Hg. 45%; eosinophilia, 7%; negative for parasites. Patient received a course of oil of chenopodium for hookworm, but refused to stay longer. Days in the hospital, three.

CASE No. 503.—Male, aged 20 years. Farmer.
Past history.—General health always poor.
Present illness.—Seven years before coming to the hospital had an affection of the skin on left side of abdomen, which was followed by enlargement of spleen. Patient was delicate from that time on, but was able to be up and about. Diarrhoea always present, stools were blood-tinged at beginning but not recently. No fever. Two months ago abdomen began to swell gradually.
Physical Examination.—Negative, except for abdomen which is swollen and symmetrically enlarged. There is free fluid and shifting dullness. Spleen enlarged.
Patient gradually declined in strength and died on the tenth day from general exhaustion. He received one injection of 1/2 grain on the sixth day.
Laboratory findings.—Urine, slight trace of albumin. Feces, normal color, mucus and pus present, also ova of Schistosoma japonicum. Blood: not reported.
Tartar Emetic in Schistosomiasis Japonica.

Case No. 401.—Male, aged 14. Student.

Past history.—Health usually good. Had malaria two years ago.

Present illness.—Loss of appetite, fever, distension of abdomen and blood-tinged stools for about one year. Illness first began with emaciation and poor appetite. Movements, 3-4 times daily. Slight fever at times. Slight abdominal pain usually present.

Physical examination.—Essentially negative except for enlargement of spleen. It reached to the level of the umbilicus and medially about 1/2" from linea alba. No tenderness and no fluid.

Laboratory findings.—Urine, slight trace of albumin. Blood: W.B.C. 7,350; Hgb. 55%; eosinophiles, 5%. Stools: ova of Ascaris, Ankylostoma, Schistosoma japonicum and Trichuris.

Course in hospital.—Patient remained in the hospital 13 days during which time he received two courses of oil of chenopodium and one injection of tartar emetic (1/2 grain). Could not be persuaded to stay longer. Slight fever.

Case No. 691.—Male, aged 32. Merchant. Entered hospital on October 13, 1922.

Past history.—Scarlet fever, malaria off and on. Gonorrhea.

Present illness.—Began two months ago with dysentery; stools were bloody and contained mucus. There were about two stools every hour. There was also pain at this time. A mass was felt in the splenic region and some pain there. Had noticed the mass for about two years, present at times, absent at other times. It has grown larger the last year. There began to be swelling of feet and abdomen about one year ago. He also had some chills and fever at this time. The dysentery continued about two weeks and then the abdomen began to swell and there was some difficulty in breathing.

Physical examination.—A fairly well developed man with embarrassment of respiration. There is generalized edema from the level of the spine of the scapula posteriorly and the costal margin anteriorly. The legs are about twice normal size and very tense. The skin is broken in places and water oozes out. The lungs are filled with dry wheezing rales with fluid at the bases. Heart pushed upward and aortic second sound accentuated. Abdomen very tense with fluid.

Laboratory findings.—Urine, first examination negative; second examination nine days later shows albumin. Blood: W.B.C. 4,000; R.B.C., 3,520,000; Hgb. 75%; eosinophiles, 3.5%; Kalar-azar test negative. Feces at first, no blood, mucus or pus, but ova of Schistosoma japonicum, and Trichuris present; nine days later much blood, no parasites.

Course in hospital.—

October 14th. Because of edema, eliminative treatment by magnesium sulphate and daily sweat bath.

October 16th. Edema increasing, left arm affected. Injection, 1/2 grain of tartar emetic.

October 17th. Paracentesis, withdrawal of about 4 gallons of a light straw-colored fluid. Examination shows spleen about 4 1/2 inches below the costal margin and extending to median line. Liver not palpable. Patient much relieved.

October 18th. Tartar emetic. Gr. 2/3 20th. " 1 1/2

22nd. " 1 3/4

24th. " 2 1/2

Total, 6 1/2 grains.
October 25th, 1922, 9 a.m. Patient's general condition seems to be worse. Mucous membranes are of a dusky color and he says he feels badly. Yesterday in the afternoon vomited several mouthfuls of blood. Stools also positive for blood. Undoubtedly this blood comes from the varices about the stomach and liver as a result of the progress of the disease. This is rather a hopeless case.

11.30 a.m. Patient's general condition very bad. Pulse weak and rapid. He is cyanotic and cold. He passed 900 c.c. of dark blood by rectum, containing some clots. He is now suffering from loss of blood but says he feels better than yesterday evening. The loss of blood is probably partly due to the hemorrhage of preceding day. Discharged and sent home.

Case No. 565.—Male, aged 14. Occupation: at home. Entered hospital on August 18th, 1922, and remained 59 days.

Past history.—Negative.

Present illness.—Began three years ago when enlargement of spleen was noticed. The abdomen began to swell and the patient had diarrhoea. Question whether he had had fever. Cough began two months ago.

Physical examination.—Essentially negative except for poor general condition, râles in lungs, enlarged spleen, and free ascitic fluid.

Laboratory findings.—Urine negative. Blood (two counts gave about the same results, one being taken a week after the other); W.B.C. 3,800; R.B.C. 2,400,000; Hgb. 65%; eosinophiles, 8%. Stools: no blood, mucus or pus; ova present of Ascaris, Trichuris, Ankylostoma and Schistosoma japonicum. Sputum, negative on two examinations.

August 26th. Tartar emetic, 1% solution, 4 mils (c.c.)

" 28th " " " " 7 " Rise in temperature to 101° F.

" 30th. " " " " 8 " Temperature, 100° F.

September 5th.

" 7th. Tartar emetic " 6 mils (c.c.)

" 11th. " " 8 mils

" 14th. " " 10 mils No further injections for 20 days

October 4th. " " 1/3 grain

" 6th. " " 2/3 "

" 10th. " " 1 "

" 16th. " " 1 1/3 "

A total of about 12 grains was thus given over a period of fifty days. Following the injection of 10 mils the patient vomited. It may have been simply from the coughing which was quite severe after each injection; and a regular paroxysm of coughing followed the larger doses.


October 10th. Because of pressure paracentesis was performed and about 3 gallons of a light straw-colored fluid were withdrawn. Examination shows liver 3 finger-breadths below costal border. Edge of liver firm and roughened. Spleen reaches to the ilium and almost to mid-line.

October 16th 1922. Patient refused further treatment, so was discharged. Very little, if any, improvement in general condition.


Past history.—Negative.

Present illness.—Began about two years ago with pain in lower abdomen and bloody stools, 4-6 in 24 hours. There was also pain in the
Tartar Emetic in Schistosomiasis Japonica.

rectum with spasm. Gradual loss of weight and strength. Entered the hospital previous December and remained 10 days without improvement. Health has gradually declined since then.

Physical examination.—Essentially negative except for the abdomen which is very tympanitic. Tenderness over both lower quadrants and in the epigastrium. Liver and spleen not palpable.

Laboratory findings.—Urine, negative. Stools, normal color, blood and pus present also ova of Ascaris and Schistosoma japonicum. Blood on October 6th: W. B. C. 5,000; R. B. C. 2,500,000; Hgb. 70%; eosinophiles, 3%. October 21st. Kalar-azar test repeatedly positive. Sputum, two examinations negative for B. tuberculosis and spirochetes.

Course in Hospital:
October 4th. Tartar emetic 2/3 grains.
6th. 1/3 
16th. i 1/3 
18th. » 2/3 
20th. » 2 1/4 

Notes.—October 18th. Condition about the same. Patient raising large amounts of yellow-greyish thick sputum. Suspicious of tuberculosis but sputum negative and no physical signs of this disease present.
October 25th. No improvement.
October 27th. Sputum absent and no ova of parasites in the stools. There is marked infiltration and tenderness over the sites of injections in both arms and patient says bones are sore. There was an infiltration in the last two injections. Some edema of abdominal wall and small amount of fluid present. Injections stopped because no veins available.
October 30th. Swelling of genitals, and edema more marked.
November 1st. Xo improvement in the diarrhoea which is the worst symptom; 12-14 stools in 24 hours. Tried to inject into the jugular veins.

Past history.—Negative.

Present illness.—Began about eight years ago. Patient does not know much about it except he has felt a mass within the abdomen since that time that was not there before. Slight diarrhoea.

Physical examination.—Undersized boy, but in fairly good condition. Liver three finger breadths below costal border and spleen about the same.

Laboratory findings.—Stools, ova of Schistosoma japonicum present. October 23rd, negative. Blood: W.B.C. 7,200; R.B.C. 3,200,000; Hb. 70%; eosinophiles, 16%.

Course of treatment.—Beginning September 8th and extending to November 1st ten injections were given of tartar emetic from 1/2 to 1 1/2 grains each. Following the injections coughing has been quite marked and paroxysms occurred after the stronger doses. After last injection the patient vomited. Some of the solution infiltrated into the tissues and later a small abscess developed.

November 1st. General condition quite improved. Looks better and feels better. No ova of parasites found in stools.

Case No. 700. Male, aged 48 years. Merchant.

Past history.—Negative, except for a doubtful history of cough and bloody sputum four years ago.

Present illness.—Began four years ago with a small mass (spleen) which gradually enlarged to present size. No diarrhoea, and no other
symptoms except general weakness and loss of weight. About two years ago a small mass appeared in right thigh, the leg became swollen and has remained so since. Abdomen began to swell about two months ago.

**Physical Examination.**—Negative, except for the following points:
- Spleen, four-inches below costal border and extends to about three-inches from median line. Fluid in both flanks. Liver not felt. Swelling (edema) of right leg.

**Laboratory findings.**—Urine, negative. Feces (on the 18th, 24th and 28th), normal color; no blood or mucus; ova of *Schistosoma japonicum* found at all three examinations. October 17th. Blood: W.B.C. 4,000; R.B.C. 3,000,000; Hgb. 65%; eosinophiles, 5%; Kalar-azar test negative.

**Course in hospital:**
- October 18th. Tartar emetic 1 grain.
- 20th. " " 1/4 "
- 22nd. " " 1/4 "
- 24th. " " 2/4 "
- 26th. " " 3 "
- 28th. " " 3 "
- Rise in temperature to 100.4° F. and increase of pulse rate by 20 beats.
- 30th. " " 2 "
- 3 "
- A total of 12 5/6 grains spread over 14 days.

**Notes.**—October 26th. Following the injections of tartar emetic the patient has had violent coughing spells, which were particularly severe after the injection (3 grains) on this day. This violent coughing has also been noted in other patients.

October 28th. Stools still show presence of ova of *S. japonicum* and there is no improvement to date.

October 30th.—Patient’s respiration is embarrassed by enormous collection of fluid in the abdomen. This has developed very rapidly. Paracentesis was done at 2 p.m. and 9-10 liters of yellowish-brown opalescent fluid were withdrawn. Patient’s embarrassment greatly relieved. This fluid was different than any other fluid I have seen. It was opaque from the large amount of albumin present and there were quite large pieces of albuminous material in the fluid. The color was due to blood which in the test tube settled at the bottom. The blood could not have come from the puncture because of its uniform distribution throughout the fluid, and because there was no bleeding when the trocar was withdrawn. It must have come from within.

October 31st. I noticed the patient as soon as I entered the ward on my morning rounds and made the following notes: Patient in a very bad condition. Pulse irregular and weak. Tongue coated and breath foul. Is restless but “dopey.” The mucous membranes are of a dusky hue and the skin and conjunctivae are yellow. All this may be the result of the injection of tartar emetic. Body has an uraemic odor. Patient says he feels as if he had taken ether; mind a little cloudy.

**Physical examination.**—Patient complains of tenderness in the epigastrium below ensiform and there is a mass palpable there which seems to be part of the liver, the left lobe; perhaps this was not elicited before on account of fluid. He evidently is in a very toxic state; looks as if it were a severe case of jaundice. Why should this condition appear so suddenly? Is it the result of poisoning from the tartar emetic, or due to the disease itself? The skin is dry and hot. Eliminative treatment begun; calomel and salts given, and salt solution by rectum.
4 P.M. Patient's condition about the same as in the morning, but his mind is a little less rational. Pulse is weak and irregular. Tincture of digitalis given.

6:30 P.M. Pulse improved, but general condition remains about the same, though he is not as rational as early in the day. His respiration is somewhat labored and he seems to be in distress. He has passed no urine since early morning.

November 1st, 1:30 a.m. Night nurse reported that patient while on the bed-pan suddenly collapsed, and died before he was seen by the doctor.

Was this a case of poisoning from the cumulative effects of the tartar emetic? Korns⁹ states that the use of antimony over prolonged periods, as in the treatment of kalar-azar, is attended with potential danger. He cites the case of poisoning reported by Breinl and Priestly in which 1.74 grams had been given. The autopsy showed extensive fatty degeneration and the kidneys an acute nephritis. He further says that poor excretion of the drug may have been responsible for the onset of the terminal toxæmia which was acute in type. He mentions the case of bilharziasis of Archibald and Innes, which died from influenzal pneumonia after about 2 grams of tartar emetic had been given. The kidneys and liver showed fatty degeneration, though there had been no symptoms of poisoning during life. In the experiments with rabbits very much the same condition was found at autopsy.

In view of these facts it seems certain that our case is another instance of poisoning from antimony potassium tartrate. Clinically, it presented to me a picture of uraemic toxæmia upon which was superimposed the jaundice. This could be accounted for by lesions similar to the autopsy findings in the cases quoted by Korns. The blood in the ascitic fluid might also be accounted for in this way. The acute terminal toxæmia may also have been due to the poor excretion of the drug which caused the cumulative action.

But why this sudden onset when less than 13 grains had been given while 1.74 grams, or more than twice that amount, had been given to the patient of Breinl and Priestly? Moreover, according to Korns, the amount which may be safely used in the treatment of kalar-azar is considerably larger than heretofore used. With due regard for individual susceptibility he advises a more rapid approach toward the maximum dose. Could death be due to the fact that the patient had received 8 grains in 5 days? There had been a rise in temperature and in the pulse rate, and quite violent coughing followed the injection of 3 grains and for that reason the
next dose was reduced to 2 grains. I had ordered only 2 grains for this last dose but through a misunderstanding 3 grains were given. Yet it hardly seems possible that this single factor in itself would have caused the fatal result.

SUMMARY.

Eight cases of *Schistosoma japonicum* infection were treated with tartar emetic.

Four of the cases were severe; one was moderately severe. In the first case the stools were negative after 4 ¾ grains of tartar emetic had been given but the general condition was unimproved. In the second case the stools were negative after 8 2/3 grains, the diarrhoea was less, but there was no improvement generally. In the third case no parasites were found and no sputum after 7 grains, but the diarrhoea persisted and the general condition was unimproved. The fourth patient received 12 5/6 grains and then death ensued. Parasites were present in the stools during last days of illness. The fifth case was less severe. The stools were negative after 11 grains had been given and there was quite marked general improvement.

CONCLUSIONS

1. Tartar emetic will destroy *Schistosoma japonicum* and improve the general condition in the less severe cases. How effective it is in the severe cases which mostly come under our care remains to be seen. Here, too, if it can be pushed far enough it may give good results.

2. Great care must be exercised in the administration of the drug for it is very irritating to the tissues when infiltration occurs.

3. When is the danger point reached? This is hard to determine, but one must be careful in a severe case when the general condition of the patient is poor. Each case must be taken by itself.

REFERENCES.

C. M. M. A. CONFERENCE, 1923: ITS SOCIAL ASPECT

Occasionally the complaint is heard that nowadays there are far too many conventions, conferences, committees and other gatherings; that men are drawn away from their work for no good reason; that the papers read at conferences are seldom of permanent value and are quickly forgotten, and that the resolutions passed have no practical issue. All such proceedings, so it is said, are a waste of time, energy, and money, and tend to lessen that steady efficiency to which we should all attain.

Despite such criticism, it seems to the ordinary observer that religious, political, social, medical and other conventions and conferences are held more frequently than ever before. Thus in the United States the fraternal organizations are very numerous and are multiplying; in many the members number hundreds of thousands; some have a membership of over a million. These organizations are almost wholly composed of shrewd business men. Yet they all hold annual conventions lasting several days, spend money very freely, and combine a great deal of social pleasure with their business.

It may well be asked, what is the meaning of this great social movement? It is certainly very remarkable. The writer happened to be a visitor last summer to the city of Los Angeles, California, and during his stay was much impressed by the various organizations which spent several days there, especially by the Mystic Shriners who came in their thousands, adorned with red fezzes,
The China Medical Journal.

crescents, and other signs and symbols of "the mysterious East." The movement must be ascribed to something solid and good.

No doubt business men are now convinced that nothing renews their mental and physical strength so much as a few days rest with complete change of environment. But if we mistake not, there is a deeper meaning: It is a reaction against the political economy which insists that each man must stand by himself and struggle for his own well-being, without much regard for the rights and well-being of others. Men have learned they can be better and happier, and accomplish more work by friendly co-operation than by ruthless competition; if some fail, it is now seen their loss means no permanent gain to others. The great social organizations to which we are referring seem to be wholly actuated by the spirit of brotherly kindness, of mutual helpfulness. They are almost evangelistic in their fervor. Indeed, a Rotarian who visited Shanghai a short time ago declared that if in 1914 the peoples of Europe had known of the Rotary Association there would have been no war! The Mystic Shriners have recently given over a million dollars to orthopaedic work in the United States, and the Grand Lodge of the Knights of Pythias has given a similar sum for work among the lepers in the Philippines. By coming together in annual conventions and spending a few days in pleasant social intercourse, the members learn to know each other better, to understand each others difficulties, and therefore they are more ready to lend a helping hand to those in distress than to push them to the wall. In short, their organization tends to make them wiser and kinder, and in their unity they find strength.

The foregoing may seem a long and somewhat irrelevant preface to what we have to say concerning our own organization, but the reasoning should be plain. If men in other walks of life in more favored lands find it helpful to meet annually for a few days, how much greater reason there is for medical missionaries, once in two or three years, to meet for mutual benefit? For many are stationed in far inland cities in professional loneliness, or with but one or two medical colleagues. Herein may lie one of the causes which lead some missionary physicians to send in their resignation during or at the end of the first period of service, for circumstances may be very trying. After the novelty of life in China has worn off and the physician has settled down to work, he
may soon find that he has more to do than he can accomplish to his own satisfaction. His hospital is crowded with patients. Of an afternoon there are a hundred or more patients to be seen in the dispensary, and with all his other duties he can only spare a couple of hours or so to see them. After weeding out ulcers of the leg, cases of chronic conjunctivitis, and other easily recognized and long standing complaints requiring only stock remedies, he knows that not a few of the remaining cases deserve the most careful study and this he can seldom find time to give. To himself he seems to be contending with forces that are too strong for him. "Have you never got tired of the incessant work?" a great medical missionary, Dr. Laws, of Livingstonia, was asked near the close of his active career. He replied, "I have often been tired by the work, but never of it. I don't mind work, but I like to get on the top of it; it is only when there is so much that I cannot get through that I begin to be worried."

Now when a physician is unable to get "on top" of his work, either he remains in a state of permanent dissatisfaction with himself and his circumstances, or he drifts into performing his duties in dull routine fashion, or else he attends one of our Association conferences and sees the way he should take. For at a conference he meets men who have to struggle with exactly the same circumstances as himself and are not overcome by them. Further, he realizes in association with others, that he is not an isolated unit, but a member of a goodly fellowship; he sees more clearly that his work is linked with the work of several hundred others extending over a very large part of China, and that taken as a whole the organization has accomplished a vast amount of good. Merely to meet at a Conference with brothers and colleagues in friendly intercourse is a very great help, especially when at the close of each day, science and business, personal cares and anxieties, are laid aside, and in quiet fellowship all seek to renew their spiritual strength.

We urge, therefore, every member who can possibly do so to attend the Conference, not only for the scientific help and the wide vision of the purpose and work of the Association which may be gained, but also for the spiritual and social help we can give to each other.
A meeting of the Executive Committee was held on Saturday, December 9th, 1922. Present: Dr. Johnson (President), Dr. Cousland (substitute for Dr. Shields), Drs. McCracken, Thompson, Houghton, Merrins, Fowler, and Tucker.

The minutes of the previous meeting were read and adopted.

In considering the programme of the Conference, a letter was read from Dr. Hiltner stating that he would be absent from Shanghai at the time of the Conference and therefore would be unable to present a paper on Medical Ethics as promised. The question whether medical ethics was a subject of sufficient importance to take the time of a morning session was discussed. Finally, the question was decided in the affirmative and Dr. Merrins was asked to prepare a paper on Medical Ethics and Dr. Huntley was also asked to speak on the subject.

On motion it was unanimously agreed to add one or more sessions on X-ray work to the sectional meetings, with Dr. Hodge as Chairman.

On motion it was decided to send to each member of the C.M.M.A., a full printed programme of the Conference at as early a date as possible.

The importance of securing a business Committee to arrange for the work of the Conference while in session was recognised. The following were appointed on this committee: Dr. Snell (Chairman), Drs. Houghton, Cadbury, Cochran, Davenport, Love and Fowler.

Dr. Houghton, as acting Director of the China Medical Board, read a letter informing the Committee that the China Medical Board had made financial grants to the C.M.M.A. of Mex $15,000, annually for 1922 and 1923, and of $10,000 annually for the three years 1924, 1925, and 1926 on condition that the C.M.M.A., should raise each year a gross income similar in amount to the annual grant, the salaries and allowances of Drs. Beebe and Merrins paid by their Boards, being included in this income. After discussion as it was felt that the conditions could be met, Dr. McCracken thereupon moved and Dr. Fowler seconded a motion which was carried unanimously, that the grant be accepted.
The following resolution, proposed by Dr. Merrins and seconded by Dr. Pell, was passed unanimously: "In accepting the gift from the China Medical Board of the Rockefeller Foundation of the sum of $15,000 per annum for the C.M.M.A., for two years, and of $10,000 per annum for a further period of three years, the Executive Committee of the C.M.M.A., expresses its thanks to the Board for this timely aid which will greatly strengthen the work of the Association; and the Executive Committee on behalf of the Association takes this opportunity to express its grateful appreciation of the financial and other help given to many of its members and institutions which has been of inestimable value to us, and through us to the Chinese whom we serve."

Dr. Houghton moved and Dr. Pell seconded a motion expressing appreciation of the courtesy and kindness of the President and Council of the Protestant Episcopal Church, U.S.A., in permitting Dr. Merrins to give his whole time, without expense to the Association, to the editorship of the China Medical Journal.

Dr. Houghton moved and Dr. Pell seconded a motion, which was carried, that the Executive Committee of the C.M.M.A., should authorise the Editor of the China Medical Journal to issue the Journal monthly beginning with January, 1923. As this involves a greatly increased expenditure, a motion was passed that the Executive Committee recommend to the Conference that By-law 16 of the Constitution and By-laws of the Association, be altered so as to read:

"The yearly dues of members to the Association shall be $7.00 Mex., payable on the first day of January in each year."

"The price of the China Medical Journal to those who are not active members of the Association shall be $10.00 Mex., per annum, postpaid."

Dr. Merrins moved and Dr. Houghton seconded a motion that the office and duties of the treasurer of the Association shall be wholly transferred to the Executive Secretary, who shall receive and administer all the funds of the Association, including those of the China Medical Journal, and that such transfer shall take effect upon the appointment of the new Executive Secretary.

A committee consisting of Drs. Tucker, McCracken and Peters was appointed to receive and forward any materials which the
missions in China may desire to send for the next convention of the American Medical Association to be held in San Francisco, June, 1923.

It was moved and carried that the C. M. M. A., strongly recommends the appointment by each Home Mission Board with medical work, of a permanent full-time Medical Secretary, as the Association had noted with satisfaction the impetus that has been given to medical missionary work since the appointment by several Boards of medical secretaries.

Note:—The foregoing is a brief and partial report of the proceedings of the Committee taken from minutes not yet corrected and approved.

C. M. M. A. CONFERENCE, 1923.

Special Notices

Prior to the Conference, meetings will be held by the various Standing Committees of the Association.

Wednesday evening: February 14th, 1923.—Reception by the President and Officers of the Association.

Thursday: February 15th.—Conference opens 9 a.m.

Sunday: February 18th.—Special services in Shanghai Churches.

Tuesday: February 20th.—Conference closes.

Daily Programme

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<td>8.00 a.m.</td>
<td>Breakfast</td>
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<td>9.00 a.m.</td>
<td>Morning Sessions</td>
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<td>9.00 a.m.</td>
<td>Business and announcements</td>
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<td>10.00 a.m.</td>
<td>Reading of Conference papers</td>
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<td>10.30 a.m.</td>
<td>&quot;Setting up&quot; exercises</td>
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<td>Devotional exercises</td>
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<td>11.00 a.m.</td>
<td>Discussion of papers</td>
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<td>12.15 p.m.</td>
<td>Tiffin</td>
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<td>9.30 p.m.</td>
<td>Social hour</td>
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<td>10.10 p.m.</td>
<td>Devotional</td>
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Morning Sessions

Thursday, February 15th, 1923. Medical Mission Policy; reviewing recent Survey of the China Continuation Committee; the reports of the five Commissions considered at the National Christian Conference, and the report of the Educational Commission to China. Paper by Dr. H. Fowler. Discussion.

Friday, February 16th.
Medical Evangelism. Dr. F. M. Auld, Dr. H. F. Love and others. Discussion.

Saturday, February 17th.
Medical Ethics. Dr. Merrins and others. Discussion to be opened by Dr. Huntley.

Monday: February 19th, Public Health:
2. The Problem of the Future of the Council on Health Education. Dr. W. W. Peter.
3. The Problem of the Future of the National Health Association of China, by Dr. S. M. Woo.
Discussion by Drs. Houghton, Balme, Tyau and Yen.

Tuesday: February 20th, Hospital Problems:
(a) Hospital Administration. By Dr. J. H. Snoke. Discussion.
(b) Training of Hospital Technicians. By Dr. J. A. Snell. Discussion.

SECTIONAL SESSIONS.
(1.30 p.m.—3.30 p.m.)

Section on General Medicine.

Chairman: Dr. F. C. McLean, PeKing.

First Session:—The Treatment of Diabetes. Dr. F. C. McLean.
Lethargic Encephalitis in China. Dr. A. H. Woods.
A simple Precipitation Test for Syphilis. Dr. Samuel Cochran and Dr. L. F. Heimberger.

Second Session:—Radium. Dr. C. N. Frazier.
Kala-azar in China. Dr. C. W. Young.
Some problems of Pediatrics in China. Dr. Hammond.
Observations on the Growth and development of Chinese Children. Dr. V. B. Appleton.
Rickets: Observation of Cases in Peking. Dr. Tso.

Third Session.—Carbon Tetrachloride as an Anthelmintic in Uncinariasis. Dr. W. W. Cadbury.
A Preliminary Report on the Physical Examination of Medical Students. Dr. E. B. Struthers.
A Survey of Malaria among the Students of Soochow University. Dr. K. H. Li.

Fourth Session.—Leprosy (Discussion under Professor B. E. Read’s direction).

Surgical Section.

Chairman: Dr. J.R.B. Branch, Changsha.

1. Hernia.—Illustrated paper and demonstration. Dr. A. S. Taylor.
2. Skin Grafting.—Dr. A. S. Taylor.
3. Ruptured Spleen.—Dr. J. C. McCracken.
4. Bone Surgery.—Dr. J. C. McCracken.
5. Tuberculosis of Knee.—Dr. T. Stearness.
6. Fistula in Ano.—Dr. J. R. B. Branch, Changsha.
7. Pathological changes in the Scrotal contents: some difficulties in diagnosis and treatment. Dr. R. Howard Mole.
9. Ankylosis of the Elbow Joint as seen in an Inland Hospital. Dr. George T. Tootell, Changteh.

Operative clinics will probably be held at the Red Cross Hospital in connection with the reading of the first, second, fifth and sixth papers.

Clinical Physiology Section.

Chairman: Dr. H. G. Earle, Hongkong.

1. Introductory Address and Discussion on Physiology in relation to Clinical work with special reference to Chinese physiological standards.


Experimental Tetany. Professor Cruickshank.

Vitamins. Dr. E. C. Peck.

New Methods in Blood and Urine Analysis. Dr. Hsien Woo.

Subsection in Pharmacology.

Chairman: Professor B. E. Read, Peking.

First Session:—The Hospital Dispensary. Western drugs and their preparations.

A standard formulary for hospitals in China.

(a) The best form for the presentation of drugs as regarded from the standpoint of economy, elegance and efficiency. Paper by Dr. H. Owen Chapmen on "Stock Mixtures, their intelligent use and detailed preparation." Discussion of the paper, and of the relative value of pills, tablets etc.

(b) Materia Medica. The need for greater simplicity and standardization along lines common to the Pharmacopoeias of U. S. A. and Great Britain. Paper by Prof. B. E. Read on a standard Materia Medica. Discussion of paper, and of the place of new remedies and the definition of obsolete drugs.

(c) Suggested formulas for hospital use and present existing formularies in China. Open discussion of a formulary for general use in China.

Second Session:—Chinese Drugs, their Use in Western Hospitals.

(a) Western drugs on the China market. The relative importance of price, purity and preparation.


2. Vegetable Drugs. Paper by Prof. B. E. Read.

(b) Psychic adjuvants in medicine. Colors, aromas, flavors and bitters as prepared from Chinese drugs. Paper by Mr. C. T. Cheng.
(c) Chinese drugs of therapeutic value to Western Physicians. Dr. Peter Kiang and Dr. H. P. Chu.
(d) Toxic substances in Chinese medicine. Their occurrence, classification, symptoms and antidotes. Prof. B. E. Read.

Obstetric and Gynecological Section.
Chairman: Dr. J. Preston Maxwell, Peking.

1st session.—(i) Osteomalacia in China. Subject to be introduced by Dr. J. Preston Maxwell, and Dr. F. J. Wampler.
(2) The methods for preventing the possibility of confusion of infants in the nursery of an obstetric ward. By Dr. Lee M. Miles.
(3) Discussion of a proposal brought forward by the Staff of the Obstetric and Gynecological Department, Peking Union Medical College:
"All obstetric cases are to be considered morbid in which the temperature exceeds 37°.8 C or 100° F. on any two successive days; or exceeds 37°.8 C. or 100° F. for a continuous period of 12 hours between the end of the 1st and 8th days after delivery.
(4) Ectopic Gestation in China. By Dr. Arthur Woo, Peking

2nd session.—(1) Suspension of the Uterus. Subject to be introduced by Dr. J. R. B. Branch, and Dr. J. L. Maxwell.
(2) Measurements of the Chinese Pelvis. Dr. Clara Whitmore.
(3) How to stimulate the secretion of milk in a nursing mother. Dr. Eileen Smyly.

Section on Ophthalmology.
Chairman: Dr. Harvey J. Howard, Peking.

First Session:—A plea for the routine examination of the vision of school children in China, with recommendation to the Conference. Dr. E. J. Stuckey.

Symposium on Cataract.
a. Indication for operation.
b. Choice of operation.
c. Technic of some of the newer operations.
d. The handling of accidents in cataract extraction.
e. After treatment.
f. Statistics.
Symposium to be opened by Dr. R. A. Peterson, Dr. C. A. Hayes, Dr. H. J. Howard, Dr. D. V. Smith.

Symposium on Glaucoma.
  a. Predisposing causes and prodromal symptoms.
  b. Indications for operation.
  c. Choice of operation and why.
     1. The iridectomy.
     2. The trephine operation.
     3. The La Grange operation.
     4. New operations.

Symposium to be opened by Dr. D. V. Smith, Dr. H. J. Howard and Dr. G. M. Harston.

Second Session;—Drugs and Instruments, Dr. R. A. Peterson.

Symposium on Trachoma.
  a. Differential diagnosis.
  b. Pathology of trachoma.
  d. Statistics.

Symposium to be opened by Dr. G. M. Hartson, Dr. Frank Oldt, Dr. D. V. Smith, and Dr. F. C. Yen.

Symposium on Squint.
  a. Methods of determining the causes.
  b. Indications for conservative measures.
  c. Indications for operation.
  d. Choice of operation and why.
  e. Results that may be expected.

Symposium to be opened by Dr. H. J. Howard Dr. J. W. Hewitt, Dr. C. H. Hendry, and Dr. F. A. Wilmot.

Section on Pathology.

Chairman: Dr. E. S. Tyau, Shanghai.

1. Papers on the Pathology of Plague, Beri-beri, Dysentery, etc.
2. Demonstration of Pathological specimens.

Section on Diseases of Ear, Nose and Throat.

Chairman: Dr. W. S. Thacker Neville, Changsha.

1. The routine work of a Laryngologist in China. Opening address by Dr. Thacker Neville.
2. Tubercular Disease of the Larynx. Dr. Liu, Peking.
3. Indications for Tonsillectomy. Dr. Digby, Hongkong.
4. Local Anaesthesia in Tonsillectomy. Dr. Han, Shanghai.
5. A demonstration of Bronchoscopy and Oesophagoscopy. Dr. H. R. Slack.
6. A demonstration of laryngological instruments. Dr. Thacker Neville.

Section on X-rays (tentative programme).
CHAIRMAN: DR. P. C. HODGES, PEKING.
1. Papers on the subject of X-ray apparatus, technique, treatment and diagnosis.
2. An exhibit of apparatus, charts, diagrams and cases following reading of papers.

Section on Parasitology.
CHAIRMAN: ERNEST C. FAUST M. A., PH. D., PEKING.
1. Seminar on Schistosomiasis Japonica in China:
   b. The Intermediate Host of the Oriental Blood-Fluke in China, being a Survey of the Soochow Area. Drs. H. E. Meleny and Dr. Faust.
2. Clinical and Therapeutic Aspects of Schistosomiasis japonica:
   a. Clinical Diagnosis. Dr. J. A. Snell and others.
   b. Therapy. Dr. Faust and others.
3. Public Health Aspects of Schistosomiasis japonica:
   a. Distribution of the Disease in China. Dr. J. L. Maxwell, Dr. Faust, Dr. Tootell, and others.
   b. Prophylaxis. Dr. J. B. Grant.

1. A new type of dysentery amoeba found in China. Dr. Faust. Discussion.
4. The Problem of Malaria in China. Dr. E. S. Tyau. Discussion.
5. Recent Aspects of Kala-azar in China. Dr. C. W. Young and Dr. Cochran. Discussion.
6. Coccidiosis (due to *Isospora hominis*) in the Wuhan area. Dr. C. McA. Wassell. Discussion.

3. Parasitology and the Clinical Laboratory:
   b. Anomalies in Human feces. Dr. Faust.

2. Blood examination.
   a. Kala-azar. Dr. C. W. Young.
   b. Malaria. Miss Grace Bauer.

3. Demonstration of eggs of human helminths found in China, with criteria for their identification. Dr. Faust.

4. The Life History of *Fasciolopsis buski* in China. Dr. C. H. Barlow.

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Section on Public Health.

Chairman: Dr. F. C. Yen, Changsha.

First Meeting.—1. The Essentials for the Initiation of Health Education in Schools. Dr. John B. Grant. Discussion opened by Dr. S. M. Woo.

2. Health Teaching and Activities in Colleges in China. Dr. Paul Wakefield. Discussion opened by Dr. Huntley.

3. Public Health Courses in Middle and Primary Schools in China. Dr. Ido Bell Lewis. Discussion opened by Dr. V. C. Appleton.

4. Teaching of Preventive Medicine in Medical Schools in China. Dr. F. C. Yen. Discussion opened by Dr. C. M. Mariland.

Second Meeting.—1. Statistical Work in China. Dr. John B. Grant. Discussion opened by Dr. Wu Lien Teh.

2. Health of Missionaries in China. Dr. R. N. Atwater. Discussion opened by Dr. F. A. Wilmot.

3. Child Hygiene. Dr. V. B. Appleton. Discussion opened by Dr. Louis Farnam.

Third Meeting.—1. Recent Advances of the Control of Diphtheria. Dr. C. E. Lim. Discussion: Dr. C. P. Maitland.
2. Trachoma Eradication among School Children. Dr. H. J. Howard. Discussion opened by Dr. F. Oldt.
3. Sex Hygiene. Dr. Frank Oldt.

EVENING SESSIONS.

Wednesday, February 14th, 1923, 8.30 p.m.-9.30 p.m. Reception.
Thursday, February 15th, 8.30-9.30 p.m. Public Health.
2. What Public Health Activities are possible of Immediate Initiation in China? Dr. Wu Lien Teh.
4. Public Health Activities in Nanking. Dr. C. W. Woodworth.

Friday, February 16th, 8.30 p.m.-9.30 p.m. Addresses.
(a) Pasteur. Dr. C. Noel Davis
(b) Lister. Dr. E. G. Gauntlett.

Saturday, February 17th, 8.30 p.m.-9.30 p.m. Papers on Nursing by Miss Cora E. Simpson, and by Miss Gage.

Monday, February 19th, 8.30-9.30 p.m. Paper on Medical Education, by Dr. J. C. McCracken. Discussion opened by Dr. Balme and Dr. Houghton.

Tuesday, February 20th, 8.30 p.m.-9.30 p.m. Lecture with demonstration and moving pictures. Dr. W. W. Peter.

Syphilis Statistics in Japan.—Dr. Hata has collected data on the reproductive power of women married for three years or more who show a positive Wassermann reaction. He gives the following percentages: Not impregnated, about 40 per cent; impregnated, about 60 per cent. Among the children of these syphilitic mothers, there were 28 per cent. premature and only 30 per cent. survived more than two years, only a third of whom will live a natural healthy life. Maternal syphilis is one of the most serious factors in the problem of repopulation.
NURSES' ASSOCIATION OF CHINA: ITS ORIGIN
AND DEVELOPMENT

Miss Cora E. Simpson, R.N., General Secretary, Nurses' Association of China.

What was the beginning of the Nurses' Association of China? In the China Medical Journal for November, 1908, the following communication was enclosed as a separate leaflet.

Kindly hand this sheet to the nurse connected with your hospital.

A NURSES' ASSOCIATION.

Extract from a letter recently received:

I am the first graduate nurse in our Mission, and after my year of language study, will be at the—-Hospital. We have never trained any nurses in this part of China. We have always trained medical students in the hospitals instead, but now I think the time is ripe in China for medical students to take their training in the medical colleges and give place to the hospitals for the training of nurses as we do in the home lands.

I would like to know what has already been done along the line of training nurses. Have we any text-books or course of study marked out? Is there any Nurses' Association in China? If so, I would like to become a member. I realize that this is a new work, and many of the Chinese look down upon the nurses' work as only fit for coolies; but it must be time to try to change that idea and teach these people that this new way is only one of the methods in which the Master would minister to suffering humanity. I do not think I shall be able to start my class in nursing this year, but am very anxious to come in touch with what has already been done, for I believe that in union there is always strength.

With the steady increase in the number of the missionary nurses in China and the growing importance of this branch of our work has the time not come for the nurses to get together to form an association of their own for mutual help? In the absence of any organization I shall be glad to act as 'middleman' and receive letters from any or all who may be interested in the subject. It is important that a lady be nominated to act as temporary organizing secretary, some one who has had experience and is fairly centrally situated. Please write at once and make suggestions.

The Editor bids me say that he will be happy to assign space in the China Medical Journal to a Nursing Department.

(Signed) P. B. Cousland.
I had written the letter to Dr. Cousland in the spring of 1908, little dreaming it would go down in history. He had been home on health leave, so the answer was delayed. In reply, among other things, he said: "Your letter opens or rather touches on a big subject. We physicians are pretty well organized and have a good Journal, but the nursing sisterhood still consists of a small and scattered folk. I think the time is coming when you should get together and organize yourselves for mutual help. Some method of intercommunication is essential. Perhaps, at first, a page or two in the China Medical Journal will answer. Eventually you will be able to have a little paper of your own. We ought to have schools for nurses. There is no Nurses' Association yet—there is no branch of the Red Cross in China." What has always impressed me is the fact that, busy man as he was, he had time to give some good advice on language study that I have tried to follow and which would be good for every nurse on first arrival in China.

In 1918, in another letter, Dr. Cousland wrote: "Yes, your letter set a big movement on foot."

The nurses at Kuliang had a meeting in the summer of 1908 and in Kuling in 1909, and a beginning was made.

The first President was Mrs. Hart, of Wuhu, wife of Dr. Hart who gave his life in the typhus epidemic of 1912. The first General Secretary was Miss Maud Henderson, of Wusih. In the China Medical Journal, January, 1909, Dr. Fulton of Canton, and Dr. Gaynor of Nanking welcomed the movement started in this way. Dr. Fulton translated a work on Surgical Nursing which is widely used in our Schools. Dr. Chestnut, who was killed at Lienchow, had begun a translation of Mabel Adams Hampton's Principles and Practice of Nursing. This was finished by Mrs. J. J. Boggs, M.D. and was published in 1909, by the Publication Committee of the C. M. M. A. This committee has helped us greatly by revising and re-issuing this book and by publishing other books in Chinese on Nursing. (After writing her book Miss Hampton was married to Dr. Robb, so her name became Hampton Robb.)

Dr. Gaynor was always the friend of the Nurses' Association. At a dinner in her home on one of those early days she said, "Go to, I can see in this movement one of the greatest healing and
evangelizing agencies in the whole of China. God's blessings upon it.” She also gave her life for China as she died in the typhus epidemic of 1912.

In 1909, I wrote several more leaflets which were sent out over China. In December, 1909, Dr. Cousland wrote that he was trying to get nurses interested and spoke of many who seemed very indifferent, but he added, “Congratulations on the way you are pushing this question; may it be satisfactorily solved.”

Dr. Cousland and Dr. Booth invited me with several other nurses to attend the C. M. M. A. Conference held in Hankow in February, 1910. We accepted and had a good time. In my introduction to the Conference, Dr. Cousland, the President, spoke of the early beginning of the Nurses’ Association and asked the doctors to stand by the nurses in building up an association. He asked how many there present had foreign trained nurses in their hospitals. The number was pitifully few. Dr. Logan said his hospital had an American nurse and he married her to keep her. One young doctor got up and said “I want a nurse.” I did not understand the shrieks of laughter that followed until Dr. Booth explained later that the young doctor was not married. I have often wondered if he has ever found his nurse yet.

Thus the little Association was born, but it was feeble and weak. Its life hung in the balance for a time. In the early part of the winter of 1912, Miss Gage infused new energy into it, and helped it to survive until the meeting in Kuling in the summer of 1912. In consequence of the airing, dosing, doctoring, and nursing it then received, there has been a fine healthy growth ever since. Plans were then made for the registration of Schools of Nursing, the compilation of a standard curriculum, the holding of national examinations and the awarding of an Association Diploma. It was also decided to hold a National Convention of Nurses in Shanghai in 1914.

The Nurses’ Convention held in Hankow in January, 1922, resulted in a great advance by the inclusion of Chinese Auxiliaries, the appointment of a Committee on Nursing Education, and of a full-time General Secretary. Further, we are able proudly to present to our friends of the medical profession in China, “the little paper of our own” that Dr. Cousland prophetically spoke of in 1908, our Quarterly Journal for Chinese Nurses. Our Associa-
The China Medical Journal.

tion is affiliated with the International Council of Nurses and again we are proud to announce to you that over sixty Registered Schools of Nursing, for both men and women, are scattered all over China. Once again I am invited to attend your Convention and again I have accepted. Miss Gage will also be present. We shall then have the pleasure of meeting all who are there and thanking them in person for all the help and encouragement we received from the medical profession in China in the "hard days." We shall invite you to rejoice with us in our success and help us to plan for the wonderful future.

CHINESE AMENDED LAWS CONCERNING MORPHIA.

The following regulations (Bull. Internat. Anti-Opium Assoc., December, 1922) were issued by the Chinese Government, and came into force on December 31st, 1920.

1.—Whoever manufactures, sells, or intends to sell, or stores morphia, or exports the same to foreign countries will be punishable according to the second or third degree, and fined not more than $3,000.

2.—Whoever manufactures or sells, or intends to sell, or stores morphia for injection, or exports the same, will be punishable according to the 3rd or 5th degree, and will be fined not more than $1,000.

3.—Whoever, being a Customs House official or assistant, shall sell or induce others to sell morphia will be punishable according to the 1st or 2nd degree and fined $5,000. Whoever such shall inject morphia, or induce others to inject morphia, will be punishable according to the 2nd to the 4th degrees, and will be fined not more than $500.

4.—Whoever shall administer morphia injection will be punishable according to the 2nd, 3rd, or 4th degrees, and will be fined $2,000.

5.—Whoever shall dispense morphia, or employ others to do so will be punishable according to the 4th degree, or imprisoned with hard labour. For a repetition of the offence the offender will be punishable according to the 2nd and 3rd degrees, or with treble the punishment previously inflicted.
Chinese Amended Laws Concerning Morphia,

6.—Whoever shall conceal stores of instruments used for morphia injections will be punishable by imprisonment with hard labour or will be fined not more than $100.

7.—The sale or use of cocaine, heroin, or strychnine, not having been previously prohibited, is now covered by the foregoing regulations (Here cocaine and heroin are defined, and formulas are given.)

8.—Whoever manufactures cocaine, or supplies coca leaves will be punishable according to the 4th degree, or will be imprisoned with hard labour, or fined $1,000.

9.—Police officials, inspectors, or their assistants failing to inflict the punishments due to offenders under Regulations one to five, seven, and eight, will be punishable by receiving the punishment that should have been inflicted.

11.—Offenders against Regulations one to five, seven to ten, may be deprived of civic rights.

According to the Revised Draft of the Criminal Code, the Degrees of Punishment are: —

1.—Death.

2.—Imprisonment for Life.

3.—Imprisonment for a definite period.......of not less than two months nor more than fifteen years; except in case of reduction of punishment when the period may be reduced to less than two months, or in case of increase of punishment when the period may be extended to twenty years.

4.—Detention.......of not less than one day and less than two months; except in case of increase of punishment when the period may be extended to more than two months.

5.—Fine.......of not less than one yuan.
BURIAL AFTER DEATH FROM INFECTIOUS DISEASE

[The Chinese custom of leaving the dead in coffins in open fields and other spaces several days before permanent burial, has more than once raised the question whether there is not a certain amount of danger to the living when the bodies are those of persons who have died of infectious disease, especially when the coffin is poorly made and there is partial exposure. It sometimes happens, also, that in the course of time, burial mounds are disturbed. One Japanese bacteriologist after investigation, reached the conclusion that the organisms found in old graves are not pathogenic. (See China Medical Journal 1920, p. 412). The Japanese medical profession, however, to judge by government laws and regulations recently promulgated, seem to hold there is considerable danger from the bodies of those who have recently died of infectious disease. The following is an official translation of those sections of the law referring to this subject.—Ed.]

Art. I. By the term infectious diseases in the present Law are understood cholera, dysentery (including Ekiri), typhoid fever, paratyphus, smallpox, exanthematous typhus, scarlet fever, diphtheria, epidemic cerebrospinal meningitis, and plague.

Art. XI. The body of the person dying of an infectious disease shall not be buried until it has been disinfected in a manner considered satisfactory by the competent officers.

The body of a person who has died of an infectious disease may, according to a post-mortem examination made by a physician and subject to the approval of the competent officers, be buried within twenty-four hours.

Art. XII. The body of a person who has died of an infectious disease shall be cremated; this rule, however, does not hold if permission to the contrary has been obtained from the police authorities having jurisdiction.

When the body of a person who has died of an infectious disease has been buried without cremation, it shall not, until after the expiration of three years, be removed for reburial; this rule, however, does not hold in case such removal is necessary for special reasons and the permission of the police authorities having jurisdiction has been obtained therefor.

Art. XIII. In case when a body has already been buried or is about to be buried, the person is suspected to have been suffering from an infectious disease, the competent officers may cause suitable measures to be taken with respect to the said body, the patient’s house, and other things.
TREATMENT OF TRACHOMA.


The great value of the combined excision of Heisrath appears to be more generally appreciated. The relief afforded by this operation in the middle stages of the disease is nearly always very striking. Staicovici and Lobel (1920) recommend prolonged grattage with a cube of sugar which has been dipped in alcohol; the application is followed by the formation of a false membrane. Rush has found glycerite of boroglycerine a useful addition to the drugs in ordinary use. Dimitry (1921) massages the tarsal plate over a stout copper rod. The tarsus is compressed between the rod, placed in the superior fornix, and the thumb. An indurated tarsus can be made pliable in this way. Abboudy (1920) claims to have obtained good results from the method of galvanopuncture recommended by Abadir. Kirkpatrick (1921) has drawn attention to the value of a thorough stretching and exposure of the transitional conjunctiva by the injection of a syringeful of saline beneath it. Thorough applications to the membrane are thus facilitated, and if a little anaesthetic is added to the saline, they are also rendered painless. David (1920) has had very striking success in the prophylaxis of trachoma, and of other forms of conjunctivitis, by the daily instillation into healthy eyes of a one per cent. solution of sulphate of zinc, to which is added 5 per cent. of 1 in 1,000 adrenalin chloride solution.

PROPHYLAXIS AND TREATMENT OF THE ACCIDENTS OF LUMBAR PUNCTURE.

MILIAN, Paris Medical, November, 1922

The sequelae of lumbar puncture are sometimes distressing and have given the operation a bad reputation. Though the lumbar puncture itself passes without incident it may be followed the next day by a headache gradually increasing in severity, and by vomiting of the cerebral type. The patient is unable to sit up for several days. If he does so he at once loses colour and the headache and vomiting return.

Patients already suffering from a serious cerebral lesion (e.g., fractured skull, meningitis, cerebral haemorrhage) do not display these symptoms or show them only slightly. Tabetics also show remarkable tolerance, and all patients with increased pressure of the cerebro-spinal fluid are better able to stand withdrawal than those with normal or diminished pressure. Withdrawal by the needle of fluid when this does not flow out under natural pressure is liable to lead to bad results. The severity of the accidents in no way corresponds with the quantity of fluid withdrawn, but probably depends on a leakage into the tissues through the wound in the dura mater.
One of the essential conditions of prophylaxis is, therefore, the closure of the wound in the dura mater. At a necropsy 36 hours after lumbar puncture the author found the orifice in the dura as clearly marked as on the day of operation. A fine needle should be used, one mm. in diameter at most. It is essential also to make the minimum number of holes in the dura, and not to continue to make fruitless punctures which transform this membrane into a kind of sieve. It may be necessary to withdraw the first few drops of the fluid by suction with the syringe, but once the flow has begun it should be allowed to continue under natural pressure.

Certain patients are bad subjects for lumbar puncture on account of their mental condition—paranoiacs and generally those suffering from anxiety neuroses and delusions of persecution.

There are certain post-operative manoeuvres which tend to favour the closure, both of the muscular canal and of the orifice in the dura mater. Immediately after the operation the area of puncture should be massaged firmly with cotton wool tampon. Then to close the orifice in the inextensible dura the patient is at once placed in the knee-elbow position with the back hollowed as much as possible. This position is maintained for ten minutes, by which time the lymph and fibrin from the tissues have formed a coagulum in the orifice. The patient then lies on the stomach (not on the back as the textbooks teach) and remains in this position for 24 hours with the head at a lower level than the pelvis, a position which is easily obtained without discomfort to the patient by raising slightly the foot of the bed.

It is not necessary to put any dressing on the puncture wound. Collodion especially is to be avoided.

For the treatment of headache and vomiting—the common accidents of lumbar puncture—horizontal decubitus is the first essential. Pyramidon, aspirin, antipyrin and the drugs usually given under these circumstances are useless. Morphine alone eases the pain and makes it possible for the patient to get up. It must be given in doses of 0.015 gm. or more and subcutaneously three times a day. The effect is improved by the addition of 2 grammes of bromide.

**TREATMENT OF BACILLARY DYSENTERY.**


Bacillary dysentery, besides its part in the tragedy of Gallipoli, was present on all the fronts. In East Africa, in 1917, it accounted for 486.5 of all admissions per thousand of strength. For requisite diagnosis a fresh stool—best of all a swab from the rectum obtained by the pathologist himself—is necessary, but for
practical purposes a sufficiently accurate judgment can be made on a microscopic examination of the cell exudate—an exudate of 90 per cent undamaged polymorphonuclears.

The routine treatment recommended in the acute stage is castor oil and opium, followed next day and afterwards by sodium sulphate until the stools become feculent; with cocaine suppositories for tenesmus and dysuria. The value of antidysenteric serum is discussed; its chief weakness is deficiency in anti-Shiga immune bodies; the general opinion of it was favourable, but that it predisposes to arthritis; the author doubts that it is of any value if the mucous membrane has become necrosed. The fallacy of the necessary milk-diet is exposed: it is unpalatable, monotonous, and clots of undigested casein are passed; tea, albumin water, Brand’s Essence, etc, are preferable.

In chronic cases rectal lavage with ½ to 1 per cent. protargol or freshly prepared eusol is mentioned with respect. Vaccine treatment has been disappointing. Appendicostomy has not been generally satisfactory; caecostomy with an artificial anus in the right iliac fossa and the adjunct of a Paul’s tube is the operation that provides for the large bowel the requisite rest.

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**MUSSY’S POINT IN ABDOMINAL DISEASE.**

HOGLER AND KLLENHART, Wiener Archiv fur innere Medizin. October 1922.

The authors discuss the discovery of de Mussy’s point in connection with disease of the abdominal viscera. This exceedingly painful point is on the line of the left border of the sternum, at the level of the end of the tenth rib. It has been regarded as pathognomonic for diaphragmatic pleurisy, but their tests on more than 200 subjects have demonstrated that this sign of irritation of the phrenic nerve may be encountered with disease in the right abdominal viscera. When the Mussy point on the right side is pronounced, especially when the pleura and lung findings are negative, an inflammatory process in the gallbladder region should be suggested. In their 35 gallstone cases, the Mussy point was extremely painful in 32 and there was no further tenderness after cholecystectomy. In 50 cases of gastric ulcer, 10 of cancer and 58 of other gastrointestinal affections, appendicitis, etc., the Mussy sign was constantly negative, except in one instance in which the gallbladder was probably involved secondarily. In 5 gallstone cases, this tenderness of the phrenic nerve at this point was the only symptom during the intervals of the colics. In 3 cases of obstructing gallstones there was no Mussy point, and the operation confirmed the absence of an inflammatory process.
SPIROCHAETA PALLIDA IN SPERM.


In 1920 the author began to study the possibility of the transmission of spirochetes by the germ, and a little later Pinard and Hoch reported having found *Spirochaeta pallida* in 3 of 11 specimens of human sperm. His further research confirmed theirs. Besides his microscopic research, he inoculated the anterior chamber of the rabbit eye with human sperm, obtained by massaging the seminal vesicles after injecting 200 c.c. of physiologic saline into the bladder. *Spirochaeta pallida* was found in 5 of 22 specimens examined. In one case the spirochete was attached to the tip of the spermatozoon head by one end and to the middle piece by the other end. In another case, half the spirochete clung to the middle of the tail, the other half floating free. Of the 22 inoculation experiments, a positive result was obtained in 9 and negative results in 10. The spirochete was refound in only 2 instances. There was suppuration in 3 of the rabbit eyes. Carle states that the mother giving birth to a syphilitic child is always syphilitic, although seemingly in perfect health. It often happens, however, that these women re-examined in the course of several years will not present any signs of syphilis, and that the sero-reaction will remain negative.

[Of course, using the word "hereditary" in its strict sense, infantile syphilis is still a congenital, not a hereditary disease, notwithstanding microscopic findings of this kind].

KAOLIN IN THE TREATMENT OF CHOLERA.


The author comes to the conclusion that the action of kaolin is two-fold: (1) Mechanical; (2) Adsorptive.

(1) Mechanical.—Such large quantities of kaolin as are used in the treatment of cholera almost fill the bowel, and the passage of this mass through the bowel must enclose and carry with it a very large number of bacilli. Kaolin has no bactericidal effect, and this fact calls for energetic action in the destruction of faeces in all cholera cases treated by this method. The fact that the kaolin forms an adherent coating to the walls of the bowel points to its usefulness in ulcerative forms of colitis, though in these cases the rectal method of administration in the form of enemata and long tube lavage would be preferable owing to the possibilities of errors of digestion arising, after long administration, from the adsorptive properties of kaolin for ferments.

(2) Adsorptive.—This, the chief function of kaolin, is very characteristic—its extremely fine state of division promotes that end.
It is clear that, at least in the case of cholera, and probably in diphtheria, ptomaine poisoning, bacillary diarrhoea, summer diarrhoea and general toxic conditions, kaolin has a wide range of use.

In the case of cholera, the first result of its administration is the cessation of vomiting. This seems to be due to the absorption of toxic bodies in the upper alimentary tract. This is followed by the cessation of the diarrhoea and consequent loss of fluid caused by the presence in the bowel of irritant substances of a toxic nature. These, being absorbed by the kaolin, cease to act as an irritant, and consequently the improvement of the patient is rapid and maintained.

The presence of a layer of kaolin on the walls of the intestinal tract appears to act in part as a filter bed, preventing the transmission of toxins to the patient. The adsorptive action of kaolin does not seem to be chemical. Professor Bayliss has pointed out that kaolin is an electro-negative colloid, whose sign may become changed by allowing it to absorb ions of opposite sign to itself. This apparently occurs in the small intestine.

The adsorption of cholera toxins by the kaolin may be explained by the electrical reaction between the two, and the failure of the toxin to reach the circulation may be explained by the electrostatic attraction of the suspensoid kaolin for the cholera toxin, which thus forms one component of a Helmholtz double layer.

Professor Bayliss has pointed out that sodium chloride diminishes electro-negative charge, in accordance with Gibbs's principle; this may be the explanation of the difference observed between cases of cholera which have had saline injections preceding the kaolin treatment and those treated by kaolin only.

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**CARBON TETRACHLORID IN TREATMENT OF HOOK WORM DISEASE.**


The author has given carbon tetrachloride to more than 20,000 patients with hookworm disease and writes very favorably of his experience.

The dose given was 0.2 c.c. (3 minims) to the year of age, up to the age of 15, when the adult dose of from 3 to 4 c.c. (from 45 to 60 minims) is reached. The maximum dose depends on the size of the adult. It may be shown later that much larger doses than this can be given safely.

Children take the drug, in this dosage, better than adults. Three c.c. (45 minims) have been given to many adults over 80 and to one man of 93. The dosage indicated is administered to all ages from 2 years upward.
The conclusions are as follows:

1. Carbon tetrachlorid is a vermifuge and vermicide of great potency.

2. It gives little discomfort to the patient.

3. It permits of rapidly treating, at a low cost, vast populations suffering from hookworm disease.

4. Re-examination of the feces of 823 treated patients indicated that one treatment administered to each individual in a given area had lowered the original infection rate of 100 per cent. to less than 9 per cent.

5. Clinically, the standard of health of the community is immediately raised.

MORTALITY FROM CANCER IN THE UNITED STATES.


The Department of Commerce announces that the returns compiled by the Bureau of the Census show that over 76,000 deaths were due to cancer in the death registration area of the United States in 1921, and, assuming that the remainder of the United States had as many deaths from this cause in proportion to the population, the total number of deaths from cancer in the entire United States for 1921 was 93,000, whereas for 1920 the number is estimated as 89,000, or 4,000 less than for 1921.

The trend of the cancer death rate is upward, the rate for 1921 being higher than that for any earlier year in 23 of the 34 States for which rates are shown in the accompanying table. The cancer death rate in the registration area in 1921 was 86 per 100,000 population, against 83.4 for 1920. In comparing the death rate from cancer in one State with that in another, the bureau uses "adjusted" rates in order to make allowance for differences in the age and the sex distribution of the population, because, generally speaking, only persons in middle life and old age have cancer, so that a State with many old persons may be expected to have more deaths from cancer than a State with comparatively few old persons.

Adjusted rates show that the Northern States have comparatively high and the Southern States comparatively low cancer mortality, and that there is little difference between the adjusted cancer rates of the white and colored races of the same States. In other words, the white and colored races seem equally susceptible to cancer, but both races seem less susceptible in the South than in the North.
THE TIME WHEN DEATH OCCURS
HASHIMOTO, CHUGWAII IJI-SHIMPO, AUGUST 1922

The author found that in typhoid fever and cholera death occurs most frequently in the morning between 5 a.m.—7 a.m., and in the evening between 3 p.m.—6 p.m. Also at midnight and at noon death occurs frequently. In relation to the metabolism of the body, death occurs when metabolism reaches its climax or is at its lowest point, and the temperature is at its highest and lowest. Atmospheric pressure also seems to be important, for death often occurs when atmospheric pressure and temperature are either at their highest or lowest points. In accordance with a very ancient and widespread notion or superstition he also believes that in mortal illness life often ebbs away with the ebb tide. Statistics in support of these conclusions are not given in the abstract of the paper.

MUSCLE NECROSIS FROM QUININE.
RAYSON, BRIT. MED. JOURN., SEPTEMBER 16, 1922.

The author writes: "I saw several cases in which intramuscular injections were used while attached to No. 1 General Hospital, Wynberg, and was so impressed with the serious results of these cases that I ceased to give injections beneath the fascia, and for eighteen months treated my cases by subcutaneous injections with excellent results; in about six cases slight necrosis occurred at the site of injection, which soon healed.

"Briefly, the advantages obtained by quinine given this way rather than orally are: (1) It can be given when owing to vomiting, quinine cannot be given by the mouth. (2) The quinine is present in the blood while the malaria parasite is free in that fluid. (3) It relieves quickly muscular pains present in some cases of malaria. (4) In anemic and debilitated subjects apparently large doses of quinine taken by mouth are not absorbed. (5) It acts quickly and certainly (a big advantage in cachectic patients): six to eight injections of from 5 to 10 grains, and the patient is convalescent.

"My object in writing this letter is to warn men new to treatment of malaria of the danger of intramuscular injections, and to assure them that the subcutaneous method is just as efficacious without the risk of muscle necrosis, which I am sure is not due to faulty technique but to the action of quinine in some patients who appear very susceptible to the drug."
AN OUTLINE OF THE PIRQUET SYSTEM OF NUTRITION. By Clemens Pirquet; Professor of Pediatrics at the University of Vienna, Austria. Price 10/- Publishers: W. B. Saunders Company, Philadelphia and London, 1922.

The author is very hopeful over his special nutritional treatment of tuberculosis. "As to the results of our feeding method in tuberculosis, I may say that we are extremely well satisfied. Having proved that method, we gradually forgot about all other methods of cure. We do not use tuberculin treatment any more, though we were very fond of it before. We do not use any other specific method of treatment. Our prognosis in a case of tuberculosis becomes more and more optimistic." Is the author being lured on make such statements by a mirage? It hardly seems possible. His system of nutrition has been tried with more than 500,000 individuals most of whom, if not all, were treated in the city of Vienna, notorious for its tuberculosis incidence. In describing his system we are introduced to a new nomenclature—peldisi, nem and numerans multiples of nem, sigua, decinemsiqua and other strange terms; these can be easily mastered. If the author's system actually does all that he claims for it, this little book of less than one hundred pages is worth its weight in gold.


"When the time arrives when everyone in the community will feel that an actual stigma attaches to one who has a preventable physical or mental disability, then the duty of the physician will be clearly defined. He will be engaged to keep his patient well by routine examination, by supervision and advice. Then the day of the practitioner of preventive medicine will indeed have dawned!"

This golden age, the author believes, is not so very far away. Much already is being accomplished by the State in the supervision of the expectant mother, the care of her infant when it arrives, and the oversight of the health of the child during the period of its school life. Further steps the author holds are necessary. The State should provide a health service free to all, rich and poor, which should include provision for antenatal supervision, home visitations, infant welfare centres, medical nursing and dental supervision in schools and colleges; also clinics for periodic medical examinations of adults. Thus health supervision would be provided for all those wishing to take advantage thereof, from infancy to old age. But there should be no compulsion. If a person wishes to obtain advice concerning his health from his own private physician and pay the regular fees, by all means let him do so.

The author wishes the family physician to take his part in public health work. Others can supervise the health of the community in general; he can supervise the health of the individual and family with the object of preventing disease in those who are healthy as well as of curing those who are ill. The most important of the diseases which are preventable are the communicable diseases. Each of these is considered from the stand-
point of incidence, etiology, modes of transmission and methods of control, including the public health regulations ordinarily employed to prevent their spread, and methods of disinfection. Other information usually given in text-books of hygiene will be found in this volume and everything is brought well up to date. For us the work has the one weakness that it does not deal with the peculiar hygienic problems encountered in the countries of the Far East. Nevertheless within its range it is excellent.


It is always a pleasure to receive a new edition of this work, for there are few others which give such a clear and comprehensive view of bacteriology as a whole which is now a vast subject. Often we can hardly see the forest because of our nearness to the trees. In this edition the chapters on Influenza and Anaerobes have been entirely rewritten, and the chapters on Streptococci, Pneumococci, and Typhus Fever extensively revised. Important additions have been made to the subjects of Immunity, Yellow Fever and some other sections, and the chapter on Methods of Studying Bacteria has been entirely rewritten and considerably enlarged.

As to the nature of spirochetes the author states that "while there are still some observers who regard the spirochetes of syphilis and relapsing fever as plant organisms, and others who regard them as animals, opinion has been shifting to the belief that these organisms stand somewhat apart from both Bacteria and Protozoa, and should perhaps be regarded as constituting an independent group between the two." Pfeiffer's bacillus, associated with influenza, the bacillus found in whooping-cough, the Koch-Weeks bacillus and the Morax-Axenfeld bacillus associated with certain forms of conjunctivitis, and the bacillus of Ducrey found in soft chancre, are all grouped under the heading, hemophilic bacteria. Typhus fever is classed with the infectious diseases of unknown or doubtful causation. Sprue, epidemic influenza and trachoma are also placed in the same group. The book is one of the best of its kind for the general practitioner as well as for the bacteriologist.


In an interesting "Foreword" Dr. Barker discusses the practical methods of clinical teaching of the present day as compared with the more didactic methods of the past. He praises highly the system by which students are permitted to become, in reality, assistants in the wards of the hospitals, in the Out-patient Department and in the clinical laboratories, taking histories, making physical examinations, performing laboratory tests and participating in the execution of therapeutic plans. But he thinks it is a mistake to regard the amphitheatre clinic and the clinical lecture as remnants of a bygone period, scarcely desirable any longer, or not altogether reputable. Properly co-ordinated with the practical technical training in the wards and elsewhere, these older forms of clinical teaching can be of inestimable value, in his opinion, both to the teachers and the taught. Hence the publication of these clinical lectures. The reports are somewhat enlivened by dialogues with students—who are always amazingly prompt and correct in their answers—after the fashion of the clinical lectures published by other well-known teachers of medicine. Dr. Barker's lectures cover a wide range of subjects and are well worth careful reading.
Perhaps there is no one volume on the practice of medicine which is so generally acceptable to medical students and physicians as was the volume issued by Sir William Osier, which ran into many editions. Dr. Stevens was formerly a pupil of Osier and the volume under review is dedicated to his memory. We think it is a worthy memorial. The material is well arranged; it is fully abreast of the latest advances in medicine, and the style is clear and firm. There are no literary allusions or references to clinical cases, as in Osier; instead, in the description of many diseases, references which give a more or less complete bibliography, or which deal with comparatively recent investigations, or which are historically interesting, have been inserted for the benefit of those who wish to study the subject more fully. Stevens' Practice is a work which we can sincerely recommend.


After twelve years study of the subject, the author is convinced that exophthalmic goitre is a morbid process belonging strictly to the realm of the internist, and that surgery, in ordinary cases at least, is a fallacious procedure because the disease is secondary to a cause or causes outside the thyroid gland. He argues that the object of all treatment in this disease is to arrest the processes which produce saturation of the blood with thyroid secretion. Surgery may accomplish this for a brief few weeks' duration, but in many instances the operation leaves the patient's system more than ever saturated with the offending substance. The chapter on medicinal treatment is very full. A number of illustrative cases are given. Probably differences of opinion will continue between the internist and the surgeon concerning the proper treatment of exophthalmic goitre, but those who have the care of patients suffering from it should certainly read all that can be said in favor of conservative medicinal treatment.


In the words of the author, he has compiled "a very short, compact, easily comprehended, convenient and inexpensive manual describing concisely but clearly forty exercises which can be executed without apparatus in the patient's room, at any time convenient to the patient. These exercises are especially designed for the use of convalescents, invalids and persons engaged in sedentary occupations." As to the last mentioned class: "Students, professional men, investigators and all other persons who are compelled to do intellectual or monotonous physical work for several consecutive hours daily will find it to their advantage to throw off their coats, open the windows and go through a dozen of these exercises several times a day. If they will do this when they begin to feel fagged, tired, listless, sleepy or dull, they will soon find the quality of their work improved and the quantity increased, and this with less wear and tear on their nervous systems." This advice is all very true and those who have the iron resolution to follow it steadily, day in and day out, will find this little book very serviceable as a guide.
Book Reviews.


We are not quite sure whether this book was written for the instruction and entertainment of the medical profession or of the laity. Probably the author had an eye on both. The book is well written and extremely interesting, but it reminds one of an early settler in a new country who marks out for himself the boundaries of an enormous territory which he can never fully occupy or cultivate. Everything in life is said to be dependent on the endocrine glands—the difference between animals of various species; the variations between animals of the same species; racial characteristics; individual characteristics of mind and body, and most of the mental and bodily diseases which afflict us. As the author is a gynecologist, apart from an instructive chapter on the training of children, the work is mainly concerned with the mental and physical diseases of women and, as we have already intimated, there are few of these diseases which he does not, somehow or other, trace to abnormalities of one or other of the endocrine glands, singly or in combination. There are far too many hypothetical, conjectural and conditional phrases. A new edition, when our knowledge of the physiological properties of the ductless glands is on a firmer basis and more complete, may be very valuable. But the present edition is useful as it should convince every physician that the functions of the endocrine glands ought to be reckoned as important factors in the causation and complications of many diseases.


One of the most interesting chapters in this volume is the historical survey of the various theories held in succession concerning the artificial feeding of infants.

First, there was the “protein period” of Biedert, Meigs and Rotch. Biedert started with the central idea that in order to have a rational basis for the feeding of infants, it was necessary to know the exact composition of human milk, the baby’s natural food, and then to imitate this as closely as possible in the artificial mixture. He laid special stress on the indigestibility of the casein of cow’s milk, and the smaller proportion of casein in human milk. His mixtures were arranged accordingly. Meigs made a more accurate analysis of milk and found that Biedert had overestimated the amount of casein in human milk, but he still believed casein was the main offending substance. Therefore he reduced the amount of it in his mixtures and suggested a better proportion of cream, sugar, with lime water to increase the alkalinity. Rotch was impressed by the idiosyncrasies of infants, so he held there could be no fixed formula; every infant is a law unto itself. Feeding should therefore be on a percentage basis according to the child’s particular needs.

The next advance was to study the baby primarily, and the food secondarily. Widerhofer and other pathologists ascribed the gastrointestinal troubles of infancy to pathological anatomic changes in the stomach and intestines.

Escherich showed the significance of bacteria in the normal and abnormal processes and their relation to food in the intestines, laying down the great principle that the types of bacteria existing in the intestine are dependent upon the kinds of food which are given.
A further advance was made by Czerny and Keller (the fat period) when not only was a study made of the baby's stomach and intestines, but also of its whole system, and the effect of the different food elements upon the general metabolism of the body. They divided nutritional disturbances into three broad groups: (1) from food, such as fat injury (which they considered one of the most important of all food injuries), starch injury, gelatin injury and scurvy; (2) from infections; (3) from constitutional defects or peculiarities.

At the present day the dominant teaching is that of Finkelstein, and his co-workers, Langstein and Meyer. They hold that sugar is the one particular thing that causes the gastrointestinal troubles of babies and then the fat and the salts of the milk increase the trouble. Finkelstein's four main clinical groups are as follows: (1) disturbed balance; (2) dyspepsia; (3) intoxication; (4) decomposition.

So all the constituents of milk have been indicted, each in its turn. Have we reached the end? No: our author says that "as we learn more our present ideas will undoubtedly change and the infant feeding of 1950 will probably be little like that of 1920." Fortunately, whatever the dominant theory or theories may be, a goodly proportion of babies manage to survive the perils of infancy and the population of the world is steadily increasing.

We have given a summary of this historical survey to show the judicious attitude of the author towards the problems of infant feeding. As he wisely says, "Realising that we have by no means as yet reached the solution of the problem, we must be broad-minded; must keep away from fads; must not focus on one point to the undue exclusion of others; must accept the fact that there is more than one way of looking at this most interesting subject, we must not be too assertive and dogmatic in our statements, and we must remember that what is apparently true to-day may be proved false to-morrow." We have not space to comment on all the good things in the book. Suffice to say we recommend it to all specialty interested in the artificial feeding of infants and in the gastro-intestinal diseases of infancy and childhood.

Healthy Living, by Dr. C. E. A. Winslow, Prof. of Public Health. Yale University School of Medicine, Price $2.80. Published by Charles E. Merrill Co., Publishers, 432 Fourth Avenue. New York City, U. S. A.

This volume contains all the good features of its predecessor, the Land of Health, reviewed last month, but the teaching is more advanced.

As a preparation for citizenship, Healthy Living has particular value. It shows what the government and the citizens should do to safeguard health. It tells of the sacrifices of heroes of science and our debt to them. It teaches how to get the most out of life and instructs the young how to do the things which will make them more efficient and less liable to weakness and disease. W. W. P.
Correspondence.

Correspondents are requested to write on one side of the paper only, and always to send their real names and addresses. The Journal does not hold itself responsible for the opinions or assertions of correspondents.

Medals Commemorating Opening of Peking Union Medical College

Dear Dr. Beebe:—We have sent you by freight one case containing 144 medals granted by ex-President Hsu Shih-ch'ang to guests of the Peking Union Medical College at its formal opening in 1921 in commemoration of said event. As we are not sure of the addresses of many of the recipients and in view of the forthcoming conference of the China Medical Missionary Association in the middle of February in Shanghai, at which a large majority of the recipients will probably be present, we have taken the liberty of forwarding the medals to you for distribution during the conference. It is also possible that delegates from medical missions may be willing to take back to their missions medals intended for other members of their missions who are not present at the conference.

Kindly acknowledge receipt of the above case and also let us know regarding the distribution of the medals when the conference is over. Enclosed please find a list in duplicate of the recipients.

Sincerely yours,

Archibald P. Chien.

List of Recipients.

A

Aitken, Dr. I.
Ancell, Dr.
Appleton, Dr.

B

Beddoe, Dr. R. E.
Beel, Dr. L. Nelson
Betteridge, Dr. Cunningham
Birk, Dr. W. H.
Butterfield, Dr. and Mrs. K. B.

C

Cooke, Dr. Alma
Cratty, Miss Mabel

D

Dalby, Dr. and Mrs.
Davenport, Dr. and Mrs. C. J.
Digby, Dr. and Mrs. K.
Dow, Dr. Jean I.
Dunlap, Dr. R. W.

E

Edwards, Dr.
Edwards, Miss
Evans, Dr. and Mrs. P. S.
Everham, Dr. Marguerite
Ewers, Dr. and Mrs.

F

Fairburne, Dr.
Fletcher, Dr.
Foster, Dr. and Mrs. J. H.
Foster, Mr. and Mrs. R. C.
Fowler, Dr. Henry

G

Gage, Dr. and Mrs. B.
Gamewell, Dr. F. D.
Gaston, Dr. H. M.
Gilman, Dr. A. A.
Gordon, Mrs. E. K.
Gordon, Mr. and Mrs. R.
Gossard, Dr. J. E.
Gray, Dr. J. H.
Graybill, Dr. H. B.

H

Hadden, Dr. George
Hadden, Dr. R. P.
Hagman, Dr.
Haunett, Dr. H.
Harding, Dr. Ben.
Harris, Dr. Carr
Haughton, Dr. F. G.
Hausen, Dr.
Heal, Mr. and Mrs.
Helliwell, Dr. P. B.
Helliwell, Mrs.
Hemingway, Dr. W. A.
Hewat, Dr.
Horning, Dr.
Huizenga, Dr. Lee S.
Hume, Dr. E. H.

James, Dr. and Mrs. H. C.
James, Dr. M. L.
Jones, Dr. F. C.

Keeney, F. F.
Kears, Dr. Sarah,
Kerr, Dr. and Mrs. D.
Kirk, Dr. and Mrs. E. W.

Laird, Mrs. P.
Lambert, Mrs. C. T.
Lee, Dr. and Mrs. C. M.
Lee, Dr. and Mrs. T. H.
Lee, Dr. V. T.
Lees, Dr. and Mrs. A. A.
Leslie, Dr. P. C.
Lewis, Dr. Charles,
Lewis, Miss Laura
Lobenstine, Rev. E. C.

McClure, Dr. W.
McConnell, Bishop F. J.
McCracken, Dr.
McCullough, Dr. Charles
McDonald, Dr. F. R.
Mackay, Dr. M.
McCordie, Miss
McNeill, Miss M.
Manget, Dr. F. P.
Malcolm, Dr. Wm.
Maxwell, Dr. J. L.
Merrow, Dr.
Miller, Dr. Iva

Nairn, Dr.
Nance, Dr. W. B.
Neville, Dr. W. S. Thacker
Nutting, Miss Clara

Osgood, Dr. E. I.

Padelford, Dr.
Peake, Dr.
Pederson, Dr.

Peter, Dr.
Polk, Dr. Margaret
Pott, Dr. and Mrs. F. L. H.
Powell, Dr. C. A.
Pruitt, Dr. and Mrs. S. O.

Reeds, Dr. W. R.
Reid, Dr. C.
Robertson, Dr. and Mrs. D. S.
Robson, Dr. I. K.
Roots, Bishop and Mrs. L. H.
Ross, Dr. J. R.

Sanders, Dr. Morris
Selmon, Dr. and Mrs. A. C.
Simon, Dr. M.
Snell, Dr. J. A.
Speers, Mr. and Mrs. James
Starmer, Dr. Ethel
Stewart, Dr. M. A.
Strick, Dr. E. J.
Struthers, Dr. E. B.
Struthers, Dr. and Mrs. R. G.
Stuart, Dr. Warren
Sweet, Dr. W. C.

Taylor, Dr. H. B.
Taylor, Dr. Hugh
Teachout, Dr. and Mrs. D. W.
Thomas, Dr. Harold
Thurston, Mrs.
Thurston, Mrs. Lawrence
Tucker, Dr. A. W.
Tucker, Dr. and Mrs. F. F.
Turner, Miss Carrie

Venable, Dr. W. H.
Vierling, Dr. Frank
Vincent, Dr. E.

Waart, Dr. A. de
Wakefield, Dr. S.
Wakefield, Dr. and Mrs. Paul
Wallace, Dr.
Wampler, Dr. and Mrs. F. J.
Watson, Dr. Percy T.
Westbrook, Dr. C. H.
Whitmore, Dr. Clara B.
With, Dr. Viggo
Williams, Dr. and Mrs.
Wilmut, Dr. and Mrs. W.
Wilson, Dr. R. M.
Correspondence.

Wilson, Mrs. R. M.
Wood, Miss R. A.
Wooley, Dr. Mary Emma
Wylie, Dr. J. H.

Young, Dr.

Will those who do not receive their medals at the conference kindly apply for them at 4 Quinsan Gardens.

Substitute for Cataplasma Kaollini (U.S.P.)

To the Editor of the C.M.J.

Dear Sir:—We have made a discovery which may be as new to others as to ourselves. There is a substance called (t'ufen) earth-powder, that the Chinese use for glazing. It is plentiful and cheap in Shantung and Kiangsu. It is a soap-stone, talc, so we think, which makes a wonderful basis for a home-made antiphlogistine. The t'ufen is sterilized by first pulverizing, and then baking it. After baking it will again require pulverizing. My prescription is as follows:—

Native peanut-oil...one fl. pound.
Thymol, powdered...forty grains.
Oil of peppermint .......... one ounce.
Oil Eucalyptus........ four ounces.
Native talc, soap-stone, sufficient quantity.

Dissolve the thymol in the oil of peppermint, add the eucalyptus oil, and then stir all into the peanut-oil gradually. Combine this mixture with the talc powder, using mortar and pestle. Make a soft mixture not quite so solid as the commercial antiphlogistine. Probably glycerine would be better than the peanut-oil. This preparation can be either rubbed in as a liniment, or applied as a poultice. We use it generally for boils or inflammations of any kind. It is especially good for frost-bites, and as an application for inflamed lung or throat, or for a traumatism of any kind. It hastens the absorption of extravasated blood in a wonderful manner. For ordinary dispensary use there can be nothing more satisfactory. It is not to be applied in just the same manner as antiphlogistine, but should be first well rubbed in, if possible, and then applied. It is also good for rheumatism and joint inflammations.

A good pharmacist may be able to improve upon my prescription.

Yours sincerely,

Mrs. B. C. Patterson, M.D.

Tenghsien, Sung, January, 1923

It may be interesting to compare the foregoing prescription, with that of Cataplasma Kaollini (U.S.P.) which is identical with the trade preparation known as antiphlogistine. It consists of:

Glycerine, 37½ parts by weight:
Boric Acid, 41 parts: Thymol, ½:
Methyl Salicylate, ½: Oil of peppermint, ½: Kaolin 57½ parts.

This is intimately incorporated by the aid of heat to a homogeneous mass.

Talc is a native magnesium silicate: kaolin, a native aluminum silicate.
BIRTH.

SMITH.—On December 19th 1922, at Kweiling, Si., to Dr. and Mrs. E. Dargan Smith, a daughter (Mary Blakeman).

POST—GRADUATE WORK IN OBSTETRICS. MARGARET WILLIAMSON HOSPITAL, SHANGHAI.—Dr. Florence Kraker, Professor of Clinical Obstetrics in the Woman's Medical College of Pennsylvania is spending a year at the Margaret Williamson Hospital. She has charge of the Obstetrical Department, which has an average of sixty-five cases per month. Chinese women doctors, who know something of the English language, are being received for terms of one month and two months for special work with Dr. Kraker. Those interested should communicate with Dr. Harriet Love.

ANTHROPOLOGICAL ASSOCIATION OF CHINA.—A meeting of the Anatomical and Anthropological Association was held on January 25th, in the Auditorium of the Peking Union Medical College. The speaker was Mr. Roy Chapman Andrews, his subject being the work of the Third Asiatic Expedition of the American Museum of Natural History during its first season in the field, illustrated with colored lantern slides and moving pictures.

PASTEUR CENTENARY.—All over the world medical and other scientific societies have been celebrating the centenary of the birth of Pasteur. France itself paid high tribute to M. Poincare, accompanied by other Ministers, presided at the ceremony at the Pasteur Institute, at which speeches were made extolling the scientist. President Millerand afterwards took part in a pilgrimage to Pasteur's tomb in Paris. Provincial and foreign students held demonstrations in the evening.

EPIDEMIC OF DIPHTHERIA IN SHANSI.—"The great central plain of Shansi has, during the last three or four months, been scourged by an epidemic of diphtheria. Thousands of children have been carried away by the epidemic, which is still raging violently in several districts. I have heard of one boy's school enrolling 140 pupils where only 20 are left. The aggregate of the deaths in this epidemic must be greater than the toll of plague victims in the epidemic of 1918. The Chinese are practically helpless in the face of such a situation. In spite of progress on many other lines in Shansi, there is still nothing like a public health service, and all ideas of sanitary measures, isolation of cases of infectious disease, quarantining, etc., are most elementary." N. C. Daily News, December, 1922.

RADIIUM FALLING IN PRICE.—Radium has dropped $50,000 a gramme in price, and the Standard Chemical Company has been forced to close its carnitite properties in Paradox Valley, in western Montrose Country, Colorado, throwing 250 men out of work. Discovery of vast deposits of pitchblende in the Belgian Congo is said to be responsible for the decrease in price of radium, which is said to sell for $70,000 a gramme now, compared with $120,000 a gramme formerly.—Reuter.

MEDICAL PROGRESS IN CHINA.—A very important action, believed to be the first of its kind in the history of the Chinese judicature, has been brought in the Shanghai City Court. It is a claim for damages against a practitioner of Chinese medicine for alleged carelessness and incapacity. The plaintiff is a woman and the allegation she makes is that defendant was responsible for the death of her son. The action is now proceeding.
NEW PASTEUR LABORATORY IN TIENTSIN.—The New Pasteur Laboratory in the French Concession at Tientsin, was opened last week by the French Consul, in the unavoidable absence of the French Minister. The institute is in the newly-named Rue Pasteur, the former Rue de l'Amirauté, and is designed for the carrying out of rabies treatment, vaccine investigations and other bacteriological work, as well as for Wassermann tests. Among others present were Dr. H. Y. King, director of the Peiyang Naval Medical School, Dr. Lassouarn, superintending the Pasteur laboratory, Dr. O'Neill, M. Ferrer, Mr. Woollen, Messrs. Blanc, Rousseau, Evans, Juvet, Vardy, Thesmar, Samarq, Miss Warner, Dr. Lespinasse, and other residents.

MEDICAL ETIQUETTE IN CHINA.—Yesterday and to-day Kaifeng has been over-run with old women who came to do honour to Gen. Chang Fu-lai, the Tuli, or military governor, of Honan. The story goes that, some months ago, when Gen. Chang was ill, he consulted a woman witch-doctor of Chengchow, who cured him of his ailment, whatever it was. In return he showed his appreciation of her work by presenting her with a congratulatory tablet.

Now that her patient has risen to the high office of Tuli, this old lady felt she ought to compliment him in a proper way, so she gathered together over 1,000 old women, who yesterday travelled over from Chengchow in a special train to present the Tuli with a tablet. It is said that the train required three engines to draw it, which may be so, for never have I seen so many old women together. They have been feasted at the expense of the Tuli, and though many returned to Chengchow to-day, a large number have remained over for a day or so. N. C. Daily News, December, 1922.

STANDARDS FOR OUTPATIENT CLINICS.—The Association of Outpatient Clinics of New York has published a list of practical standards for outpatient clinics in the hope of receiving the comments and criticisms of the profession. The standards relate to the scope of responsibility of the outpatient clinic; community relations; general organization; relation to the hospital; medical organization; facilities, equipment and procedure; admissions; appointment system; limitation of numbers; fees; social service; follow up; accounting; districting; adaptation of clinics to clientele, and appraisals of results.

SHELTON MEMORIAL FUND.—In memory of the death of Dr. A. Shelton, medical missionary, murdered by Chinese bandits, a fund of $100,000 is being raised in America to go toward mission work in America and Batang.—Weekly Review.

SALE OF NARCOTIC DRUGS.—We have received from the Bureau of Drug Inspection and Standardization, an organization conducted under the Ministry of the Interior and having its local office at No. 35 Boulevard des Deux Republiques, regulations for the control of drug stores and dispensaries handling foreign and Chinese drugs. These regulations have been drawn up for the purpose of supervising the sale of morphine, cocaine, heroin and the like, and
they seem to be of a comprehensive character. Provision is made for annual and temporary licences for the sale of narcotics, the latter apparently for epidemic seasons, and penalties are provided for violations of the licence conditions.

—N. C. Daily News.

CHINESE LACK OF MEDICAL AMBITION.—A foreign doctor who had served in France during the war, came across one of his Chinese hospital interpreter-dressers the other day in Peking, who had served under him abroad. The dresser had been very efficient and the doctor always imagined he would become the right-hand man of some harassed doctor in a country mission hospital. Instead, he has contentedly shed all his past knowledge and training and is quite happy as a typist earning $30 a month. Many other interpreters and dressers are now glad to be humble hospital orderlies and have no ambitions.—N. C. Daily News.

WANTED: BUSINESS MANAGER FOR MISSION HOSPITAL.—The School of Medicine of Shantung Christian University and the University Hospital, Tsinan, Shantung, are in need of a man to act as business manager to carry on during the furlough of the present manager. A knowledge of Mandarin Chinese and some experience in China is essential. Correspondence invited. Address, Dean of the Medical School.

The Quarterly Journal for Chinese Nurses. In English and Easy Wenhi. Published by the Nurses' Association of China.

Object: To aid the cause of scientific nursing in China by bringing before students in Chinese schools the value of nursing as a vocation, and by sustaining the interest and efficiency of nurses in their duties after graduation. The cooperation of medical missionaries in this work is desired. Annual subscription to Journal $1.00.

Editor: Miss Margaret Dieter, R.N., Luchowfu, via Wuhu, Anhwei.

Subscriptions and other business communications should be sent to Miss Cora E. Simpson, R.N., General Secretary, Nurses' Association of China, 10 Quinsan Gardens, Shanghai.