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Original Communications.

ONE HUNDRED CASES IN THE CORONER'S  
COURT OF MONTREAL, 1893.

By WYATT JOHNSTON, M.D., Montreal.

The increased interest taken in the proceedings of the Coroner's Court by the medical profession and the public during the past year, which has led to my being entrusted with the medical examination of bodies upon which inquests are held—as far as was possible under the existing laws and regulations,—makes a faithful report of the work done one of the duties of this position. In a preliminary communication prepared jointly with Dr. G. Villeneuve,\* it was found impossible to do much more than deal with the general statistical aspects of the medical evidence, in order to prevent our paper from being too long, so that the scientific details of the cases could not be considered.

It is perhaps necessary to apologize for including so many ordinary and commonplace cases, but, as no such series has yet been published in Canada, it seemed worth while to give a true picture of the ordinary every-day work of a coroner's physician. Although 100 cases form too small a material to offer much that is novel or curious in the way of medico-legal facts, yet it seemed well at the present time to publish a series of observations which would give a general idea of the

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\* Montreal Medical Journal, Aug., 1893. L'Union Médicale du Canada, Aug., 1893.

usual medical questions coming up for consideration, and the grounds upon which they were decided.

In giving evidence, I have made it a rule to confine my statements of opinion as far as possible to what was clearly demonstrated by the facts observed, and in each case to state fully the facts from which these conclusions were drawn; in other words, to let the facts speak for themselves. In case it became necessary to make statements based upon probabilities, this was frankly admitted, and the possible objections to the view taken fully discussed. The practice of bolstering up weak and inconclusive facts by strong affirmations of opinion is unworthy of the name of medical testimony.

The chief end of the medical evidence was, of course, to establish clearly the cause of death. Many interesting cases of the present series have, unfortunately, not been made clear by the medical testimony, owing to autopsies not being permitted. Out of my 100 cases there were 29 autopsies ordered, testimony being given after external examinations only in the remaining 71 cases.

As a general rule, it was found that where autopsies were performed the cause of death was demonstrated with absolute certainty in almost every case, and testimony of the most positive kind could be given without reserve. On the other hand, in the case of the external examinations, I can only recall half-a-dozen instances where I felt justified in making a positive statement as to the cause of death, and these few were in connection with public accidents, where, in any case, there would have been no reasonable doubt on this point, even if no medical examination at all had been made, as the circumstances of the accidents and their fatal results were clearly established by eye-witnesses.

In two of the more important cases (Nos. 45 and 59) I was fortunate in having the co-operation of Dr. G. Villeneuve in making the examinations, and obtained valuable aid from his thorough knowledge of medico-legal questions and clear reasoning upon the facts observed by us jointly. It is much easier, as a rule, to recognize the facts brought out by a post mortem

than to decide upon their significance and the extent to which they are to be allowed to influence an opinion. The system at present in vogue, which necessitates hastily formed conclusions being submitted, without time for reflection, to an impatient jury, is one which is bound to lead, sooner or later, to serious error or miscarriage of justice, and which places the medical witness in a most unenviable position.

I have arranged the cases according to the causes of death found, rather than according to the verdicts given, and have considered chiefly the facts brought out by the examination, the conclusions formed from these, and the finding of the jury.

In drawing up reports the French form of protocol has been followed. The German system of numbering each paragraph is convenient for reference afterwards, but was found to be too cumbersome.

#### I.—DEATH BY DROWNING (22 CASES.)

Of the 22 cases, 18 were identified and 4 were those of unknown persons. Three autopsies were ordered, one of which was upon a body not identified. The remaining examinations were external only. In my opinion, autopsies should always be made where the facts of the death are not proved by eye-witnesses, or where there is any reason to suspect the good faith of such witnesses. Two verdicts of suicide and one of manslaughter were rendered, and in 14 the death was stated to be accidental. In the remaining five cases the verdict was simply found drowned or found in the water. In all but two of the identified persons the circumstances of the death were attested to by eye-witnesses, making the medical testimony merely corroborative. In these cases the bodies were usually found close to the scene of the accident, after the lapse of from a few hours to a few days.

When a body is found in the water, the following questions always arise :

- (a) How long has the body been in the water ?
- (b) Was the death due to drowning ?
- (c) Was the death the result of a crime ?

A. — *Indications of Time in Water.*

The following signs given by Duvergie and Vibert were prepared from an extensive and accurate knowledge of the appearances of drowned bodies :

TIME.		APPEARANCE.
WINTER.	SUMMER.	
3 to 5 days...	5 to 8 hours.	Rigor mortis; body feels very cold and clammy; epidermis commencing to whiten; finger tips wrinkled.
4 to 8 days...	24 hours ....	Limbs flaccid; skin of natural colour; epidermis of palms very bleached; palms wrinkled; rigor in summer.
8 to 12 days..	48 hours ....	Flaccidity; bleaching of backs of hands; face waxy-looking.
2 weeks.....	4 days .....	Face puffy, reddened in places; greenish tinge of skin over sternum; epidermis of palms and soles completely bleached and commencing to form folds. Interstitial formation of gases commences. ( <i>Green putrefaction period.</i> )
1 month .....	8 to 12 days.	Face reddish-brown; lips and eyelids green; chest greenish; skin of hands and feet wrinkled, swollen and creased as if by poultices, its consistency chalky. Body floats owing to production of gases. ( <i>Period of bloating.</i> )
2 months ....	1 month .....	Face brown and swollen; epidermis largely peeled off from body; nails still attached; hair of scalp readily scraped off; skin begins to get sodden, like wet cardboard or parchment. ( <i>Brown putrefaction period.</i> )
2½ months...	.....	Epidermis and nails of hands detached; epidermis of feet detached, nails still adherent; reddening of subcutaneous tissues; partial saponification of cheeks, chin, mammae and anterior surface of thighs. ( <i>Saponification period.</i> )
3½ months ...	.....	Partial detachment of scalp, eyelids and nose; saponification of neck and groins; epidermis of hands and feet completely detached and nails fallen off. ( <i>Destructive putrefaction period.</i> )
4½ months ...	.....	Complete saponification of face, neck and anterior part of thighs; cutis opalescent; cranium denuded and becoming brittle; incrustation of lime in the form of small rounded or conical tubercles, size of peas, in skin of thighs. ( <i>Incrustation period.</i> )

Duvergie states that the changes in summer appear about 20 to 22 days earlier than in winter, the rate in spring and autumn being intermediate. In these late periods the signs are uncertain, and the relation between the summer and winter rates of alteration very inconstant. In winter maceration alone occurs; in summer putrefaction and maceration go on simultaneously. Immersion, while it lasts, retards putrefaction, but bodies removed from the water putrify with astonishing rapidity; hence the necessity of their being viewed without delay, in order not to confound the appearances produced while in the water with those which occur subsequently.

I have endeavoured, from my own cases, to check these statements as far as possible, and find out by a study of the appearances of bodies where the period of immersion was known, to see what statements might safely be made with regard to bodies found in the neighbourhood of Montreal.

The collection of facts on this head was made difficult by the fact that nearly all of the examinations had to be made under unfavourable conditions as regards light, the bodies often being laid out in rooms lighted with candles only. The absence of facilities for dictating full notes also made the task more difficult.

The rapid decomposition of bodies after they had been removed from the water was very striking. Bodies which looked perfectly fresh when first removed became almost unrecognizable in the course of a few hours. It was impossible to prevent the occurrence of these changes in the absence of a proper refrigerating chamber. The absence of a suitable morgue made it also impossible for the progress of decomposition to be followed and noted.

As will be seen by reference to the cases, the signs of immersion, or, in other words, the evidences of maceration, came on even more rapidly in summer than might be expected from Duvergie's table. After the end of June this was especially marked. In Cases 96 and 97, an immersion of a few hours in August was found to induce as marked maceration changes than would ensue in as many days in June.

In connection with this, it is of interest to record here my observations of the mean monthly temperature of the water about Montreal, made two years ago. As I have found that the water temperature of 21° C. for August was the same in 1893 as in 1890, it may be assumed that these temperatures are fairly constant. The great size of the bodies of water (St. Lawrence and Ottawa rivers) from which they are taken, renders it unlikely that the daily and weekly variations are considerable in amount. Canal and reservoir water was found to be 2° to 4° C. higher than river water during the summer.

TEMPERATURE IN 1890.\*

MONTHS.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Water, C°.....	0	0	0	4	10.9	14	18	21	18.3	13	10	4
Air, F°.....	15	17	26	42	52	65	66	66	62	45	33	7

In the examination of the bodies immersed near Montreal, and recorded in tabular form below, the chief deviation from the results given in text books was the longer duration of rigor mortis, which was still well marked after one to two weeks' immersion during the summer, in spite of the presence of advanced putrefaction in parts of the body. The muscles of the legs appear to resist putrefactive changes for a considerable time. In one case where a body showed marked maceration and decomposition, but where rigor mortis persisted, a bacteriological examination showed the absence of bacteria, microscopically, from the rectus femoris muscle and cultures made from that region remained sterile.

The early appearance of a greenish tinge over the sternum and pectoral region mentioned by Duvergie was often present. It evidently depends upon the early and rapid decomposition of the head and neck, with penetration of the gases along the planes of the fascia. It appears long before a green tinge of the abdomen is seen:

\* The temperature of the air is that recorded by Prof. C. H. McLeod at the McGill Observatory.

The wrinkled and bleached condition of the hands was, on the other hand, produced much more rapidly than one would expect from Duvergi'es tables. I found in a body (Case 97) recovered from the water on a warm August afternoon, after a submersion of less than an hour, and examined a few hours later, before it had even time to become cold, a quite typical, bleached and wrinkled appearance of the palms and soles, and another body (Case 96) examined earlier on the same day, after being in the water for two hours during the previous night, also presented a typical condition of wrinkling of the epidermis. In neither case was the epidermis specially thick, one being that of a young girl and the other that of a boy of twelve.

Whether the water bacteria, or the bacteria of the body are the active agents in bringing about the decomposition of the bodies is a matter which I hope to deal with in a future communication. The extremely rapid march of putrefaction in immersed bodies appears to depend essentially upon the greater amount of water which the tissues contain, just as a moist gangrene shows much more marked putrefaction phenomena than a dry, senile gangrene. When, however, a body has been for a very long time immersed in water (several months), its putrefaction upon exposure to air is relatively slow, perhaps because the bacteria which have penetrated the tissues have had time to die out, or non-putrescible substances formed in the tissues.

The presence of cutis anserina was noted in 2 cases. It did not appear, as would be expected from the statements found in text books, as an early change, and was found in bodies which had been immersed from three to seven days. It appears to be more readily produced by cold air than cold water, and was commonly seen in bodies which were placed on ice.

Shrinking of the penis and scrotum was often seen, but is not a reliable sign, as the external genitals soon become puffy and emphysematous when the bodies are removed from the water. It is said that this appearance may be produced by immersion post mortem.



In several instances the skin over the knees was white and wrinkled.

*B—Did Death result from Drowning?*

The distinction between drowning (submersion) and the entrance of a dead body into the water (immersion), I found to be easy to decide in some cases, and difficult or impossible in others.

It may be well here to mention briefly the signs of drowning.

The signs of immersion given above only show that the body has remained for a certain period. In addition to this, certain appearances indicate that the body entered the water alive.

(1) *External Signs of Drowning.*—The only direct and reliable sign is that of a very abundant, fine, white froth which issues from the mouth and nostrils of drowned for a period of a few hours until two or three days after death. This is not well marked until some hours after death and disappears by the time the maceration changes have become advanced, or when putrefaction has fully set in. This foam was found present in 5 of my cases and absent in 17. It is not absolutely characteristic of drowning as I have seen it in two cases of cerebral hæmorrhage, and one of which was spontaneous (case 66), and the other traumatic (case 48), and is of value chiefly in indicating that death has been due to asphyxia. A reddish, frothy fluid, oozing from the mouth and nose of bodies partly decomposed, is no evidence of drowning.

The skin of drowned bodies is blanched.

Ecchymosis of the skin and conjunctivæ, common signs of asphyxia, were not met with in any of my cases of drowning, an observation in accordance with the statements of text-books.

Seminal emissions were twice observed. When not emphysematous, the penis and scrotum were usually shrunken.

The presence of mud, tufts of grass, etc., about the fingers and nails, which is supposed to indicate struggling near a bank, was only met with in one case (No. 61).

(2) *Internal Signs of Drowning.*—These are : (a) *Respiratory tract.*—The epiglottis is stated to be vertical in bodies

which have been drowned, and merely partly raised in those immersed after death. The presence of froth or water in the air passages, with œdema, or sometimes emphysematous inflation, engorgement and sub-pleural or deep-seated ecchymosis of the lungs is highly characteristic. The presence of a pint or so of reddish fluid in the pleural cavity was noted, but has no distinct significance. (b) Foreign bodies, such as mud, etc., in the air passages and eustachian tube. These were not seen in the cases where autopsies were made, and their absence has obviously no negative significance where the body is found in a large, clear body of water like the St. Lawrence river. (c) Fluid in the stomach. In the three cases examined, the stomach was found practically empty. In one of these the death was sufficiently recent to infer from this that water had not been swallowed in any considerable quantity. In the other two transudation into the peritoneum may or may not have occurred. It has been recommended\* to compare by chemical analysis the fluid found in the stomach, middle ear, air passages, etc., with the water in which drowning is supposed to have occurred. (d) Water in the middle ear. (e) Foreign substances in the middle ear.

The penetration of foreign bodies into the middle ear and bronchi has also been produced artificially by immersing dead bodies in a solution of starch or meal.† This took place in 28 per cent. of the experiments. This is stated by Lacassagne only to occur after death when there is perforation of the tympanum. None were met with in my cases.

The three cases in which autopsies were allowed were all bodies which had been a long time in the water and which had in addition become putrefied after removal, so that the characteristic signs of drowning were absent.

It is stated that œdema of the lungs may occur in post-mortem immersion, also that in an œdematous lung collapse may occur. Palttauf‡ was able to show, by means of the

\* Bougier. Thesis, Paris, 1884.

† Huevkovsky. Arch. l'Anthropol. Criminol, Sept, 1887.

‡ Ueber Tod durch Ertrinkung, 1888.

hæmomometer, that in bodies immersed experimentally the blood in the heart had become diluted.

\* Bougier found that in bodies immersed and afterwards frozen that ice crystals were found in the large and middle-sized bronchi, but not as a rule in the bronchioles.

The right heart may either be engorged with blood or completely empty, according to whether death occurs by asphyxia or syncope.

(f) On the whole, the presence of a large amount of watery fluid (over 12 oz.) in the stomach is probably, next to actual froth in the bronchi, the most reliable of signs of drowning, as water does not tend to enter the stomach after death. My own material is too limited to permit me to express an opinion.

#### *C.—Was Death the result of a Crime?*

For the distinction between homicidal, suicidal and accidental drowning the medical testimony, apart from other evidence, cannot, as a rule, be very positive. It is impossible, for example, to tell whether the individual simply fell into the water, or was pushed in.

The direct medical evidence bearing upon this point would be the signs of a struggle, bruises, scratches, etc., and for this reason the hands and fingers must be examined with especial care.

In two of my cases (Nos. 93 and 94, drowned at the same time and place) such marks of violence were found. These consisted of numerous spots of ecchymosis on the arms and chest. The opinion given was that bruises had occurred before death, and that certain other lesions of the surface, abrasions and parchmentation had been produced after death, probably in the process of fishing out the bodies, but that the legal significance of the bruises could not be definitely stated without further knowledge of the circumstances of the death. It subsequently transpired that one of the victims, who could not swim, seized hold of the other, who struggled in vain to free himself, and when found the limbs of both were locked in a close embrace.

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\* H. Bougier. Thesis, Paris, 1881.

Anything pointing to a criminal homicide, after which the body might have been thrown into the water, has to be borne in mind. This was not indicated in any of my cases.

The absence of any marks of violence or evidence of other modes of death affords, to a certain extent, grounds for supposing that death must have been due to drowning, even when the signs of drowning have disappeared, but statements on this head have to be made with extreme caution, as the possibility of poisoning must be borne in mind.

The question of whether wounds have been made before or after death must also be dealt with in a guarded manner, as on the one hand the blood pigments tend to diffuse themselves in a remarkable degree in immersed bodies, and on the other hand an actual blood-clot may be washed away, or decolorized, or even dissolved. Definite ecchymosis of clotted blood about an injury, however, indicates a lesion produced before death.

I venture to offer the present small material for consideration, more from a desire to offer proof of having been "faithful over a few things" than in the hope that the cases quoted are specially interesting to others. The following are the details of the cases:

CASE 47.—*Blow on Head and Drowning.—Autopsy.*—J. B. C., aged 45, labourer, while working upon a dredge, was struck upon the head by the iron scoop and knocked into the water. The body was recovered two weeks later, and an autopsy ordered.

Autopsy performed June 3, 1893, 24 hours after removal from water. Clothing not torn or disarranged. Head and neck greatly swollen, and features nearly obliterated. Genitals emphysematous. *Hair of scalp and moustaches readily scraped off. Skin of palms and soles white and wrinkled.* Over trunk numerous large blebs beneath epidermis filled with greenish fluid. On lower limbs similar vesicles containing clear fluid. Rigor mortis present. Strong odour of putrefaction.

A scalp wound, with ragged, lacerated edges, extends from two inches above the left external angle of the orbit nearly to the vertex. The pericranium is torn, and the bone exposed.

A linear fracture, three inches in length, extends upwards from the left frontal eminence.

On reflecting the scalp, the occipital region is seen to be infiltrated with a bloody, serous fluid extending downwards into the cellular tissue of the upper part of the neck., and *clotted blood is found free in*

*the tissue.* On removing the skull cap by sawing through the bone and brain together,\* it is seen that the fracture is chiefly confined to the outer table of the frontal bone, the inner table presenting only a line of fracture one inch long. There is no ecchymosis about the fracture of the inner table or the dura.

Brain much softened, but the surface and convolutions retain sufficient consistency to be studied at the seat of the injury. There is no evidence of hæmorrhage or laceration.

On removal of the dura from the base of the skull, the bone is found free from fracture.

Half a pint of reddish fluid in each pleura. Bronchi free from foreign bodies. Stomach contained about 4 oz. of thick, greyish pulp. No water or foreign bodies found in internal ear.

(Nothing abnormal was found in the other organs).

*Conclusions.*—1. The body shows signs of maceration corresponding to a stay of about two weeks in rather cold water. The internal organs are sufficiently well preserved to render their examination satisfactory.

2. A lacerated and contused scalp wound and fracture of the outer table of the skull exist. This injury appears to have been produced before death, and been of sufficient severity to stun a man, but not to kill him immediately.

3. The state of the lungs and stomach corresponds with that of a man unable to struggle in the water.

In this case the death was the result of an accident. A verdict of manslaughter was returned, as a foreman was thought to have been guilty of criminal negligence, but the Grand Jury found no bill. The points to be determined at the autopsy were whether death had occurred from drowning or in consequence of the blow. The presence of ecchymosis beneath the scalp showed that bleeding into the tissues had taken place after the blow, and this view was afterwards confirmed by the statement of a witness that after the body had sunk a large amount of blood continued to stain the water, which of course would not have been the case if the blow had been instantly fatal. The state of the stomach, however, showed that no water had been swallowed, and that therefore probably no struggle for air had taken place.

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\* This method of removing the brain, followed in the Paris morgue, is extremely simple and easy. The study of lesions in the brain and membranes are not interfered with, and one is perfectly sure that lines of fracture are not artificially extended. It is possible in this way to successfully remove a brain which is all but diffuent.

CASE 49.—*Unknown Man—Contusion of Head—  
Drowning—Autopsy.*

Body found in Lachine Canal on June 3, 1893. Autopsy on June 5, 1893. Weather very warm. Decomposition advanced. Features unrecognizable. Skin of hands and feet white and wrinkled. Hair not detached. At outer angle of right eyelid a laceration half an inch in length, penetrating half an inch; edges ragged. Cellular tissue in neighbourhood infiltrated with reddish serum. Bones of skull and face intact. Brain a good deal softened; no appearance of hæmorrhage or disease. One pint of reddish fluid in each pleura. No appearance of foreign bodies or froth in bronchi. Stomach almost empty.

*Conclusions.*—1. The body is that of a man probably over 40 and under 50 years of age.

2. The evidences of maceration point to a week or ten days in the water.

3. The laceration about the eyelid is not shown to have been caused before death. No other signs of violence.

4. There is nothing to indicate that death has not been caused by drowning.

In this case the slight injury in the region of the eye was surrounded by abundant reddish serous infiltration into the tissues, but this is very liable to take place by the action of the water in lesions made after immersion, or gnawed by fishes. The existence of considerable ossification of the cranial bones without calcification of the costal cartilages seemed to place the age between about 40 and 50. The verdict was "Accidentally drowned."

CASE 50.—*Body of Young Woman—Identified Partly by  
Teeth—Immersion for Several Months—Autopsy.*

Found in St. Lawrence river June 6, 1893. Autopsy June 7, 1893. Clothing much torn.

*External Examination.*—Height 5 feet 3 inches. Body extensively macerated, but without much putrefactive odour. Scalp and flesh of face all gone, with exception of temporal muscles, leaving bones of skull and face bare. Flesh of trunk and limbs softened and large pieces missing. The subcutaneous adipose tissue is everywhere changed into a white, soapy substance. Skin and muscles mostly gone from hands, leaving tendons and bones exposed. Nails loosened, but still attached to hands and feet. Pubis covered with thick, dark hair. Lower part of abdomen much distended. No signs of injury to the bones nor any marks of violence on the body.

*Internal Examination.*—Muscles of deep, beefy red colour. Mammary glands firm and rounded, areola pale, tissue well preserved. No

signs of any fluid resembling milk. In pleuræ about a pint of reddish fluid. Cavities of heart nearly empty. Valves normal. Lungs crepitant throughout. Bronchi reddened, free from foreign bodies. Pharynx disintegrated and reduced to a pulpy condition. Spleen normal. Kidneys normal, in cortex a few whitish, gritty points, apparently tyrosin clusters. Bladder empty; mucosa normal. Pelvic organs appear normal. A corpus luteum of  $\frac{1}{4}$  inch diameter, with reddish tint in right ovary. Uterus small, cervix long and narrow, mucosa thick and reddish, looking soft and velvety, length  $2\frac{1}{2}$  inches, width between fallopian tubes  $1\frac{1}{2}$  inches. Hymen circular, appears intact, orifice large enough to admit the thumb. Liver soft.

Stomach large, U shaped, near the fundus half a teacupful of reddish pulpy lumps, proving on further examination to be the pulp and skin of large grapes, with about a tablespoonful of very large grape seeds. Intestines normal, contain soft fæces and no grape seeds.

*Head*—On removing skull-cap brain escapes as a thick semi-fluid pulp; no appearance of hæmorrhage. Bones of cranium intact. The sutures of cranium do not appear to be ossified. Inferior maxilla contains three well developed molars on each side. On the right side the posterior premolar is displaced inwards, projecting towards the tongue. First left, and first and second right molars carious, no fillings. Incisors and canines absent from sockets, of which the edges are quite sharp. No signs of gums. Angle of jaw about  $130^{\circ}$ . Antero-posterior diameter of skull 7 inches; greatest transverse diameter  $5\frac{1}{2}$  inches.

*Conclusions*.—1. The body is that of a fully developed woman, who has never borne children.

2. It has been in the water for over a month, and probably during the entire winter.

3. There is nothing in the result of the autopsy to show that death is due to causes other than drowning. The state of the body is such that the ordinary signs of drowning would have disappeared.

In this case the body was recognized as that of a young girl, aged 18, who had disappeared in October, 1892. The identification was at first thought to be established by a peculiar brooch made from a coin. Afterwards the friends were uncertain, but admitted that the missing girl had a malformation of the teeth similar to that described. The fact that the wisdom teeth were fully formed made it unlikely that the body was only 18 years old. In this case the autopsy was ordered to see if the distension of the abdomen was due to pregnancy or not, as from the external appearances there seemed little chance of learning anything more. I was surprised to find all the vital organs in such good preservation. The jury brought in a verdict of "Wilful suicide."

## EXTERNAL EXAMINATIONS.

No.	DATE.	TIME IN WATER.	HISTORY—APPEARANCES.
41	1883. May 25.	12 hours. Montreal Harbour. Examined 12 hrs. after removal.	W. R., sailor, aged 24. Fell off ship. No marks of external injury. Skin of hands firm and smooth. Skin of soles of feet white and wrinkled. A large amount of fine white froth issues from nostrils. Rigor mortis present. Viscid fluid in urethra. In this case the wrinkling of epidermis of soles appeared before that of the hands, owing to the fact that the body had lain with the wet boots and socks on for 12 hours before being examined.— <i>Acc. death</i>
46	June 2.	4 hours in Lachine Canal.	A. R., boy, aged 16. Drowned while bathing Skin everywhere feels very cold and clammy. Rigor mortis present. Skin of hands and feet not bleached or wrinkled. Fine white foam very plentiful about nostrils. No cutis anserina.— <i>Acc. death.</i>
55	June 17.	8 days in Lachine Canal. Examined 20 hrs. after removal.	C. S., aged 11. Fell into canal near sluice gates at Cote St. Paul. Body found at St. Henri. Skin feels cold and moist. Epidermis readily brushed off with hand. Hair not loosened. Skin of palms, soles and anterior surface of knees white and wrinkled. Nails attached. Head and neck swollen and bloated; the skin is reddened. Greenish tinge over chest. Abdomen greatly distended. No froth about nostrils. Reddish fluid containing food particles oozes from mouth. Rigor mortis marked. Moderate lividity. A little feces about buttocks. Deep punctured wound, $\frac{3}{4}$ in. long, over left patally; edges everted and rounded. No ecchymosis.— <i>Accidental death.</i>
56	June 12.	24 hrs in St. Lawrence River. Examined 12 hrs. after removal.	P. G., aged 40. Seen to fall off a wharf while placing a gangway, on June 6th, 1893. Marked rigor mortis. Advanced decomposition of head and face. Skin over chest and abdomen discoloured green. Epidermis raised into blebs filled with clear green fluid. Palms and soles white and wrinkled. Nails attached. Hair of scalp not easily detached. A bloody, frothy fluid keeps bubbling from nose.— <i>Accidental death.</i>
57	June 14.	5 days in St. Lawrence River. 12 hrs. after removal.	N. D., aged 7. While playing, seen to fall off a wharf. Rigor mortis throughout body. Advanced decomposition. Head and neck reddened and swollen. Nose flattened. Conjunctive red. Lids swollen. Reddish frothy fluid oozing from nostrils. Skin over chest greenish. Palms, soles and skin over knees white and wrinkled. Epidermis peels off when scraped.— <i>Accidental death.</i>



EXTERNAL EXAMINATIONS—*Continued.*

No.	DATE.	TIME IN WATER.	HISTORY—APPEARANCES.
61	1893. June 20.	3 days in shallow, muddy water near Longueuil. Examined 12 hrs. after removal.	J. M., aged 21. Seen to sink while bathing. Body smeared with thick mud. Numerous larvæ. Rigor mortis present. Skin of hands and feet wrinkled. Epidermis detaches from body. Head and face not much swollen. Genitals puffy.— <i>Accidental death.</i>
62	June 20.	(?) Examined 10 hrs. after removal.	Unknown man. Body found at Maison-neuve. Rigor mortis present. Body much decomposed. Head and neck swollen and nearly black in colour. Features obliterated. Veins appear as bluish-green lines over upper extremity. Skin of hands and feet white and wrinkled. Hair comes off readily in scraping.— <i>Found drowned.</i> (The time of immersion was estimated at one to two weeks.)
65	June 27.	10 days in Montreal Harbour. Examined 12 hrs after removal.	A. M. Wharf labourer. Last seen on a wharf, and missed by his friends the following day.— <i>Found drowned.</i> Rigor mortis present. Reddish, frothy fluid issues from nose. Head and neck swollen and discoloured. Veins of upper extremity show as dark lines in the skin. Palms and soles wrinkled.
67	June 30.	2 days in Lachine Canal. Examined 10 hrs. after removal.	J. R., aged 15. Seen to drown while bathing. Rigor mortis marked. Lividity posteriorly. Undertaker's incisions for injecting embalming fluid. Skin cold and clammy. No signs of decomposition. Slight wrinkling of skin of palms, none of soles. Cutis anserina absent. Abundant white froth about nostrils. Superficial abrasions about backs of hands.— <i>Accidental death.</i>
69	July 2.	3 days in Lachine Canal. Examined 6 hrs. after removal.	St. P., aged 12. Seen to fall into water while playing. Putrefaction very far advanced; body has an internal putrid smell. Head and neck swollen and reddened. Chest greenish. Rigor mortis present. Skin of soles and scrotum white and wrinkled.— <i>Acc. death.</i>
76	July 13.	(?) in St. Lawrence River. Examined 24 hrs. after removal.	Unknown man, 20 to 30 years old. Mud and grass about fingers. Epidermis detaching over body. Skin of palms and soles white and wrinkled. Hair can be scraped off scalp. Decomposition advanced. Limbs flaccid.— <i>Found drowned.</i> (Immersion estimated at one to two weeks.)

EXTERNAL EXAMINATIONS—*Continued.*

No.	DATE.	TIME IN WATER.	HISTORY—APPEARANCE.
82	1893. July 25.	(?) in Montreal Aqueduct. Examined 24 hrs. after removal.	Unknown man; no history. Tattoo mark on right forearm. Advanced maceration. Limbs flaccid. Scalp and flesh of head and face almost all detached. Flesh of hands and feet detached, with exception of a few ragged fragments adhering to the bones. Muscles of neck and arms ragged and frayed, apparently from maceration. Subcutaneous fat appears completely saponified. No bones fractured. (Immersion estimated by me at several months.)— <i>Found drowned.</i>
84	July 31.	1 week in St. Lawrence River Examined 20 hrs. after removal.	J. H., age 35. Seen to fall overboard from a hay barge.— <i>Accidental death.</i> Marked rigor mortis. Face bloated and features almost effaced. Great discolouration, reddish black about head and greenish on chest and abdomen. Epidermis detaching. Skin of hands and feet bleached both on palmar and dorsal surfaces. Scalp feels thick and sodden. Hair not loosened.
93	Aug. 13.	2 days in Montreal Harbour. Examined 12 hrs. after removal.	T. W., aged 19. Bathing together with case No. 94. Skin of palms and soles white and wrinkled. Hair not loosened. Marked rigor mortis. Cutis anserina on inner surface of both thighs. Several spots of parchmentation on chest, arms and abdomen, some of which show ecchymosis beneath it; also several bluish spots were found in incising to be ecchymosis. <i>Opinion.</i> —1. The body shows marks of bruises and scratches, some of which have been produced before death and some after. It is impossible to tell what significance these have without other information about the circumstances of the death. 2. The cause of death cannot be stated from external examination.— <i>Acc. death.</i>
94	Aug. 13.	2 days in Montreal Harbour. Examined 10 hrs. after removal.	W. S., aged 25. Drowned on same occasion as case No. 93.— <i>Accidental death.</i> Mold forming on face. Rigor mortis marked. Cutis anserina of thighs. Skin of palms, soles and knees white and wrinkled. Hair firmly attached. Face swollen and discoloured. Abdomen green. Genitals emphysematous. Greenish froth issuing from mouth. Numerous marks of parchmentation on trunk, which show in some cases ecchymosis beneath them. On left arm small elevated areas due to ecchymosis.

## EXTERNAL EXAMINATIONS—Continued.

No.	DATE.	TIME IN WATER.	HISTORY—APPEARANCE.
94	1893. <i>Cont'd.</i>		<p><i>Conclusion.</i>—There is evidence of bruises made before death, and also abrasions apparently made after death. Their significance cannot be determined without more information about the circumstances of the death and recovery of the body.</p> <p><i>NOTE.</i>—It appeared from the evidence that T. W., who was unable to swim, had seized hold of W. S., who could, and a violent struggle took place in consequence of the latter's efforts to save himself. The bodies were found closely locked together. This gave a clear explanation of the ecchymosed spots. The other abrasions may have been caused at the same time, but more probably were due to the grappling irons used in fishing for the bodies.</p>
96	Aug. 16.	2 hours in Lachine Canal. Examined 8 hrs after removal.	<p>C. McA., a girl aged 19, was seen to fall into the canal in attempting to jump from an open drawbridge to the bank. Clothing not removed; body placed on ice.</p> <p>Marked post-mortem rigidity. Face and neck slightly swollen and puffy; not discoloured. No cutis anserina. Skin of palms and soles white and wrinkled. Fine, very abundant white froth about nostrils. Conjunctivæ pale.—<i>Accidental death.</i></p>
97	Aug. 16.	Montreal Quarries. 1½ hours. Examined 4 hrs. after removal.	<p>A. D., boy aged 12. Seen to fall out of a boat into a shallow pond. Clothing not removed.</p> <p>Body still warm; limbs flaccid. Conjunctivæ pale. Blood obtained by incising scalp is fluid, not very dark, oozes freely from veins. A little thick, white froth in mouth and nostrils. Skin of palms and soles white and wrinkled. No cutis anserina.—<i>Accidental death.</i></p>
98	Aug. 17.	(?)	<p>W. W. Missing since July 6 (about six weeks). Circumstances of death unknown. Rigor mortis present. Intense putrefaction, odour like that of rancid fat. Epidermis detaching from all parts of body, and has completely separated from the hands and feet. Nails gone from hands and feet. The exposed cutis is smooth, slightly reddened and oily looking. Veins of surface appear as reddish or greenish hues. Hair readily scraped off from scalp. Face and neck swollen and bloated. Tongue protruding between the thickened lips. Eyelids everted and eyeballs protrude. Scalp feels sodden and at the same time puffy and emphysematous. Reddish fluid oozing from nose.</p>

EXTERNAL EXAMINATIONS—*Continued.*

No.	DATE.	TIME IN WATER.	HISTORY—APPEARANCE.
98	1893. <i>Cont'd.</i>		NOTE.—In this case the length of immersion was estimated as being at least two weeks. Not having data concerning the appearance of bodies immersed for specified times at this season, I was unable to state whether the appearances made it possible that the body had been in the water for the whole six weeks during which he was missing.— <i>Found drowned.</i>
100	Aug. 21.	3 days in Montreal Harbour. Examined 2 hrs. after removal.	Identified as body of J. S., who was one of three men who threw themselves off the long wharf on August 18, 1893, with the intention of committing suicide. The two companions were saved. Rigor mortis present. Lips thick. Face swollen, discoloured and bloated. Reddish fluid in mouth. Testis retracted, scrotum emphysematous. Hair of scalp readily scraped off. Epidermis of hands and feet white and wrinkled, both on dorsal and palmar surface, and partly detached. Skin over knees white and wrinkled. Nails adherent. Greenish tinge over pectoral and sternal regions.— <i>Suicide.</i>

In the above report I have omitted the description of matters concerning identification of bodies, though, of course, these were recorded in the case of the unknown persons.

As a rule the opinions in the cases of external examination were drawn up as follows :

1. The body presents the appearances of having been in the water for . . . . .
2. The cause of death cannot be stated from external examination.

In five of the cases it was stated that the body presented external appearances found in drowned persons. In several cases it was stated that no external signs of injury were present. This statement I have almost ceased to make, as it is calculated to mislead the jury into supposing that violence by blows, etc., has been proved not to have been committed, whereas it is well known that blows of great force, sufficient, for instance, to fracture the skull, can be inflicted without leaving any traces upon the surface of the body.

In the case of those bodies where the cause of death remained unexplained, it was a matter of keen regret to me that autopsies were only ordered in 2 out of 7 cases. It is true that the autopsy might not have solved this point, owing to the advanced post-mortem changes present, but it might have shown the presence of water or foreign substances in the stomach, air passages, middle ear, etc., on the one hand, or on the other have shown some internal disease or injury. My opinion is that the grounds for ordering an autopsy should be simply that the death is obscure, irrespective of whether the difficulties produced by post-mortem changes lessen the chances of a positive result or not. This is the view held in all European countries, and all physicians charged with medico-legal work are officially notified that *no degree of decomposition or disintegration of the body* ever justifies a medical man either in refusing to perform an autopsy or in neglecting to recommend it.

In my own work this view was always carefully stated in a general way to juries, both by Coroner McMahon and myself. As the matter of autopsies is still in an unsettled state in Montreal and is on its trial, I did not feel justified in directly insisting on their being held, on the off chance of finding out the cause of death under unfavourable circumstances, from the feeling that a large number of negative results at the present time might prejudice the whole question of the routine performance of autopsies. I therefore only insisted strongly on an autopsy in my written report in three instances, where I was able to show beforehand that information would certainly be obtained on special points requiring solution. These were case 47, when a fracture of the skull was found; case 49, where a fracture of the skull was shown to be absent, and case 50, where possibility of pregnancy was negatived. Thus in each case the information looked for was obtained at the autopsy.

That in inquests upon the bodies of unknown persons found dead the inquiry should be habitually closed without having used such an obvious means of investigation as is offered by an

autopsy, is a matter for which the responsibility must be borne by the juries who had it in their power to order autopsies and neglected to do so.

An additional case, not in this series, is added because an autopsy happened to be performed (at the request of a private individual.) The case presents some interesting features.

*Case 102, 1893.*—J. T., aged 25, coloured, was seen to sink in a public bath. He was able to swim. The statements about the circumstances of the death were somewhat contradictory, but it is certain that the body was removed from the water after an immersion of a few minutes only, and fruitless attempts at resuscitation were practiced by two skilful physicians.

The body when viewed two hours after the accident showed flaccidity of the limbs. A white froth was seen about the nostrils. The surface was still warm and quite dry, No signs of maceration. Two spots of bruising about the forehead. Conjunctivæ pale. A little fluid like sperm in the urethra. Autopsy 24 hours p.m. Rigor mortis marked, Foam still visible in nostrils. A few ounces of reddish fluid in peritoneum and pleura. Blood fluid; not thick or dark. Lungs bulky, inflated, crepitant throughout, gorged with blood, and show a few sub-pleural ecchymosis and numerous small areas of hæmorrhage in the substance. Cut surface yields abundant rusty foam, not watery. Tracheæ, bronchi and larynx reddened and contain reddish foam. Pharynx free. Heart enlarged, weighs 350 grammes; cavities somewhat dilated. Tricuspid orifice dilated, measures 6 inches in circumference; other orifices of usual size. Heart muscles very pale and bloodless, not fatty. A few ecchymosis beneath epicardium; none beneath the endocardium. Coronary arteries normal. Slight atheroma of aorta and mitral valves. Aorta and iliac arteries present slight but widely distributed atheroma. Inter-vertebral arteries slightly atheromatous. Radial arteries normal. Spleen normal. Lymphatics and mesenteric glands full of white chylous fluid. Stomach contains 12 oz. of thick, greyish, sour gruel-like pulp, evidently for the most part digested, but including some lumps of meat nearly the size of walnuts. The mucosa thick and grayish, covered with adherent mucus and with an extremely large number of whitish lymph glands as large as split peas near the pylorus. Intestines full of ordinary looking feces; their vessels full and injection of mucosa marked. Kidneys large, weigh 200 grammes each; shape somewhat hog-back. Capsules rather thick, surfaces smooth and dark. Stellate veins full. On section cortex thick or coarse looking and *septa Bertini* wide. Bladder contains 4 oz. of ordinary looking urine. Liver normal. Head—In frontal region, an area of coagulated blood extravasated in subcutaneous tissue beneath pericranium, diameter  $1\frac{1}{2}$  inches; bone not injured. Brain normal; vessels moderately full. Middle ear free from water. Vessels of mastoid region extremely full of blood. Skull-cap dense, diploë scanty.

*Conclusions.*—1. Death has been due to drowning.

2. From the condition of the heart and kidneys it is possible that the submersion may have been due to a syncopal attack, but this cannot be stated with certainty.

3. The significance of the contusion on the forehead cannot be stated; it seems severe enough to have caused stunning.

In this case it was probable from the signs of drowning being so ill marked that some accessory cause was present. Whether this was due to a blow on the head, or to some passing functional failure in a heart not perfectly normal, I am unable to decide, though the jury, by admitting heart failure, seem to have considered themselves in a position to do so.

The stomach at the time of death was still in full digestion, but most of the contents seemed to have been disposed of. Sufficient food remained to have masked the presence of a small quantity of water, say four to five ounces. From the presence of arterio-sclerosis, in the absence of any syphilitic lesions, the possibility of alcohol as a cause of this change had to be considered, but I refrained from making any statement on that point in absence of any conclusive proof, knowing the predilection of juries to bring in what may be termed "alcoholic" verdicts on very slender grounds.

I have endeavoured to show in the discussion of the above cases that the collection of facts, such as they furnish, may enable in the future statements as to the length of the period of immersion to be made with more confidence. I think it is also fairly evident that it would be better as a matter of routine to have autopsies performed in cases of death from drowning than not to have them performed. When the object of the inquiry is to decide the question of wilful homicide, it is indispensable that the physician making the examination should have a large experience in examining drowned bodies. If in ordinary cases the bodies are merely taken out of the water, viewed and buried, without being made available for scientific study, it is evident that no one can possibly be expected to acquire the experience necessary to make him an expert whose opinion, in a really difficult criminal case, would be of much value.

*(To be continued.)*

REPORT OF TWO CASES OF TETANY OCCURRING  
IN INFANCY.\*

BY D. J. EVANS, M.D., MONTREAL.

*Mr. Chairman and Gentlemen.*—Instead of reading a report of my cases first, and making remarks upon them afterwards, permit me to reverse the usual method by presenting the case reports at the conclusion of my remarks.

*Definition*—Ross, in his Diseases of the Nervous System, thus defines the condition I would submit to your consideration this evening: “Tetany consists in paroxysms of tonic contractions of certain groups of muscles, affecting for the most part the muscles of the face, arm and hand, and sometimes extending to all the muscles of the upper and lower extremities, but seldom attacking those of the lower alone.”

The contracture is not accompanied by fever, may be sporadic or epidemic, idiopathic or sympathetic—*i. e.*, may occur quite independent of other disease or may be set up reflexly.

*Etiology.*—This malady is most frequently met with in young children between the ages of one and two years, and seems to be rather more frequent in boys. It is seldom met with in healthy, but is most frequent in nervous, delicate children and those enfeebled by acute or chronic disease, neglect, or by injudicious feeding. Among exciting causes may be noted intestinal irritation from worms, indigestible food, etc., teething and cold. The latter as an exciting cause has led to a variety of tetany being called rheumatismal tetany, where a red and swollen condition of the joints nearest the affected muscles may be noticed.

*Symptoms.*—A child, the subject of intestinal derangement or suffering from mild rickets, is noticed, perhaps suddenly, to be attacked by a spasm affecting the muscles of both hands, or of all the extremities. This spasm may pass away in a few moments, or may last for days, or even eight or ten weeks. Generally the first spasms are very slight and may escape notice until severe contracture compels attention. The child may be restless and appear to suffer pain, or may not apparently be the

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\* Read before the Montreal Clinical Society, June 3rd, 1893.



subject of any inconvenience whatever. The spasm causes the hands to be flexed at the wrist, the thumbs strongly adducted, the fingers approximated and flexed, all four being pressed against the thumb, causing the whole hand to assume a cone shape. Occasionally the thumbs may be flexed upon the palms and the fingers strongly flexed upon them. The feet are usually extended, the toes strongly flexed. The muscles of the calves and forearms are very tense and well defined. There may be œdema of the dorsal surface of both hands and feet; swelling and redness of ankles and wrists may be noticed; a condition of ecchymosis of the extremities has been recorded in several instances. Spasm of the muscles of thighs and even of the trunk and face have been recorded. The condition is usually bilateral, the same group of muscles on both sides of the body being affected. In severe cases the spasm may not relax during sleep. The patient is frequently the subject of laryngismus stridulus. The reflexes are usually exaggerated, and in these cases a spasm of orbicularis palpebrarum, levator palpebrarum, and levator angulorum can readily be induced by tapping the cheek just in front of the epitragus. This reflex is often present in subjects of laryngismus and frequently persists in cases of tetany long after the contractures have ceased.

*Diagnosis.*—The diagnosis is, as a rule, not difficult. The spasms are found to occur in cases where nutrition is impaired from gastro-intestinal derangement or recent acute disease. The child may be the subject of rickets and has perhaps suffered from other forms of nervous derangement. The spasms are bi-lateral and symmetrical; there is no elevation of temperature, and the pulse rate is not as a rule increased; the mental condition of the child is unaffected.

*Nature.*—The nature of the malady is the subject of conjecture. Banchut considers the condition to be a congestive neurosis, entailing a hyperæmia of the brain and cord. He bases his opinion on two cases he had the opportunity of examining post-mortem, and on the ophthalmoscopic examination of several cases, in all of which he observed the choroid to be deeply injected. Barthey et Sausiè consider it to be of a con-

vulsive nature and designate the condition "Convulsion externe tonique." The nervous irritability of the child is increased; this effects a disturbance in the circulation in the brain and cord, which leads to an explosion of nervous force in the form of spasmodic contracture of these groups of muscles. The difference, according to these observers, between laryngismus stridulus, tetany and general convulsions is only one of degree. The congestion may be caused either by reflex irritation, as worms, undigested food, or by central irritation due to blood changes (cold, poisons, etc.)

*Prognosis.*—Tetany is merely a symptom. The prognosis must be founded on the condition of the child and its response to treatment and proper feeding.

*Treatment.*—The action of the bowels must be carefully regulated; feeding and other hygienic measures attended to; rickets, if present, calls for treatment; any source of irritation should be removed; the gums should be examined and lanced, if necessary. The general impression is that little benefit is to be derived from the administration of bromide of potash or chloral.

Good feeding, cod-liver oil, cream, iron and phosphates are strongly indicated. Calabar bean in doses of from  $\frac{1}{32}$  to  $\frac{1}{8}$  of grain t.i.d. has been recommended.

CASE I.—Topsy, female colored child, aged 17 months, suffering from a spasmodic contraction of both hands and feet. Patient was born after an easy labour, no instruments having been applied. Breast-fed for six months, the mother being a healthy young mulatto. On weaning, milk and water was tried, but without success. Lactated food gave no better results, but Dyer's food seemed to agree with the child, and on this it was fed till I saw it.

On my attention being called to the child I found it to be small for its age, rather thin, sitting all collapsed, as though weak and unable to hold its head up. Skin cool, head moist, great deal of saliva flowing from the child's mouth. Mucous membranes pale, six teeth through, tongue coated with white fur. Some enlargement at end of long bones; thoracic beading and

transverse groove marked ; abdomen distended ; muscles generally flabby, and articulations very lax. The hands and feet were in a state of spasm, thumbs being strongly adducted, the fingers all approximated to the terminal phalanxes of the thumbs and slightly flexed, as was also the whole hand. The feet were extended and the toes strongly flexed ; dorsal surfaces of both hands and feet œdematous ; muscles of calves and forearms very hard. Child does not like to be disturbed, but suffers no pain apparently. Temperature, pulse and respirations normal.

Examination of lungs reveals presence of few loose rales. Heart's sounds are normal ; spleen not defined ; motions are somewhat frequent and are undigested ; head rather square ; facial reflex present ; patellar reflex exaggerated. No history, convulsions or laryngismus ; no evidence of syphilis. The hands remained more or less in this condition for ten days and then gradually relaxed.

*Treatment.*—Milk diet with cream ; cod-liver oil inunctions ; lactopeptine with phosphates of iron and quinine. The child rapidly gained in weight and strength.

CASE II.—Female white child, aged 10 months ; breast-fed from birth ; mother large, well nourished woman who has had five children, all dying in infancy of convulsions. Mother having had a suspicious looking rash on her arms, hands and chest, was treated with proto. iod. pills, which caused the rash to disappear.

Child has been noticed to be failing lately, motions being curdy and greenish in colour. Child is flabby and pale, very irritable. Facial reflex not present ; no laryngeal spasms ; no evidences of syphilis beyond tendency to snuffle. Hands and feet both in state of spasm, a condition which lasted for five days, being more marked on occasions.

*Treatment.*—Bowels cleared out with castor oil ; ordered child to be fed on peptonized milk during the day and only to be nursed twice during the night. Pot. bron. gr. v, b.i.d. for four days. Ten days later the child's general condition had improved and there were no evidences of spasm.

## EXTRACTS FROM THE TWENTY-THIRD ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF MASSACHUSETTS.

As the contents of this volume are of so much importance and public interest, we reprint extracts from it bearing on the questions of the effect of aeration on water and the disposal of sewage by filtration. The experiments have been very extensive and complete, so that the conclusions drawn may be accepted. We have omitted all the tabular matter, and only give an outline of the experiments, with the results obtained.

### THE EFFECT OF THE AERATION OF NATURAL WATERS.

It is a very common belief that water deprived of air will deteriorate in quality and become unfit for use, and that the only way to maintain its purity is to keep it freely exposed to the air. The mountain stream which breaks over rocks and stones is thought to be a good illustration of the intimate connection between the aeration of water and its purity.

On the other hand, it is not generally known that the waters of many deep wells which we prize for their high purity, their clearness, coolness and good taste, contain no air, and have been preserved in this condition in the earth, for aught we know, for centuries. There is clearly a need of a clarification of our ideas on this subject.

Pure water, preserved from contact with organic matter, remains unchanged indefinitely. If exposed to the air it dissolves a definite amount of the gases of which the air is composed—nitrogen, oxygen and carbonic acid,—the amount dissolved being dependent upon temperature and pressure. If the pressure is removed, or if the water is boiled, the gases escape, to be reabsorbed when the water is exposed to the air again at ordinary temperatures; but in no sense does the air exert any preservative action on the water or tend to keep it “fresh” or “sweet.”

The condition of affairs is, however, entirely changed when water contains organic matter which is capable of undergoing decomposition. The familiar process of the change of organic

into mineral matter by *decomposition* is one of oxidation, and the necessity of the presence of air to carry on this change is well understood. The breaking up of organic matter when oxygen is not present is one of *putrefaction*, the products of which are usually very offensive.

The analogy between the comparatively slow process of oxidation in nature and the destruction of organic matter by combustion has seemed to justify the inference that we can hasten the former as we can the latter by increasing the supply of oxygen. Acting on this assumption, it is not uncommon in waterworks practice to aerate the water by causing it to flow over a series of steps, or by forcing it into the air as a fountain, or by pumping air under pressure into the distribution system. Whatever the method employed for aerating the water, the idea behind it is that the water will be thereby purified by oxidation to a degree beyond that which would take place if the water were exposed to the air on the surface only.

During the past two years numerous experiments have been made in the laboratory of the State Board of Health to test this theory of accelerated oxidation, and all the experiments have given negative results. The question, let it be clearly understood, is not one of supplying oxygen to an impure water, like sewage, which contains no oxygen, but this: Will an impure water, which contains at all times more or less free oxygen in solution, be purified more rapidly by oxidation if the amount of oxygen is increased by spraying the water or by pumping air into it; can the natural process of oxidation be hastened by these means? It is to this question that the experiments give a negative answer. If we look for the cause of this failure to hasten oxidation by increasing the amount of oxygen, we find that it rests in the inherent nature of the process—a process which is only remotely analogous to the chemical process of combustion. In combustion we have the direct chemical combination of carbon and hydrogen with oxygen, and, by varying the supply of oxygen, we can at will make the combustion slow or rapid. The case is entirely different in the oxidation of organic matter in nature. Here we have to do

with the living activity of bacteria, which, in some way not fully understood, causes first the carbon and hydrogen of the organic matter, and then the nitrogen, to combine with oxygen. This process can only be hastened by increasing the number of bacteria, or by providing more favourable conditions for their activity. Thus we know that the temperature at which bacteria are most active differs with different species, but we have no evidence that, provided some free oxygen is present, the activity of the bacteria of decomposition is in the least affected by its amount. Here the analogy of bacterial oxidation and combustion ceases.

The first series of experiments was made to ascertain whether there was any change in the nitrogen compounds in waters under different degrees of aeration, namely:—

1. By exposing water contained in bottles to the air of the room.

2. By drawing a current of air through the water by means of an aspirator.

3. By shaking the water with air in a bottle, in a shaking machine driven by an electric motor, the air being renewed from time to time by removing the stopper from the bottle.

4. By exposing the water to air under a pressure of sixty to seventy-five pounds to the square inch in soda-water siphons.

The variations in the amounts of albuminoid ammonia and the nitrates in these experiments are, in general, too small to have any significance, and fall, in most cases, within the limits of accuracy of the processes used. The loss of free ammonia when the water is aerated is an instance of the driving out of one gas by another. Ammonia cannot be completely removed in this way, but when it is present in considerable amount in a water the effect of aeration by a current of air is very marked. When sewage is thus aerated, a very considerable amount of free ammonia passes out with the air.

In some cases the changes in the amounts of nitrogen compounds are not easy to explain as the result of any particular treatment. The problem is a complex one. On the one hand we have the tendency of the organic nitrogen to pass into

ammonia, and the ammonia to be oxidized to nitrates, and, on the other hand, the influence of vegetable organism in directly assimilating the nitrogen of the ammonia and nitrates. Still, the results, as a whole, show plainly that the aeration of water containing nitrogenous matter and ammonia in considerable amount has no tendency to accelerate the oxidation of the nitrogen.

In the foregoing experiments the nitrogen compounds only were investigated. The oxidation of the carbon of the organic matter represented by the albuminoid ammonia would have as a result the formation of more free ammonia; but, as any inference based on the amount of free ammonia might be complicated by its partial removal by aeration, a series of experiments were made to ascertain directly whether any carbon was oxidized by vigorous aeration. In this series only air under pressure was used, and the evidence of the oxidation of carbon was obtained by the "oxygen consumed" from permanganate, which oxidizes only carbon and hydrogen of organic matter, not nitrogen. Should any considerable oxidation of the carbon take place by the oxygen of the air under pressure, there would be a considerable reduction of the amount of permanganate used, or of the "oxygen consumed."

The next two series of experiments were on the aeration of water under pressure of seventy pounds to the square inch, and on the aeration of sewage diluted with distilled water.

Here, as in the previous series, we find that no more rapid oxidation goes on when the air is under pressure in the water than when the water is exposed to the air at the surface. It may be fairly concluded from the above experiments that oxidation of the elements which go to make up organic matter is a process which cannot be hastened by offering the bacteria, which are the active agents in the process, an excess of oxygen. Their activity is not stimulated in this way.

This is in accord with the interesting investigation of Dr. A. R. Leeds, who examined the water above and below Niagara Falls and found no difference in the free ammonia, albuminoid ammonia and oxygen consumed after this vigorous aeration.

An interesting confirmation of the results of these experiments may also be found in the special report on Sewage Purification (1890), in which (pages 730-734) is given an account of experiments to determine the amount of air necessary for a good purification of the sewage by oxidation in intermittent sand filtration. When the atmosphere in the sand of the filter contained from one to three per cent of free oxygen the oxidation was as complete and rapid as when twenty per cent. (or the full amount in the atmosphere) was present.

Although the strictly chemical theory of oxidation in the aeration of water will have to be abandoned, it does not follow that the practice of aeration is not without good effect. It is a well-known fact that one soluble gas passed in a current through water will drive out other soluble gases which may be present in it, provided there is no chemical combination between the water and gas. The same effect is accomplished by exposing water with any gas in solution to an atmosphere of another gas. Thus when we pass a current of air through water containing sulphuretted hydrogen in solution, the latter is completely driven out, and an offensive water becomes entirely odourless. This is not a case of oxidation, for a current of carbonic acid will effect the same result. In the same way a water which has temporarily a bad odour from an excessive development of algæ, or infusoria, can be rendered quite odourless by sufficient aeration. Even sewage loses its odour when aerated by a current of air for many hours. In these cases the only change effected is the mechanical removal of the soluble gas which is the cause of the odour.

There is another good effect of aeration where it is accompanied by agitation of the water, namely, the prevention of the growth of algæ with their attendant bad tastes and odours. As is well known, it is only in the comparatively quiet waters of ponds and reservoirs that this annoyance from excessive development of vegetable growth is met with. Moving waters are free from this trouble. It seems a not unreasonable explanation of the fact that an excessive growth of algæ is sometimes stopped by continuous aeration to attribute it to the agitation of the water.



The most rapid means of aerating water are, first, by pumping air into it under pressure, the excess of air escaping when the pressure is removed ; second, by breaking it into spray by providing a series of falls, or by means of a fountain jet, or, third, by a fall in a pipe of similar construction to an injector. But these violent methods of supplying oxygen are not necessary if there is circulation in the water of a pond or reservoir whereby all the water in turn is exposed on the surface to the atmosphere.

On the advent of warm weather in the spring of the year, the water of any pools over twenty feet deep may become stagnant at the bottom, and if the water contains decomposable organic matter the oxygen in solution is soon consumed, and no more can be obtained from the atmosphere. Under these conditions, this stagnant layer becomes very foul from putrefaction.

But the water in the stagnant layer does not become foul unless there is decomposable organic matter present. Thus, in Basin 4 of the Boston Water Works, which was carefully prepared for the reception of the water by the removal of all soil and vegetable matter, and is supplied with a brown swampy water from a watershed almost entirely free from population, the water is good at a depth of forty feet, because the water contains very little organic matter with a tendency to decomposition.

The water is *permanently* stagnant during the summer months only below a depth of about twenty feet, because it is turned over by strong winds to this depth in ponds of 100 to 200 acres area. But water may be temporarily stagnant at a less depth in the absence of strong winds. In some ponds we have found oxygen to be absent at the depth of ten feet, and the water to contain much free ammonia and other products of decomposition which were absent in the layers nearer the surface.

In cases where it would be possible to bring about a circulation of an entire body of water during the warmer months, so that the lower layers would be brought to the surface and stagnation prevented, we would have effective aeration of the water

with the prevention of the accumulation of products of decomposition.

In the case of ground water, it is now well understood that the more directly from the ground it is supplied to the consumer the more acceptable it is. It needs no aeration. In fact, its storage in open reservoirs results often in the conversion of a cool, clear, palatable water into one which is repulsive to sight, smell and taste.

There is, however, one class of ground waters, not unfrequently met with, which are only fit to use after they have been exposed to the air, namely, waters which contain considerable iron in solution in the form of protoxide. These waters deposit iron oxide on standing, owing to their absorption of oxygen from the air. Aeration in connection with settling basins or filter beds might make waters of this class available for general use.

To resume :—

1. The oxidation of organic matter in water is not hastened by vigorous agitation with air or by air under pressure.

2. The aeration of water may serve a useful purpose, by preventing stagnation, by preventing the excessive growth of algæ, by removing from water disagreeable gases, and by the oxidation of iron in solution.

#### EXPERIMENTS UPON THE PURIFICATION OF SEWAGE.

During the past two years investigations have been continued upon purification by filtration along the same general lines as during the previous two years, but in such a way as to throw additional light upon numerous points of great practical importance. Most of the filters described in the previous report have been continued in use to obtain information as to their permanence, while many others have been started to investigate special points connected with sewage purification and the filtration of water.

Filter Tank No. 1, which is one of the original filters and has been in use four years, has filtered sewage during the past two years, 1890 and 1891, at an average rate of 85,920 gal-

lons per acre daily for every day in that time, and with a removal of 94 per cent. of the organic matters, as shown by the albuminoid ammonia, and 98 per cent. of the bacteria. Filter Tank No. 2, also one of the original filters, has filtered for the same period, at an average rate of 49,360 gallons per acre daily, and has removed 97.5 per cent. of the organic matters and at least 99.99 per cent. of the bacteria of the applied sewage. With many other filters correspondingly good results have been obtained.

Regarding the purity of the effluents obtained by intermittent filtration, it will suffice to say in this connection that there is no other method of sewage purification which yields results at all comparable to those obtained by intermittent filtration under favorable conditions.

One of the most important results of the past two years' work is the fact that, by systematically breaking the scum which forms on the surface of filters, a very much larger quantity of sewage can be purified without any deterioration in the quality of the effluent.

We had found that different materials require different treatments for the best results; that a system of applying sewage best adapted to a fine material fails to yield the best results when applied to a coarse sand, and *vice versa*. By studying the performance of our different filters under various conditions, in connection with the mechanical composition of their materials, we have discovered many of the causes of these differences, and have secured data which will enable us to determine, in advance, the general line of treatment required by different sands. In a similar way we can form an approximate estimate of the quantity of sewage which can be successfully applied to various materials under known conditions. The reader should bear in mind that the results given in this paper were obtained at the Experiment Station, where all of the work is under scientific supervision, and the sewage is applied to small areas with uniformity and in definitely measured doses. In applying these results to actual work on the large scale, some allowance may have to be made for less favourable conditions.

We have continued the study of the effect of winter weather upon filtration, and have found that even with unprotected filters good results are possible in our climate. The effluents obtained in winter, while less perfect than those of the warmer months, were still good—much better than could be obtained by other processes; as, for instance, chemical precipitation.

An excessive quantity of acid in the sewage prevents satisfactory purification, but our experiments have shown that if, for the treatment of such sewage, a filter containing limestone is employed, the acid is neutralized, and a good result is obtained. This is a most important demonstration, as it assures the successful use of sewage filters, regardless of possible acidity of sewage. If the sewage is only occasionally acid, it will cause no trouble with ordinary filters, but if it upon trial proves to be so strongly and continuously acid as to prevent satisfactory purification, the addition of limestone to the upper layers can be depended upon to correct the acidity, and to insure as good a result as could otherwise be obtained from normal sewage.

The permanency of filters has also been made the subject of special study. The leading fact of intermittent filtration is that the organic matters of the sewage are destroyed instead of being stored in the filter, as is largely the case with other methods of filtration; and it seemed probable, from the available data at the time of writing the special report upon the Purification of Sewage and Water, that there would be no continued accumulation of matter in the filter. Further study has shown, however, that the conditions which allow the purification of the maximum volume of sewage with the best results are such that a small percentage of the more stable organic matters of the sewage resist the oxidizing action of the filter, and accumulate in its upper layers, until after a time the surface may become choked to such an extent that it will remain saturated with water, thereby excluding the air. This can be remedied temporarily by turning the surface under, but it does not seem probable that continued inversion of the upper layers will allow the indefinite use of the same material while still

maintaining the application of the maximum quantity of sewage. With lower rates of filtration the storage may be less in proportion to the amount of sewage, and, in any case, the replacing with fresh material of a moderate amount of the upper layers of sand from time to time will ensure the permanency of the filter. It is quite possible that the removed sand, when taken entirely away from the filter, will in time so far regain its original properties as to again allow its advantageous use as filtering material. We are giving much attention to methods for hastening this renovation.

The purification of sewage by intermittent filtration depends upon oxygen and time; all other conditions are secondary. Temperature has only a minor influence; the organisms necessary for purification are sure to establish themselves in a filter before it has been long in use. Imperfect purification for any considerable period can invariably be traced either to a lack of oxygen in the pores of the filter, or to the sewage passing so quickly through that there is not sufficient time for the oxidation processes to take place. Any treatment which keeps all particles of sewage distributed over the surface of sand particles, in contact with an excess of air for a sufficient time, is sure to give a well-oxidized effluent, and the power of any material to purify sewage depends almost entirely upon its ability to hold the sewage in contact with air. It must hold both sewage and air in sufficient amounts. Both of these qualities depend upon the physical characteristics of the material. The ability of a sand to purify sewage, and also the treatment required for the best results, bear a very close relation to its mechanical composition. It is our present purpose to more definitely formulate the results obtained with a view to predict the action of any material from its mechanical composition.

Each of the materials used has been made the subject of special study to determine the most advantageous method of applying sewage. With the coarser materials the amount of sewage which can be applied at one time is limited by the slight retentive capacity of the sand; if too large a quantity is added at once a portion of the sewage will pass through the filter in

too short a time for complete oxidation. It is evident that the dose should not exceed the water capacity of the material,—because if it should a portion would pass through at once after having forced out the water previously held. It has been shown in the special report upon Purification of Sewage and Water that even an equivalent of the water capacity is too large a quantity to apply at once, for some of the sewage passes by the water previously held, which is mainly contained in the finer pores, while the larger open spaces offer a free passage to the freshly applied sewage. In the case of No. 1 sand, with a dose equal to two-thirds of the water capacity of the filter, a very considerable quantity of sewage passed unoxidized; with smaller doses, amounting to less than one-fourth of the water capacity; but applied so frequently that the total daily dose was even larger than before, a much better effluent was obtained. With the very coarse material, No. 16, the size of the dose which can be applied at once is very much smaller, even when compared with its smaller water capacity, some experiments having shown that with a dose of less than three per cent. of the water capacity a measurable, although a very small, amount of freshly applied sewage reached the outlet within ten minutes. With the finer, No. 6, sand there is no trouble from sewage passing too quickly when the dose equals one half the water capacity, or even somewhat more than half.

With the finer materials, the dose might be an even greater fraction of the greater water capacity, were it not for the limited air supply. It may be said, in a general way, that sewage requires its volume of air for its oxidation; and there is great danger that so much sewage may be got into the filter at once that the air present in the sand will prove inadequate for its purification. With No. 2 sand five feet deep and comparatively clean, a dose five inches deep over the surface has been applied three times a week without overtaxing the air; No. 4 has taken half as much with good results; while with the soil, No. 5, any practicable quantity is an overdose.

The amount of sewage which can be applied in a single dose does not, however, give any indication of the amount of sewage

which can be purified in a given time. With the fine materials the sewage enters the sand slowly, and time must be allowed for this slow process, and afterwards for the water to drain out at the bottom, drawing in at the same time fresh air from the top to purify the next portion of sewage to be applied. Two or three days must be allowed for this to take place in sands as fine as Nos. 2 and 4, and probably a longer time might be advantageous under some conditions. With the coarser sands the draining and renewal of air is more rapid, and applications may follow each other at shorter intervals without danger of exhausting the air.

One effect of passing large volumes of sewage through clean sand is to increase the amount of organic matters held by the sand. This organic matter forms a sticky coating on the sand grains, as has already been noticed, and greatly increases the capillary attraction and water capacity, while the air space is correspondingly decreased. A most striking illustration of this is furnished by No. 1 sand in Filter 14. When the sand was new and quite clean, it retained only eight per cent. of water, but after three years of constant heavy dosing with sewage, every grain of sand in the upper portion of the filter was covered with a slimy coating, which, keeping itself moist, increased the water capacity of the entire filter to fourteen per cent., or nearly double the original amount.

With coarse materials, where the amount of sewage which can be applied at one time is limited by the water capacity, and a large excess of air is always present, this increase in the amount of water held has a beneficial effect, and the sand, after filtering sewage for a time, is capable of doing more and better work than at the beginning. With fine materials, on the other hand, where the amount of sewage which can be applied is limited by the air in the material, no such improvement with age is observed. The reduction of air space, especially near the surface, where the storage of organic matter is greatest, retards the passage of sewage, and to an even greater extent the exchange of air, with the result that doses must be smaller, or else applied at longer intervals.

As the sand becomes choked in its upper layers, the ventilation of the filter becomes of vital importance. The ridging of the surface of some of the filters was an attempt to secure better ventilation. It was hoped that as sewage passed down through the trenches, exhausted air would be driven up through the ridges, to be replaced by fresh air, as the filter drained. With Filters Nos. 2 and 9 no definite improvement followed the ridging. Filter No. 1 gave a better result after the change, but it is open to question whether this resulted from the ridges in themselves or from the reaching of cleaner sand by digging the trenches. In the latter case, the result might simply indicate that one-half the surface clean allowed better ventilation than the whole surface clogged. We have, then, no results which show any clear advantage from the use of trenches over flat surfaces, as far as ventilation is concerned.

Ventilation can often be increased by applying larger doses at longer intervals. A large dose of sewage makes a great disturbance of the air in a filter, and, within certain limits, changes more air in proportion to its own volume than a smaller dose. The application of volumes of sewage in excess of the water limit in coarse materials causes a great increase in the number of bacteria in the effluent, but it may improve the chemical analysis when there is a lack of air, and so might be justified where there was no possibility of the effluent finding its way into drinking water.

The removal of bacteria has a close relation to the size of the material. With the fine materials, Nos. 2, 4 and 5, there is reason to believe that no bacteria are able to pass from top to bottom of the filters; with the coarser No. 9 sand, if any pass, the number is ordinarily extremely small, certainly as low as one in a hundred thousand of those applied. The coarser sands, Nos. 1 and 6, allow the passage of considerable numbers, especially with doses in excess of the water limit, and with the coarse gravels bacteria come through freely and in large numbers, the percentage depending upon the condition of the filter and the size of the dose.

During the first winter, 1887-88, the various filters were



exposed to the weather without protection, and no nitrification was obtained until the temperature began to rise in spring. The result might have been different if the filters had been nitrifying well before cold weather. During the two following winters the filters were protected from snow, and to a certain extent from cold, by canvas covers. It was found that when the filters were so protected, almost, if not quite, as good results were obtained in the winter as during the warmer months, and it was established, as stated in the special report upon Purification of Sewage and Water (pages 29 and 255); that intermittent filtration is entirely practicable in this climate, if snow is kept from the filtering area.

We had no satisfactory information, however, as to what results could be obtained from unprotected filters. Accordingly, in the winter of 1890-91 the out-door filters were left exposed to the weather. Filters 1, 2, 4 and 6 were receiving from 34,000 to 103,000 gallons of sewage per acre daily, and were free from complications, so that they furnish the best data in regard to frost. All the other filters with exposed surfaces were so complicated by other circumstances that the results obtained with them cannot fairly be considered in this connection.

When sand is frozen solidly after drainage, there still remain open pores through which the sewage easily finds its way, thawing to some extent the frost as it proceeds. After the sewage has drained away, the portion which remains in the sand again freezes, but open pores are still left, which allow the passage of the next portion of sewage. If, however, the sewage settles away very slowly, it will freeze before the sand drains, and in this case no pores are left, and the next application of sewage will remain upon the surface and freeze solidly, if the weather is cold enough. If snow is upon the surface of the sand and sewage is applied uniformly to it, it is at once chilled to the freezing point, and has then no power of thawing the frost in the upper layers of sand, and if the weather is cold the whole will solidify on the surface, effectually closing the filter. The two essential conditions to the passage of sewage through the filters in winter are that sewage shall never be put

into snow, and that the filtering material shall be open enough to absorb its dose rapidly.

Sewage was applied uniformly at a temperature of from 44° to 46°, or the average sewage temperature in winter. The sewage which comes to the station is chilled by passing through the Merrimack River in an iron pipe, and is afterwards warmed to its original temperature by hot-water pipes passing through the measuring basins. All the snow was promptly removed from the filters by shovels. Each week the surface was disturbed; if the sand became sufficiently thawed at any time when it was not sewage covered, it was then raked. When there was no such opportunity for raking, the surface was disturbed with a pick in numerous places.

As soon as frost began to form freely in the various filters a marked change was noticed in the chemical composition of the effluents; the free ammonia increased, and soon the nitrates decreased. The organic matters, as shown by the albuminoid ammonia and by the oxygen consumed from permanganate, also increased, but not to an extent corresponding with the free ammonia. During the colder months nitrification was much checked: ammonia, instead of nitrates, was largely the end product of oxidation, as far as nitrogen was concerned. The first stage of purification, namely, the oxidation to ammonia and carbonic acid, was not affected to the same extent.

During the colder months of the year there was a period with each filter of about three months, during which purification was much less complete than at higher temperatures. The time of this period varied in the different cases: the coarse materials were the first to suffer; the finer sands were not so soon affected, but the period was as long, extending into warmer weather. With No. 1 a marked improvement occurred while the temperature of the effluent was still decreasing.

In filter No. 17 A a little limestone was mixed with the upper layers of the filtering material, and sewage which was made strongly acid was regularly applied for over a year. The effluent showed as good a purification and nitrification as when normal sewage was filtered, under similar conditions, through

sand without limestone. We have thus a cheap and effective remedy for any complication due to acidity of sewage. If the sewage is only occasionally acid, or if the filtering material contains available base, the acid will not injuriously affect the result. If, however, the filtering material contains no lime, and the sewage is so constantly and strongly acid as to interfere with the result, a little limestone, put upon the surface or dug into the upper layers of the filter, will completely overcome the effect of the acid.

Some of our filters have been in continuous use, without change of material, for four years, and are still capable of doing good work. As has been frequently intimated on the preceding pages, there has been an accumulation of organic matters in these filters. We have already seen some of the effects of this accumulation in making the sands act as if they were finer than when clean, increasing the water capacity and decreasing the air space, thus within certain limits increasing the effectiveness of coarse materials, but not improving the finer sands.

The constancy of the percentages of storage of insoluble nitrogenous matters is remarkable. Taking the final results, the highest are not twice as great as the lowest, and with seven filters out of nine the percentages are between 66 and 80. This can only be interpreted as showing that there are substances in sewage so staple as to resist, for a very long time at least, the oxidizing action of the filters.

We have not as yet obtained a permanent condition of equilibrium with no further increase in storage. On the contrary, the organic matters have been steadily increasing, and at a rate approximately equal to 70 per cent. of the insoluble matters applied. The accumulation has proceeded so far in some of our filters as to seriously cripple them. To secure as good results in the future as in the past some remedy must be applied. Two alternatives suggest themselves: the clogged upper layers can be turned under to a considerable depth, or they can be removed. If upon turning the surface under, its organic matters become oxidized in time so that it will again serve for a surface layer, then turning under is the better policy; otherwise removal is the better way.

This point was discussed in the report upon the Purification of Sewage and Water. It was there shown that the organic matters were accumulating at the surface and decreasing elsewhere, and it was thought that this indicated a stronger oxidizing action beneath the surface. Another explanation is that the matters near the surface were those suspended in the sewage and that those stored below were the more soluble and decomposable matters of the sewage; that it was the difference in character, and not in position which determined their oxidation. This view is supported by the fact that when the surface was raked and spaded under, these matters instead of disappearing steadily increased, as more sewage was applied.

Some results on this point have also been obtained with Filter No. 14. On July 29, 1891, the upper foot of material in this tank was inverted. Excellent results followed, and after three months the albuminoid ammonia was reduced in the second six inches, that is, in the old surface, from 50 to 29 parts per 100,000. At the same time there was an increase nearer the surface almost equal to the suspended matter of the applied sewage, and also in the material below the first foot. This last amounted to more than half as much in total weight as the decrease in the old surface layer. After making the inversion, the downward flow of sewage was very rapid after flooding; and it is probable that this organic matter was carried down mechanically by the rapid current. The total reduction of albuminoid ammonia below the upper six inches was comparatively small.

The fact of continually increasing storage in the large outdoor filters is sufficient evidence that they do not afford conditions favourable to the oxidation of this material. On them we have applied as much sewage as was possible with good results, and much more than is usually applied in practice. In a majority of cases—always with the fine materials, and often with the coarser ones,—this has meant as much sewage as could be oxidized by the air in the filter. All the air available has been required to oxidize the more decomposable matters; the stable insoluble matter, we believe, can only receive the attention of

the bacteria when there is an excess of air. Filters do their maximum work when the volume of sewage applied is so large that there is no considerable excess of air; when the supply exactly meets the present demand, oxidizing only the less stable matters and preventing their passage into the effluent. There may also be a question as to whether the bacteria will do their best work upon this insoluble matter while they are receiving a daily dose of fresh sewage, with its rich supply of food for them.

If the fresh sewage were entirely cut off would not the bacteria turn their attention to the sludge? If the upper layer were removed entirely and piled up by itself, would it not purify itself much more rapidly than anywhere in a filter where it is continually wet with new sewage? If this clogged material is removed the filters will be able to continue doing the large amount of good work which they have done in the past; they may do even more in some cases. The removed material may so purify itself in time as to again allow its advantageous use for filtration, but, if not, fresh sand must eventually be supplied. In actual practice with ample areas of filtering material a simple way of applying these ideas would be to abandon for a time an old area, after it had become clogged, without removal of the surface. How long a time would be required for such an area to regain its power of purification, and what treatments would hasten the result, are subjects for further research.

It may be queried whether piling up sand containing large amounts of organic matter stored from the sewage will not create a nuisance. To this we can answer no. The stored matters are the most stable portions of the sewage; they have resisted strong oxidizing action, and are incapable of rapid or objectionable decomposition. The matters which would have caused trouble had they been stored are just the ones which have been oxidized. The material should be so placed that a change of air in its pores will be possible, and no offence need be anticipated.

Filter No. 6 in four years' use has filtered 310,000 gallons of sewage, the equivalent of 62,000,000 gallons per acre. The upper  $2\frac{1}{2}$  inches of material now contain about 70 quarts per

100,000 by weight of albuminoid ammonia, and the next 3 inches about 20 parts. To fully restore the filter to good working order we should remove the upper  $2\frac{1}{2}$  inches or 1.68 cubic yards for the filter, or 5.4 yards per million gallons of sewage treated. In July, 1891, when Filter No. 1 commenced to be seriously clogged, the layer with excessive organic matters was not more than 3 inches deep, although more than 400,000 gallons of sewage (80,000,000 gallons per acre) had passed. In this case the removal of two yards, or at the rate of 5 yards per million gallons of sewage treated, would have sufficed. In June, 1891, the surface of Filter No. 2 was clogged not more than two inches deep after filtering 230,000 gallons (46,000,000 gallons per acre), corresponding to 5.8 yards per million gallons. The sand below this upper layer contains some stored matter, which would be carried forward to the next account, and might eventually raise the amount of sand to be removed to eight or even ten yards per million gallons. On the other hand, so far as this sand regains its power of purifying sewage this amount will be reduced. If the sewage contained more or less suspended matter, correspondingly more or less new sand would be required, and if the suspended matter was first removed from the sewage by settling, we may believe that the amount of sand to be removed would be very small. Experiments are now in progress to determine this point.

The following case quoted in the report, is of interest as affording an illustration of probable infection through the domestic water supply:

The Board was requested to investigate certain cases of typhoid fever which occurred in great Barrington in the fall of 1891. In August 1891, a case occurred in the family of Mr. Hirsch, living near the village, in which one death occurred. It appeared that a drain leading from the kitchen sink past the well used by the family had been broken, allowing the discharge from the sink to soak into the soil near the well with the probability of polluting the water. Other cases not fatal were said to have followed in the same family. The Board of Health requested the family to discontinue the use of the water of this

well, and they complied, and soon moved out of the house. The sink drain was repaired very soon afterward, and while it was being repaired a boy from a neighbouring family came and played about the drain; whether he drank of the water of the well could not be learned. This lad was taken ill with typhoid fever September 7, and died October 18. His illness was followed by five other cases in the same family, the disease having a continuous run in this family of three months. The persons attacked were the mother, four sons and a daughter aged six. Of these six, four died. In this house there was no drainage whatever. The kitchen sink had no outlet, and all sink water, as well as some of the excreta of the sick, were thrown out upon the ground about the well. The privy vault was situated across the yard, at a distance of about seventy-five to one hundred feet from the house, and a cow stable was somewhat nearer.

The water supply of this household was obtained from two sources—from a cistern which was supplied from the roof, and from a well situated just outside the kitchen door. Both were provided with chain pumps. The well was mainly for drinking water.

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### Reviews and Notices of Books.

#### Manual on the Proper Mode of Extracting Teeth.

By JOHN GORHAM, M.R.C.S. London: H. K. Lewis.

The fourth edition of the above manual is most applicable to the dental student, as it denotes the names of the teeth, improved instruments used, and the mode of manipulating the modern forceps of to-day. This little volume of well arranged terms appertaining to dental extraction gives the student a practical idea in a condensed method of the art of extracting teeth, names of the different forceps, way of adjusting same, and rules to guide the operator in their uses. The author also shows plates of upper and lower dentition, the ages of the deciduous and permanent eruptions, which is most important in dental surgery, aids for extractions by means of anaesthetics, recommending those universally used, both locally and internally, and lastly shows cuts of forceps.

The views of the author are certainly very practicable and of long experience, and we commend Professor Gorham's tooth extraction to the English-speaking dentists as an easy means of acquiring the best that is known of the subject under consideration, so far as dental surgery is concerned. The work will be valuable as an educator, not only on account of the matter it contains, but because of its simplicity and the clearness with which the author presents the subject to the student.

**The Indian Medico-Chirurgical Review.** A Monthly Journal and Review of Indian and Foreign Medicine and the Allied Sciences. Edited by N. H. CHOKSY, M.D. Bombay: N. K. Rad & Co. London: Bailliére, Tindall & Cox.

This is a new journal, started at the beginning of this year, and devoted to medicine and surgery as practised in India. The present number, the sixth, contains: Original Articles—The Three Bombay Censuses, by M. B. Colah, M.D.; On the Nature of Leprosy, B. H. Nanavatty, L.M.S.; An Abstract of the Leprosy Commission Report (continued); Clinical Memorandum; Reviews and Notices of Books; Editorials and Leading Articles; Progress of Medical Science; Medical News and Notes. It is the only medical journal in that part of India, and judging from the copy which we have received, it should have a useful and extended career before it.

**Nursing: Its Principles and Practice for Hospital and Private Use.** By Isabel Adams Hampton, Graduate of the New York Training School for Nurses attached to Bellevue Hospital; Superintendent of Nurses and Principal of the Training School for Nurses, Johns Hopkins Hospital, etc. Illustrated. Price \$2. Philadelphia: W. B. Saunders. 1893.

The first chapters of this book are devoted to the discussion of the details of the organization and management of training schools and hospitals. An outline of the course of lectures and demonstrations is given for the two years' course. A section is devoted to hospital etiquette, which is admirably defined as consisting of "nothing more than the continual and systematic observance of every-day courtesies." Instructions are given regarding ward supplies and the care of the ward



and its furnishings, how to make up the beds and prepare them for special cases, and how to lift and move patients. Chapters are devoted to hygiene, disinfection and notes on bacteriology, as well as many other subjects of interest and importance to a nurse. We are pleased to note a chapter on the administration of anaesthetics, a subject which it is well for a nurse to know something about, although not as a rule coming within her province.

This manual will prove very useful as a text-book and book of reference for nurses, and, indeed, the general practitioner will find much in it to repay the time spent in its perusal, as it gives a good account of what the duties of a nurse are, and how these duties should be performed.

**Disease in Children**, a Manual for Students and Practitioners. By JAMES CARMICHAEL, M.D., F.R.C.P., Edin.; Physician Royal Hospital for Sick Children; University Lecturer on Disease in Children, Edinburgh. Illustrated with thirty-one charts. Price \$3. New York: D. Appleton & Co. Montreal: Wm. Foster Brown & Co., 233 St. James street.

This manual gives a concise account of the clinical features of the more common diseases met with in children. As the author says, "It is not strictly correct to talk of diseases of children, as we would of women who suffer from ailments particularly their own. Disease in children must be studied exactly on the same lines and by the same methods as disease in adults." Hence, before beginning a study of this subject it is necessary to have a knowledge of general medicine and the diseases of adult life. The author, working on these lines, has produced a most useful manual, embodying his own experience both in public and private practice.

It would be an improvement if the prescriptions were written out in single doses, and also if it were more definitely stated what ages the prescriptions are intended for. Appendicitis as a cause of peritonitis is just mentioned, but by no means receives the attention that it deserves, and in the treatment of diphtheria, peroxide of hydrogen is omitted from the list of local applications.

However, it is an excellent text-book, and we trust the author will pardon us for pointing out these oversights.

*Society Proceedings.*

## THE MONTREAL MEDICO-CHIRURGICAL SOCIETY.

*Stated Meeting, March 31st, 1893.*

JAMES STEWART, M.D., PRESIDENT, IN THE CHAIR.

*Enchondroma of the Mammary Gland in a Bitch.*—Dr. ADAMI brought before the Society a case of this condition on account of its rarity. Enchondroma has been very occasionally reported as occurring in the female, perhaps more frequently in the domestic animals. The present specimen, a bullet-like growth  $2\frac{1}{2}$  inches in diameter, was obtained from a setter bitch, having been removed by Mr. Hart, one of our students, in conjunction with Mr. Tracey, veterinary student. The growth would seem to be of less than a year's duration, and to have originated after a rather severe mammitis. The bitch had a litter of puppies in February, 1892. There was some difficulty about the weaning and one of the teats became injured and inflamed. The bitch recovered, but in the autumn a small lump was observed in the previously injured teat. It was removed at the beginning of last month.

The structure of this tumour is typical, it is slightly lobulated, and the centre is of bony hardness. Sections showed the lobules towards the periphery to be of hyaline cartilage, with some regions presenting stellate cells and less dense matrix; they were separated by bands of fibrous tissue. Deeper down the matrix became impregnated with calcareous salts, but even at the centre there was not true bone. There were large channels in which ran the blood vessels surrounded by loose cellular structure, but the surrounding osteoid framework possessed neither proper Haversian canals or true lamellæ. Langlois, in the *Dictionnaire des Sciences Médicales*, gives a good account of these mammary enchondromata.

*Papillomatous Outgrowth of the Lower End of the Ileum.*—Dr. ADAMI exhibited for Dr. Wyatt Johnston the lowest three inches of the ileum presenting the above condition. Several tubercular ulcers had been found higher up in the ileum, but this last portion was quite free and exhibited numerous delicate papillary prolongations, the longest from  $\frac{1}{2}$  to  $\frac{2}{3}$  of an inch in length. There was no sign of surrounding inflammation, and

they differed both in appearance and structure from the larger coarser papillomata which not infrequently are found in the neighbourhood of ulcers. These are beset by villi and in structure most nearly resemble the hypertrophied projecting, solitary glands which are occasionally met with, but if this be their nature their length and delicate finger-like appearance distinguishes them from the specimens usually encountered in museums.

Dr. WYATT JOHNSTON said that this very unusual specimen was obtained from a patient who had died from taking Paris green. At the autopsy there was found severe tuberculosis of the intestines, with but little elsewhere. In the lungs there were two tuberculous foci, each about the size of an almond, and were composed entirely of little, grey miliary tubercles; there were also signs of old cicatrices in the apex of one lung. The case appeared to present the unusual conditions of primary intestinal tuberculosis, there being extensive ulceration of the cæcum and ascending colon.

The case is of interest from a medico-legal point of view, as to the possible interpretation that might be put on these ulcerations in view of the history of poisoning by arsenic. In regarding them from the side of the mucous membrane it would be difficult to say positively that they were tubercular; but in viewing them from the serous coat inwards their tubercular nature becomes quite evident. The polypoid nature of the growths is very interesting. They usually grow in the large bowel, and when they occur in the small intestine they are usually in connection with leukæmia. The little projections contain lymphoid follicles arising from the lymphatic tissue of the submucosa.

Dr. LAPHORNS SMITH said that for the purpose of comparison with Dr. Johnston's specimen he had brought one shown by himself some meetings back. They are papillæ obtained from a papillomatous disease of the large intestine about the region of the sigmoid flexure. Dr. Adami, at the time, made a microscopical examination of these shreds and pronounced the growth benign, to the great relief of the patient. They resemble Dr. Johnston's specimen to the naked eye.

Dr. WESLEY MILLS, referring to the specimen taken from the bitch, said that enchondromata are rather unusual, al-

though tumours of the mammary glands are quite common and tend to become malignant. By far the most remarkable tumour that he had ever seen in connection with the mammary gland was a cyst containing a large worm, some five or six inches long. This position for such a parasite was one of the most remarkable cases he had ever heard of. The bitch belonged to him and he had removed the tumour.

Dr. ADAMI hoped that Dr. Smith would not express too sanguine opinions with reference to the non-malignity of the intestinal growth submitted to him for examination some time ago. While from the appearance of the tissue examined it was undoubtedly benign, it is well known that these tumours, although at one time quite benign, may later take on malignant growth. Such growths were of a much coarser nature than Dr. Johnston's specimen.

*Nephrectomy through Abdominal Incision.*—Dr. LAPHORN SMITH exhibited an enormous kidney, and gave the following history of the case: The patient was sent to me with what was supposed to be a large multilocular ovarian cyst. The tumour so completely filled the abdomen as to be immovable. It was movable with the uterus, which was pushed downwards, backwards and to the left by the growth. The tumour seemed to rest on the brim of the pelvis. On the bowels being well emptied I felt pretty sure that this was a tumour, not of the uterus, but of the kidney. I suspected pyelo-nephritis. When I opened the abdomen the tumour at once presented, but with a layer of peritoneum over it. After selecting a spot in the peritoneum where there were no vessels we (Dr. Lockhart assisted me) made an opening and proceeded to dissect the peritoneum off the tumour. On reaching the back we found a large pedicle, which was regularly ligated. We then found the incision too small to deliver the tumour through; the latter was then tapped, when it immediately collapsed and delivery was easily effected. The renal artery was tied, and the kidney removed without any great difficulty. We then washed out the abdominal cavity with boiled water, and inserted a drainage tube at the lowest part. The pedicle was dropped into the cavity. During the operation there was little or no bleeding, and afterwards there escaped from the tube in the first 24 hours about two ounces of blood, when the

discharges rapidly became serous in character. Since the operation the patient has had almost no pain and pulse and temperature have been normal. On opening the kidney it was seen to be sacculated, and in one of the sacs a calculus was found. In regard to the condition of the urine, before the operation it was free from albumen, but very scanty in quantity. The first 24 hours after the operation she only passed 8 ounces, the next 24 hours the quantity had gone up to 20 ounces. No water was allowed to be taken by the mouth after the first 24 hours from operating.

#### DISCUSSION ON TUBERCULOSIS—*Continued.*

Dr. LAPHORN SMITH, in opening the discussion, said that Dr. McEachran's paper was the very thing necessary to rouse the profession to a true way of looking at the matter. The infectious nature of tuberculosis has been more readily accepted by the public than by the profession, and in this respect the profession is not altogether free from blame. The public should have been long ago fully informed of the nature of this disease, for as a result of their ignorance thousands have died from exposure to infection—anæmic girls put into the hospital wards with tuberculous patients; young men in lodging houses occupying the same bed or same room with a chronic consumptive; young girls in boarding schools or convents.

We have so far laid too much stress on the idea that consumption is hereditary, and this is largely due to the habit of insurance companies inquiring into all the branches of the family tree, but it never seems to occur to them that a person may contract consumption by sleeping in the same room with another in the last stage. He had met cases again and again where a perfectly healthy girl contracted consumption in a few months from a tuberculous husband, and cited a case here in Montreal of a young girl who moved into a house in May, in which a consumptive had died in April, and before six months had elapsed she had contracted the disease herself.

The children of consumptives are not more likely to die of consumption than any one else, if they are timely removed from infection. The death rate from tuberculosis among children in the hospitals in Paris, the greatest number of

which are taken from tuberculosis parents, is not greater than that prevailing amongst children elsewhere. This Society has great influence, and if it sends out advice to the public, the advice will be well received. We can stamp out consumption as well as we can stamp out small-pox.

Dr. F. W. CAMPBELL thought that perhaps he was one of those men who have been educated by insurance companies to look upon the transmissibility of this disease from one generation to another as the all important factor. There are sometimes facts which present themselves to a man's observation and which he fails to realize. The facts as regards the contagiousness of tuberculosis, which now seem so plain to our eyes, were no less plain ten years ago, but not having the theoretical knowledge of to-day to work upon, they either remained as stumbling blocks in our path, or were explained on other lines. In connection with tuberculosis, not only as a disease which we may communicate to one another, but also as one which may be contracted from the lower animals, we must remember that our patients should be guarded, not only against exposing themselves with friends who have tuberculosis, but also that the importance of enquiring into the nature of their food supply, especially that of milk and meat, should be duly impressed upon them. We will never reach the bottom of the difficulty until we get a thoroughly honest and scientific investigation of the city milk and food supply. So long as the milk is allowed to be delivered without bacteriological investigation, so long will our efforts be futile; we may isolate, we may carry out antiseptic processes in the treatment of our patients; but so long as the milk and flesh of tuberculous animals is allowed to be used by the public, just so long will we have tuberculosis existing to an enormous extent among the population.

Now, although inheritance is no longer regarded as the sole factor in the etiology of phthisis, it is of unquestionable importance in this respect. There seems to be a great susceptibility of persons, under certain conditions, for the absorption of the tubercular poison. But there is no question as to the advisability of treating the affection as a contagious disease. The absolute necessity of at least partial isolation must be borne in mind. So far as occupying the same bed or the same

room is concerned, so far as having every particle of expectoration disinfected or destroyed, the principles of antiseptics must be rigidly applied. The patient should be required to spit into cloths or a paper spit box, which may be destroyed. So long as these precautions are neglected, just so long will we have tubercular patients. We may never get rid of the disease altogether, but there is a great future before us in modifying its existence. The first thing to do is to absolutely impress upon the people the idea that it is absolutely a contagious and infectious disease.

The treatment of tuberculosis is a question of great difficulty to the medical practitioner. When a tuberculous patient comes to him he is in a difficulty to know what is the proper advice to give. There is not a physician who, the moment he gets such a case, does not feel that he has a very complicated matter to deal with; it is often a matter in which finances play a great part. Many of us have of late been sending patients to Florida, to California, or to the heights of Colorado; but the amount of money required to enjoy such resorts will, in a great many instances, be beyond the means of the individual. Now we have within reasonable reach a place which is before long to stand pre-eminently the home for consumptives, and which is only a few hours ride from Montreal. There is to-day in the Adirondacks a sanitarium, under the care of Dr. Trudeau, which is indeed a very excellent place. This gentleman has done a great deal to make a good home for consumptives, his charges are only five dollars a week, which includes the medical attendance; he treats cases, and treats them very successfully, almost entirely by keeping them in the open air, amongst the pines. Thus, while we have so desirable a locality close at hand, we should hesitate before recommending long journeys and great expense where fatigue and money are subjects of consideration.

Dr. ARMSTRONG thought that it would be a wise proceeding if the facts brought out in the discussion were put in pamphlet form and sent to each member for consideration, and that some means should be adopted to spread this knowledge among the laity, for by so doing it would lighten the burden of the family practitioner. Every medical man knows how difficult it is to get families to carry out proper precautions

when the disease is in their homes, because they do not realize the danger.

Dr. WESLEY MILLS had noticed, in watching the progress of thought in the profession, a very dangerous tendency to swing round from one extreme to another. This is very well seen in the relation of heredity to tuberculosis—from considering it the sole factor, we are coming to regard it as of no importance whatever. If we were to assume that heredity has nothing to do with the subject, we would be making a mistake, and a little consideration will show that all modern physiology and pathology attach as much importance to the invaded cells as to the invading ones. Heredity means the same tendencies in the offspring as in the parents; it may be associated with similarity of form, or it may not; it may be visible or invisible, but it is there. Now, we all know from the experience of breeders that an hereditary tendency can in the course of generations be annihilated, and this fact should be borne in mind in the forming of human alliances. By an injudicious alliance an inherited tendency to a disease can be intensified, just as it can be lessened by a judicious one. So that in spite of bacilli and antiseptics it is not less, but more important than ever that people should be warned in making their alliances for life. It is true that an individual who has no special predisposition, when sleeping with a phthisical patient may contract the disease, but that is an extreme case, and under such circumstances the infection must be due to the enormous quantity of the germs. As a rule, a person who has no predisposition will not contract the disease, and an alliance of a predisposed person with such might help to eradicate the tendency. There are many instances in pathology when the contraction of the disease depends upon the quantity of the germs, and it is to such circumstances we must attribute infection where no predisposition exists. As to the question of whether the bacilli themselves can be inherited, it has been shown that the placenta has contained not only actual bacilli, but actual tubercles. What we have yet to determine is whether there is actual intra-uterine infection or not.

During the past few years he had bred many hundred pigeons of high breed, that is to say, pigeons which have



deviated much from the normal by man's selection. Such organisms are easily disturbed, and disease works great ravages amongst them. It is his custom to make post-mortems on all deaths; some of them were submitted to Dr. Johnston, and by this means many facts about tuberculosis have been acquired; one is, that the organism is quite as important as the bacillus. For a time there was but a little of the disease, at other times considerable. How is that to be explained? The strains he was dealing with were known, as well as that environment which is best suited for resisting all sorts of disease. It is also known that in birds there is one particular period of the year at which their vitality is at the lowest, namely, when they are changing their feathers, which they do completely once a year. When the amount of feathers on a bird is considered, the amount of metabolism that is required to restore these feathers, and also when many of these feathers have blood at their base, it can easily be understood how the bird's vitality must at this time be at its lowest ebb; and it is at this period that tuberculosis, enteritis, etc., is most prevalent amongst them. Then again, during the cold weather we have many instances of tuberculosis amongst our birds. These are splendid instances of how condition and environment may determine disease. Tuberculosis runs in birds a very rapid course. Symptoms of a serious nature may be absent to within a few days of death; even death may result without profound emaciation.

Dr. G. P. GIRDWOOD could not disregard a hereditary tendency to the disease. Whether tuberculosis passes direct from the parent to the offspring, or whether it is some weak constitution brought about by the union of two people with a mal-affinity, may be a disputed point; but every old practitioner knows it as a matter of observation, that in certain families all the individuals, one after another, die off as soon as they arrive at a certain age. In other families you find the greater part die off in consumption, all but one or two, and these usually the scapegraces, who have probably lived a less sedentary life—have lived more in the open air.

There is another point in connection with heredity, and that is, that a peculiarity of constitution may be developed which has no congenital antecedent in the nature of either

parent, but that some transient condition of either or both parents, some depressed vitality, may at the moment of conception beget a constitution for the offspring which renders it liable to attacks of the bacillus in after life.

He had also seen associated with tuberculous disease, madness and cancer. There were families of which several members die of tuberculosis, some of madness, others, especially the girls, of cancer. Now it may be all the one tendency which takes a particular turn in certain constitutions, now developing into tuberculosis, now into cancer, and again into madness. Again, there are cases of acute mania in young men and women who recover and afterwards die of tuberculosis, which shows another association between madness and tuberculosis. Where this tendency lies is a disputed point.

With regard to the treatment of tuberculosis, he was strongly of the impression that the proper place for a sick man is his own home. All the advantages of distant places can probably be obtained at home, such as open air and exercise which keeps a man employed out of doors, and surroundings which conduce to health. These will place the patient in the best possible position to fight the bacilli. There is also a moral aspect of the question: What right has one member of a family to spend the money required for a change of climate, when by doing so it often means harassing, if not impoverishing, the rest of the family?

Dr. RODDICK, speaking of the treatment, said that sending patients away is a subject of considerable importance, not only to the patient, but to those with whom the patient has to travel. In a trip to the South recently he was obliged to live for a day and a half in a sleeping car with three persons very far advanced in phthisis. It not only impressed him very much, but many others in the same car; one lady absolutely refused to travel with them; she can not be blamed, as she was in delicate health. Three years ago he had crossed the Atlantic with a man who was going to the South of France; he was locked up in the same berth with this man, who was constantly complaining of draft and would insist on having the door closed. Such people are unquestionably dangerous, and should not be allowed to travel in sleeping cars or steamboats, except under special circumstances. In fact, in

the South, where they have much experience of the results of such practices, so thoroughly alive is popular sentiment to the danger of contagion that many people will not occupy a room in a hotel unless it has been first as completely disinfected as if there had been a case of scarlet fever occupying it previously. This is causing so much extra expense that they are now refusing to receive consumptives in the hotels, and probably it will soon come to pass that in Southern resorts these unfortunates will have recognized quarters which they must occupy, and none other.

Dr. McEACHRAN, in answer, said that he felt sure the remarks made, if published, would have a very valuable influence relative to the treatment of the disease in the lower animals, and causing some steps to be taken with a view to even controlling it among human beings.

When statistics in the human subject are looked for they are not as easily furnished as in the case of cattle; but if the similarity of the disease in animals and man can be shown, the facts furnished from the former should serve as data for our manner of dealing with the latter. With regard to copulation as a means of propagating the disease, he quoted several instances of unquestionable transmission in this way, and in this respect it can pass as readily from the male to the female as from the female to the male. He had met with many instances which show beyond doubt the communicability by contact, sometimes produced by the males, sometimes by the females, of this dread disease.

He thought that if the Society goes before the public and makes strong statements as to the nature and manner of dealing with the disease, it will be doing a work which shall prove a lasting benefit to the country, while so far as Government interference with the disease in animals is concerned, something will be done in the near future. The Government is going to get up pamphlets, distribute them broadcast, and have the public informed of the true nature of the disease. Now, if the medical part was equally made known, the combined effect would be a work of very great good.

Dr. ADAMI, in answer, said he was very glad that this subject of heredity had been brought forward. The right view, that is, the one which has been fairly well accepted, is that

heredity does not imply an inheritance of the bacilli, but rather an inherited weakness towards resisting this particular germ. With regard to whether the fœtus is ever affected, there are two, if not more, undoubted instances recorded in which the fœtus has been affected by tuberculosis. There is no question but it can occur, but it is of very rare occurrence.

In conclusion, he agreed with what Dr. McEachran and every speaker had said, that information upon this subject should be widespread, and that the public should be made acquainted with the extreme infectiousness of this disease, and that we should do our best in every way to stamp out this terrible scourge.

The PRESIDENT named the following Committee to draw up rules in accordance with the discussion: Drs. A. D. Blackader, McEachran, Laberge, Adami and Wyatt Johnston.

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## MONTREAL CLINICAL SOCIETY.

*Stated Meeting, May 20th, 1893.*

DR. HALDIMAND IN THE CHAIR.

Dr. HACKETT read the report of an interesting case of "Puerperal Septicæmia." The patient had aborted at the third month and part of the placenta was retained. Curetting was performed on the second day post-partum and a piece of decomposed placenta removed. The temperature at once fell to normal, but rose again several days later, the rise being accompanied by a chill. As the house drains were not in a good condition, the above symptoms were ascribed to sewer gas infection, and the patient was removed to another house, when she made a speedy recovery.

In the remarks that followed Dr. KIRKPATRICK related a case of puerperal septicæmia caused by the patient using a pan-closet after the membranes had ruptured.

Dr. EVANS advocated cleansing out the uterus with a spiral brush and introducing iodoform pencils. All of his own cases had yielded to this. He related a case where the patient had got up and used the chamber just after labour. This was followed by chills, rise of temperature, etc., and in four days the patient died. Post-mortem decomposition set in very rapidly.

Dr. GUNN opposed the use of the brush for cleaning out the uterus, as it would be almost impossible to clean out the uterine corners with that instrument. Theoretically, at all events, the curette was much to be preferred. He related a rapidly fatal case. The patient had been delivered of a macerated foetus with an adherent placenta. This was removed and an intra-uterine antiseptic douche given. On the sixth day post-partum, patient became stupid, was comatose on the seventh, and died on the eighth. The lochia were sweet and there was no rise of temperature all through. The urine had not been observed.

Dr. GORDON CAMPBELL agreed with Dr. Gunn regarding the difficulty experienced in clearing out a uterus with a brush, and in support of his opinion remarked that he had seen a uterus removed post-mortem. This had been subjected to curettement previously and one corner had not been touched by the curette. If this was the case with a curette, it would be much more difficult for a brush to reach the part.

Dr. HALDIMAND remarked that where he had been practising previously midwifery was largely conducted by women, and that he had seen several cases of puerperal fever. He recalled one case which was especially virulent. When he first saw the patient her temperature was 105.2 F.° Twenty grains of quinine and the wet pack reduced the temperature to 103° F., but the case ended fatally in two days and very rapid decomposition set in post-mortem.

Dr. HACKETT replied.

Dr. KIRKPATRICK then read the report of a case of "Accidental Hæmorrhage," and showed the placenta from the same. The patient, a primipara, had received a blow on the abdomen about a month before delivery, which occurred over one month before term. The blow was followed by pain, which soon passed off. On delivery the foetus was found to be dead and the placenta fatty. The liquor amonii was blood-stained and clots of blood had formed between the placenta and the fundus of the uterus. There was also hæmorrhage into the substance of the placenta. The blow was evidently the cause of the hæmorrhage, which in turn caused the death of the foetus by separat-

ing the placenta. The fatty degeneration was merely a retrograde change.

Dr. A. W. GARDNER asked if there were any signs of endometritis, remarking that accidental hæmorrhage was often due to disease of the blood vessels.

A very interesting paper on "The Diagnostic Value of the Gastric Juice" was read by Dr. GUNN. He described its composition, as well as methods of obtaining it. He also minutely described various tests employed in his investigations. As a result of autopsies on infants performed by himself, he only once found an acid gastric secretion, thus showing the uselessness of inserting food undigested into such stomachs.

Dr. EVANS stated that some authorities held that the intestine took on the work of the stomach where there was abnormality in the gastric secretion. One Russian observer maintains that the stomach is normally merely a receiver and that the absorption goes on in the intestine, but this theory is ridiculed by Ewald.

Dr. G. BROWN had investigated the subject of digestion in a patient who used the stomach tube. He discovered deficiency of hydrochloric acid and pepsin, and prescribed hydrochloric acid and pepsin, with a good result. Gastric juice being alkaline after death is of no significance, as acid secretion is set up by food, and you would not expect to find the hydrochloric acid unless food had recently been introduced into the stomach.

Dr. GORDON CAMPBELL had tested the gastric juice in one case and found the hydrochloric acid normal after a test breakfast, but the patient only suffers after eating something more solid. In order to ascertain the amount of acid secreted, you should collect the whole gastric juice.

Dr. MORROW said that Charles stated that the pyloric glands were constantly secreting an alkaline fluid, while those of the cardiac end of the stomach secreted an acid juice, and even that only on stimulation.

Dr. GUNN replied, and after cases in practice had been related by Drs. Schmidt, Evans and Haldimand, the meeting adjourned.

*Stated Meeting, June 3rd, 1893.*

DR. ORR IN THE CHAIR.

Dr. EVANS read a short report on "Tetany," founded on two cases met with in his own practice. (See page 183).

Dr. ALLAN had seen a number of cases in men, the larger number being in shoemakers, and asked what proportion of cases were infantile and what adult?

In reply, Dr. EVANS said that it most commonly occurred in children between one and two years of age. It was also seen during the puerperium and at puberty.

Dr. SPIERS then read a very interesting summary of cases of "Scarlet Fever," which had occurred in the wards of the Montreal General Hospital under his care. The patients were mostly children, but some were young girls. One infant, 10 weeks old, had been exposed to the infection for some time, but failed to take the disease. The rash assumes many forms, and in one case was marked by general venous hyperæmia. Desquamation varies with the variety of skin, viz., where the skin is fine the desquamation is also fine. In some cases the temperature remained high for days without apparent sufficient cause, and all these cases had marked pallor. In one case death from uræmia followed suppression of urine. There was one case of double ear disease.

Dr. KENNETH CAMERON had sent Dr. Spier four cases, one of which was very puzzling. It first had a rash resembling that of measles. Two more had similar symptoms, followed on the fourth day by an œdematous scarlet rash, which, however, was unlike that of scarlet fever.

Dr. GORDON CAMPBELL considered the diagnosis of scarlet fever from measles to be by no means easy in every case. He had observed four children who had a slight pink rash and sore throat; when seen two were desquamating. Possibly these were cases of rubeola or German measles.

Dr. KIRKPATRICK said that many cases were first seen by artificial light, which made it difficult to diagnose the rash. He had observed one case of diphtheria with a typical scarlet fever rash. Jameson, of Edinburgh, keeps the skin and naso-pharynx

disinfected and does not consider isolation absolutely necessary, although advisable when possible. He uses carbolic acid 5ss. and thymol, gr. x to ʒi., for the skin. One rarely sees a young baby with scarlet fever.

Dr. GEORGE BROWN had observed two cases in children one and one and a half years of age, and both were very severe. The fever was very high. The rash varies at different times of day. In one case of convulsions a scarlatinal rash followed, and in another case the rash was only present for one day, and was not followed by desquamation.

Dr. H. D. HAMILTON saw a patient supposed to have mumps. There had been an attack of so-called hives one week previously. The urine was loaded with albumen and there was hæmaturia and hæmorrhage from the bowels for two days, followed by recovery. Pain over the parotid was caused by commencing middle ear trouble.

Dr. SPIER replied.

Dr. H. D. HAMILTON then read a paper on "Guiacol in Tuberculosis," relating a series of cases treated with that drug. He described the origin of the medicine, which he said might contain 90 per cent. of creosote. For this reason he considered both drugs together. Guiacol, however, has a less disagreeable taste than creosote, and is therefore used as a substitute. The dosage used by Dr. Hamilton was from one to twenty minims, according to the degree of tolerance. Out of eleven cases treated with guiacol, only five are under observation at present. One has died, the tuberculosis rapidly extending during the course of treatment. In only one case was there any diminution of night sweats. In another case the already advanced pulmonary symptoms remained in *statu quo*. All of the cases were in an advanced stage of the disease when they applied for treatment, and, speaking generally, Dr. Hamilton could not see any marked improvement, except locally, where topical applications were made.

Dr. MORROW said that guiacol was contra-indicated in tuberculosis where there was any tendency to hæmorrhage, and asked if Dr. Hamilton had seen any such case?

Dr. GUNN had given creosote, and investigated its effect on



the blood. He found that the number of leucocytes increased when the dose of creosote was increased. The drug was useful in some cases, but not in all.

Dr. GEO. BROWN asked if there was any increase in the number of red blood corpuscles. He quoted from a paper in the *British Medical Journal*, in which the author stated that as the condition of the stomach improved the number of red corpuscles increased.

Dr. HAMILTON replied.

The report of a case of labour at the seventh month was read by Dr. VIPOND. The child was very weak and required great care, but was still living and doing well when last heard from.

After some general business the meeting adjourned until the autumn.

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#### HURON MEDICAL ASSOCIATION.

The quarterly meeting of this association met in the large room of the Mechanics' Institute on the 11th ult., Dr. Wood, of Mitchell, president, in the chair, and Dr. Smith, of Mitchell, acting as secretary. The morning session began at 10 a.m., and ended at 1 p.m. The attendance was moderate. Two papers were read at this session, the first by Dr. McLaughlin, of Auburn, and the second by Dr. Campbell, of Seaforth. Good discussions were held on each paper, after which the meeting adjourned until two o'clock. At the afternoon session nineteen medical men were present, including Dr. Eccles, of London, and Dr. McLeod, of Brooklyn, N.Y. A report was given and a specimen was presented by Dr. Bethune, of Seaforth, after which Dr. Campbell read another paper and presented several patients. Good discussion took place on all these. The great feature of the day was a paper by Prof. Eccles describing operations which he performed. It was very interesting, and provoked a lengthy discussion. Drs. Elliott and Smith, of Seaforth, then gave a report of their late trip to the States, after which Dr. Eccles was made an honorary member, and Dr. Elliott, who is moving to Chicago, was granted his certificate of membership, with a high recommendation to the profession of Chicago. Dr. Elliott made a suitable reply, after which a vote of thanks was passed to J. Garrow, Esq., M.P.P., for his conduct in the House in reference to recent medical legislation.

## NEW YORK ACADEMY OF MEDICINE.

## SECTION ON ORTHOPÆDIC SURGERY.

*Stated Meeting, May 19th, 1893.*

W. R. TOWNSEND, M.D., CHAIRMAN.

*Severe Calcaneus after Willet's Operation.*—Dr. HALSTED MYERS presented a patient upon whom he had operated for severe calcaneus which had occurred after a Willet's operation. The anterior tendons were divided, and forcible manipulation failed to overcome the deformity. Through a posterior vertical incision he then easily exposed the astragalus, and removed a wedge from its upper surface, which had become hypertrophied from lack of normal pressure. The wedge was made three-eighths of an inch thick on the inner side, and one-eighth of an inch on the outer side, to correct a valgus present. The apex of the wedge corresponded to the anterior edge of the tibia. The articular surface of the tibia was scarified, and the foot easily brought to the normal position. The tendo achillis was a mere ribbon and was not shortened. The position is good now, seven weeks after operation, and there is apparently no motion at the ankle joint. The child is to wear an ankle brace with a higher heel for some time.

Dr. S. KETCH said this case was brought to his clinic at the Women's Medical College, and at that time the deformity was pronounced, so that it seemed as if only a radical operation would be successful. He believed that Willet's operation had been performed on the patient several times. He referred the case to Dr. Myers, and he was very much gratified at the result.

The CHAIRMAN said that Willet's operation had been done a great many times at the Hospital for the Ruptured and Crippled, but increased experience had taught them that it was only one step in the treatment of calcaneus. Careful support was necessary after the operation to prevent relapse.

*Neuromimetic Club-Foot.*—Dr. S. KETCH presented such a case. He first saw the patient at the Orthopædic Dispensary on May 15, 1893. She was about 15 years of age, and had never menstruated. The history is that three months ago, as a result of a sudden twist, the foot became contracted and she

was not able to straighten it again. Examination showed that there was atrophy of the calf and some contraction of the adductors of the thigh, the inward rotators, and the tibialis anticus; the foot was in marked varus; there was no equinus and no shortening. As she walked the limp was pronounced. The foot could be entirely replaced by gradual manual force. At this time the foot was very much more distorted than at present. A diagnosis was made of neuromimetic club-foot. As is characteristic of such cases, there were the hyper-extended toes, and a degree of varus altogether out of proportion to the contraction of the foot. Previous to this the girl had given no evidence of hysteria. By simple suggestion he had been able to improve her condition materially.

Dr. HENRY LING TAYLOR agreed in the diagnosis. He was reminded of a patient whom he attempted to treat by a brace, but she insisted upon taking it off at short intervals. After some time she developed, or claimed to develop, a hemi anæsthesia, which involved the lips and tongue and one entire half of the body. After several weeks she also developed a peculiar attitude of the hand on the same side. Within a month or six weeks she completely recovered.

*Operative and Mechanical Treatment of Flat-Foot Compared—*Dr. KETCH also presented a patient, 19 years of age, who afforded an excellent opportunity for comparing the results of operative and mechanical treatment. He first came to the dispensary one year ago, complaining of considerable pain in the soles of both feet on walking. There was very marked prominence of the sole and bulging of the scaphoid and other tarsal bones. The condition had lasted for about three years. After a short time he disappeared, and on his return it was learned that the left foot had been operated upon about three months before at the Presbyterian Hospital. He had been unable, however, to ascertain the exact nature of the operation. The patient walked on the outer side of his foot.

Dr. R. H. SAYRE said he had never met with any cases of flat-foot which he had not been able to make comfortable without a bone operation, and those which he had seen operated upon by others had not seemed to him to yield such good results as mechanical treatment.

*The Forcible Correction of Angular Deformities by means of a Special Mechanical Apparatus.*—Dr. JOEL E. GOLDTHWAITE, of Boston, read a paper with this title, and demonstrated by many large photographs and by apparatus his method of treatment.

Dr. HALSTED MYERS described a simple method which he had used successfully to reduce the lateral dislocations which occur in the course of knee-joint disease. Adhesive straps were applied to the leg, and a plaster of paris splint applied from the upper part of the thigh to the lower part of the leg. A large window was cut in this splint from the level of the joint to the lower third of the leg, diametrically opposite the deformity, to allow the bones to be drawn in that direction. By means of a webbing strap, previously passed around the the upper part and fastened over a steel spring which crossed it, traction was made forward and inward. Longitudinal traction was also made by fastening the adhesive plasters to a perineal crutch, which was always a part of the apparatus. The treatment was illustrated by the exhibition of a patient who was wearing this apparatus.

Dr. R. H. SAYRE exhibited an apparatus which he had used on a case in which the knee was ankylosed at about  $45^{\circ}$ . It would not be suitable for greater angles. The apparatus was modelled after Robin's osteoclast. In the case referred to he was unable to loosen the patella. Where the patella had slid forward to the lower extremities of the condyles of the femur he could not see how it was possible by mechanical force to slide the tibia forward to a proper bearing surface until the patella had been gotten out of the way. It might be necessary in some cases to loosen the patella through an incision by means of a chisel before applying the apparatus. In a case in which he thought there was only fibrous adhesion he adopted this plan, but after the patella was free it was impossible to reduce the posterior subluxation of the tibia. Excision was therefore performed, and he then found a remarkable hypertrophy of the spine of the tabia, which prevented by its projection into the inter-condyloid notch the reduction of the deformity. He thought the great pressure which Dr. Goldthwaite's apparatus exerted against the condyles of the femur would cause a great deal more traumatism than walking. It

was partly on this account he had preferred modifying Robin's osteoclast to using the apparatus devised by Dr. Bradford, as his patient still had tender spots on the condyle, although active symptoms had been absent for years. The fact that there was so much movement in Goldthwaite's cases is pretty conclusive evidence that there was more peri-arthritis than arthritis.

Dr. KETCH said the fact brought out in the paper that after the locking of a joint for many years one is able by such a process to restore considerable motion, was in itself interesting, and perhaps opened up a new field in the treatment of such cases. It certainly emphasized what every orthopaedic surgeon sees as a result of long-continued mechanical treatment. He referred to two cases which he had just seen, in which persistent mechanical treatment had overcome what at one time was thought to be bony ankylosis. This should teach us that no matter how long a joint has been locked, so long as no true bony ankylosis is present, one should not despair of obtaining even a considerable degree of motion. The most interesting practical point in this treatment is the possibility of lighting up an old tubercular process. The cases reported in the paper would seem to justify us in taking this risk, at least until we have further information on the subject.

Dr. H. L. TAYLOR had been greatly interested in Dr. Goldthwaite's work since the publication of his first article. The mechanical means were certainly well adapted to accomplish the desired result. In the treatment of inflammation of joints it had seemed to him always well to combine traction with whatever force is applied, and he thought adhesive plasters could be applied to the leg and used in connection with Goldthwaite's apparatus. However, from the action of the apparatus, the small amount of reaction following the operation, and the ultimate results obtained, it seemed to him that traction must be exerted by the apparatus, and that it left very little to be desired. His father, Dr. C. Fayette Taylor, described in 1879, in the *New York Medical Journal*, an apparatus which he had devised, called a genuclast. In it counter-traction above and below the knee was combined with an eccentric leverage which was perfectly under control. It was successfully employed in a number of cases, but the

method was not so well adapted to overcome the subluxation of the tibia as that presented in the paper this evening. As Dr. Ketch had remarked, those who had not had an extensive experience in orthopædic surgery could hardly realize how much could be accomplished by persistent, gradual treatment.

Dr. KETCH asked if Dr. Goldthwaite had used it as a corrector of deformity, and receiving a negative reply, he suggested that an apparatus might be constructed on the same principle which could be used as a walking brace.

Dr. H. W. BERG asked if the popliteal abscess which occurred in one of the reported cases was the result of the forcible straightening of the limb, or was the result of an osteitis. He had, in common with most general practitioners, preferred to use the gradual method, for fear of just such a complication.

Dr. WHITMAN said he had understood the author to say that the cases were selected—namely, were those in which amputation or excision had been advised. Why were no tenotomies done? Was it because most of the resistance was supposed to be in the posterior portion of the capsule? Personally, he believed that subcutaneous tenotomy would aid very much in the replacement.

Dr. R. H. SAYRE said that the suggestion of Dr. Ketch had reminded him of his father's knee splint, in which traction is made in the axis of the leg, and at right angles to the long axis, by bands passing across the front of the thigh and behind the calf and around the bars of the instrument, in the same manner as traction is made by the screw in the apparatus just exhibited.

Dr. GOLDTHWAITE, in closing the discussion, said that the discussion seemed to indicate that his method was not applicable to acute cases, yet Dr. Sayre's patient with the tender points was an acute case. His method and apparatus were only intended for a certain small class in which all acute symptoms had disappeared, and in which some severe operation, like amputation, or excision, would be otherwise attempted.

The pressure is applied evenly to the end of the femur by a leather band, and does not cause any trouble. The chances

are that in cases where there is firm, bony ankylosis of the patella to the femur, there would be bony ankylosis of the femur to the tibia; this would exclude it from the class suitable for this treatment. If, however, there were only firm fibrous adhesions, the application of his apparatus would be justifiable. He was willing to admit that in the case which did so well there was probably very little intra-articular disease, yet it was in the hands of the general surgeon, and was to be submitted to excision. Quite a number of the cases had had gradual extension by means of a weight and pulley in bed for several months, but with absolutely no benefit. It should be remembered that the cases in which his operation is to be done is where the adhesions are so firm that this treatment cannot be expected to succeed.

The fifth case was not a proper one for forcible correction; the patient was in a poor general condition; there was tuberculosis of the lung, and probably also tuberculosis of the knee. The treatment probably caused a lighting up of the tuberculosis in the knee, but it was a choice between taking this risk and allowing him to remain a hopeless cripple.

Tenotomy had been done in two of the cases, and while it was certainly not a serious procedure, it did not seem to be at all necessary, and hence he thought it better to avoid it, as it certainly prolonged the period of convalescence.

A total of eleven cases had been treated by this method, and in no instance had there been the slightest acute trouble, except in the last one reported, which, as had been said, was not a fair case for the operation. Excluding this, there had been no relapses. The first case was done in 1887, and the woman is perfectly well and has a very useful limb. The most recent operation was done last February, and she had had no trouble up to the present time.

One severe case of gonorrhoeal rheumatism which had been in the hospital for the greater part of five years had a right-angled contraction, extreme valgus and rotation, yet he left the hospital ten days after this operation, and has been at work ever since.

In two other cases, where the deformity was the result of an ordinary articular rheumatism of one year's duration, an amputation had been advised by a well-known surgeon on

account of the constant pain and deformity. The pain existing in rheumatic arthritis and in gonorrhœal rheumatism is relieved by breaking up the adhesions in this way; hence, pain is an indication, rather than a contra-indication to the operation.

On motion, a vote of thanks was tendered to Dr. Goldthwaite for his kindness in coming to New York and presenting such an interesting and instructive paper.

### Selections.

**Penetrating Gun-shot Wound of the Liver.**—J. O. Closs, M.D., C.M., Edinburgh, Honorary Surgeon, Dunedin Hospital, in the *New Zealand Medical Journal* for April, 1893, says: In view of the fact that penetrating gun-shot wounds of the liver are generally very fatal, I beg to bring this case under notice. According to Bryant, Longmore saw only one case of recovery in the Crimea, and Dr. Otis records four recoveries in America out of thirty-two cases. No. 3 Circular of the Washington War Department records four recoveries out of fifteen from this form of injury.

These statistics, coming from the source they do, are quite sufficient to indicate the fatality of this injury—that is, wounds of the liver generally, some of which may not be penetrating.

J. G., aged 42, shot himself with a revolver on the morning of the 15th of last January. He was admitted to the hospital shortly after the attempt at suicide. He was very much collapsed, both from hæmorrhage and shock, and added to this a deal of nervous excitement. The bullet, a conical-shaped one, had penetrated the body in the right mammary line in the eighth intercostal space, and was extracted in the afternoon by a counter incision close to the right side of the spine on a level with the transverse process of the first lumbar vertebra. A drainage tube was passed through this opening for about four inches, in a direct line with wound of inlet. During this operation there was no escape of bile. This fact is quite in accordance with authorities on this injury. The wounds were rendered aseptic, and a dry dressing applied. At the end of three days the drainage tube was removed, and



the wound healed quickly. The skin round the wound of inlet, for about a quarter of an inch, sloughed and healed by granulations. During convalescence there was some slight jaundice and peritonitis. The patient was discharged on February 8th. About the 20th of February he complained of a pain about the right shoulder; for this several applications of iodine were applied with good effect. When I last saw him he was able to go about as well as he did before the injury. Shortly after admission his temperature was 98.4°, and the following day 102°. For ten days it varied between 99° and 101°, and on the 27th it fell to 97.2°, gradually regaining the normal, and remaining so with very slight variations. For the first 24 hours his pulse varied from 99 to 160—this, his highest pulse-rate, was at 6 p.m. on the day of admission, and the 99 at noon on the following day. It kept varying very much up till the 29th. His respirations varied just as much as his pulse-rate. At midnight on the day of admission they only recorded 10 per minute, and at 6 p.m. the following day were 32; and so they varied till the 29th. His temperature, pulse and respirations were taken every two hours for the first three days, and after that every four hours till the 26th. The bullet must have passed directly through the liver.

**“Giving the Quilt.”**—The Queen, says *Hearth and Home*, is an expert and indefatigable knitter. During the Egyptian campaign she and the ladies of the Household employed themselves in knitting quilts, which, at the end of the war, were sent to Netley Hospital for the use of the wounded. One of these, made entirely by Her Majesty, and bearing an elaborate V.R. in the centre, was the coverlet *par excellence* of the institution, and in universal demand for a time. In assessing the claims of the candidates for the honor of sleeping under it, the medical staff naturally gave the precedence to the most severely wounded, and as the most severely wounded was the one most likely to die, very soon, alas! an evil omen attached itself to the distinction, the climax of which was reached one night, when a poor soldier, feeling someone touching his bedclothes, woke up with the perspiration pouring down his face, and cried out, “Oh, sir, do anything you like with me, but for God’s sake don’t give me the quilt!”

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No. 3.

CANADIAN MEDICAL ASSOCIATION.

The Twenty-sixth Annual Meeting of the Canadian Medical Association will be held in London on Wednesday and Thursday, 20th and 21st September, under the presidency of Dr. Sheard, of Toronto.

It is to be hoped that the interest hitherto taken in the meetings of this Association will be increased this year, and, judging from the communications received and papers promised, the success of the meeting is already assured.

Members desirous of reading papers will please communicate with the General Secretary, Dr. Birkett, Montreal, at an early date as possible.

The following papers have already been promised:—

Address in Surgery—W. H. Hingston, M.D., Montreal.

Address in Medicine—A. McPhedran, M.D., Toronto.

Treatment of Chronic Endometritis—Dr. Conerty, Smith's Falls.

Sanitary Science: Some of its Features—Dr. Canniff, Toronto.

An Angioma of the Eyebrow—E. King, M.D., Toronto.

The General Practitioner and the Insane—E. Anglin, M.D., Verdun.

(1) Some Recent Changes in British Criminal Law;  
(2) Reform in the Coroner Law—Wyatt Johnston, M.D., M. F. Quinn, Esq., Q.C., Montreal.

Is Alcohol in all Doses and in all Cases a Sedative and Depressant?—J. Harrison, M.D., Selkirk.

Displacement of the Kidney—F. Eccles, M.D., London.

Thyrotomy for a Large Sub-Cordal Spindle-Cellled Sarcoma, with presentation of case—H. S. Birkett, M.D., Montreal.

Some Measures for the Prevention of Tuberculosis—P. H. Bryce, M.D., Toronto.

———J. H. Hilliary, M.D., Aurora.

Some Unusual Conditions met with in Hernia Operations—James Bell, M.D., Montreal.

Cosmia Consciousness—R. M. Bucke, M.D., London.

The Prophylaxis and Treatment of Puerperal Eclampsia—C. T. McKeough, M.D., Chatham.

———T. K. Holmes, M.D., Chatham.

Three Cases (two sisters and a brother) of Friedreich's Ataxia to be presented—Geo. Hodge, M.D., London.

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### COLLEGE OF PHYSICIANS AND SURGEONS OF THE PROVINCE OF QUEBEC.

The examination for admission to the study of medicine will commence on Thursday, the 21st instant, at 9 o'clock a.m., in the rooms of the Medical Faculty of Laval University, in the city of Quebec. The semi-annual meeting of the Board of Governors will be held on Wednesday, the 27th instant, in the above place.

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### AMERICAN PUBLIC HEALTH ASSOCIATION.

The twenty-first annual meeting will be held under a plan which will differ very materially from that of any former meeting of the A. P. H. A. Through an arrangement entered into by the World's Congress Auxiliary and this Association, the forthcoming meeting will constitute an International Congress of Public Health, and committees are already at work to make it a grand success. Invitations have already been extended to foreign countries to participate in the meeting, and to the most prominent sanitarians throughout the world to present papers.

The regulations which will govern this meeting are outlined in this circular. Particular attention is called to the fact that the meeting will be held in sections; therefore, persons presenting papers will note under which section their paper will properly come. The classification given under each section will also suggest the topics upon which papers are desired.

It is suggested that members who intend to visit the World's Fair postpone their trip until the meeting of this Con-

gress, as there will be no better month in which to see the Fair. Another circular will be issued before the meeting, giving additional particulars.

The following is from the circular issued by the committee having in charge the details of the forthcoming meeting:

This Congress will be in session in the Art Institution Building, Chicago, October 9-14, 1893.

Membership in the Congress is open without fee to all persons interested in public health, who comply with the formalities of registration.

The proceedings will be published by the American Public Health Association, and will be distributed to all members of the Congress, who, on the payment of five dollars and election, may become members of the American Public Health Association. This payment of five dollars entitles the member to a copy of the proceedings, is the only fee required, and is entirely voluntary.

Registration may be conducted in person or by correspondence, and it will facilitate the work of the Congress for this to be accomplished as early as possible. To that end an official will be present in the Art Institute to attend to registration every day during the preceding week, October 2-7, from 9 to 5 o'clock, and again on Monday, October 9, during the same hours. Registration may also be accomplished later, according to placards in the hall.

Correspondence on this subject may be addressed to "The Registration Clerk, Public Health Congress, Art Institute, Chicago." Checks should be made payable to the Treasurer, American Public Health Association.

Registration consists in recording the name, including designating titles; the official representation, if any; the permanent residence; and the local address (this may be omitted or changed at discretion). The particular section the member wishes to work with will also be noted. No charge is made for registration.

Special business meetings of the American Public Health Association will be held each morning, including Monday, October 9, and also at 4 p.m. Monday, October 9, for the election of members.

The opening session of the Congress will be held in one of

the large halls of the Institute, at 8 p.m. Monday, October 9, and will be devoted to addresses of welcome by the President of the World's Congress Auxiliary, by the Mayor of Chicago, and by the President of the American Public Health Association, and to responses by foreign delegates. These will be followed by the Inaugural Address by the President of the American Public Health Association.

The mornings of Tuesday Wednesday and Thursday, from 10 to 12 o'clock, will be devoted to discussions in general of the meetings of the Congresses upon the following topics:

Tuesday.—Diseases chiefly manifested in the air passages: Tuberculosis, Diphtheria, Pneumonia, their prevention or control through Public Health Service.

Wednesday.—Diseases affecting the alimentary canal: the Diarrhoea of Childhood, Cholera, Enteric Fever.

Thursday.—The Eruptive Fevers: Small-Pox, Measles, Scarlet Fever, and the diseases of modern life due to nervous conditions.

Friday morning will be given up to a business meeting of the American Public Health Association.

The general meeting of Saturday morning will close the Congress.

The afternoons of Tuesday, Wednesday, Thursday, and if necessary Friday, will be devoted to the work of the Congress by sections as follows:

I. International, National and State Hygiene: Its Methods and Relations, including Vital Statistics. ("State," as here used, indicates an autonomous part of a nation, as a kingdom of the German Empire, an integral State of the American Union.)

II. Municipal Health Service. To include the control of the infectious diseases of men and animals, offensive trades, water supply, the disposal of excreta, garbage and the waste of manufactories, schools and public assemblages.

III. The Infectious Diseases of Men and Animals: Their Causes, Prevention and Control.

There will also be general meetings of a popular character at 8 p.m. on Tuesday, Wednesday and Thursday, when addresses will be delivered on public health subjects of general interest. The object of these is to disseminate general infor-

mation on such subjects as : The prevention of infectious diseases ; the causes of ill-health due to soil, air and water ; the health and sickness of self-supporters (workers).

All papers that are offered must be received by "The Secretaries of the Public Health Congress, Chicago, Ill.," before September 15, 1893, and titles and abstracts of these by September 1.

Papers for the Congress not written in English should be accompanied by an English translation.

The time for reading a paper in a section is limited to fifteen minutes, except when illustration is required or where special extension is granted, when five minutes may be added in each instance.

Thirty minutes is the extreme limit of a paper in the general session. Members desiring to discuss subjects before the Congress must send their cards to the presiding officer in order to be recognized. The floor may not be occupied for more than five minutes.

It is desired to make the Congress a demonstration of practical methods, and papers on elementary topics or theoretical views cannot be accepted. Papers bearing on the objects of the Congress are solicited from every source, but their acceptance must depend on the approval of the committees in charge of the Congress. These committees are guided in this matter by the standing rules of the American Public Health Association. Resolutions of praise or censure, or committing the Congress as such to special views, will be out of order.

The President of the American Public Health Association, which embraces the Dominion of Canada, the Republic of Mexico and the United States, will be the President of the Congress.

Honorary Presidents will be appointed from other countries.

Vice-Presidents of the Congress and of the sections will be made from the countries represented.

All persons from beyond the United States who anticipate being present are requested to notify the secretaries as early as convenient. It will materially assist in the organization for the committees to be informed by October 1 of the Americans who expect to attend.

IRVING A. WATSON,  
Secretary.

CONCORD, N.H.

## THE WILLIAM F. JENKS MEMORIAL PRIZE.

The College of Physicians of Philadelphia announces that the third triennial prize of five hundred dollars, under the deed of trust of Mrs. William F. Jenks, will be awarded to the author of the best essay on "Infant Mortality During Labour, and its Prevention."

The conditions annexed by the founder of this prize are, that the "prize or award must always be for some subject connected with Obstetrics, or the Diseases of Women, or the Diseases of Children;" and that "the Trustees, under this deed for the time being, can, in their discretion, publish the successful essay, or any paper written upon any subject for which they may offer a reward, provided the income in their hands may, in their judgment, be sufficient for that purpose, and the essay or paper be considered by them worthy of publication. If published, the distribution of said essay shall be entirely under the control of said Trustees. In case they do not publish the said essay or paper, it shall be the property of the College of Physicians of Philadelphia."

The prize is open for competition to the whole world, but the essay must be the production of a single person.

The essay, which must be written in the English language, or, if in a foreign language, accompanied by an English translation, should be sent to the College of Physicians of Philadelphia, Pennsylvania, U.S.A., before January 1, 1895, addressed to Horace Y. Evans, M.D., Chairman of the William F. Jenks Prize Committee.

Each essay must be typewritten, distinguished by a motto, and accompanied by a sealed envelope bearing the same motto and containing the name and address of the writer. No envelope will be opened except that which accompanies the successful essay.

The Committee will return the unsuccessful essays, if reclaimed by their respective writers, or their agents, within one year.

The Committee reserves the right not to make an award if no essay submitted is considered worthy of the prize.

August 1, 1893.

JAMES V. INGHAM,  
Secretary of the Trustees.

## AMERICAN DERMATOLOGICAL ASSOCIATION.

The Seventeenth Annual Meeting of this Association will be held at Milwaukee, Wis., on September 5th, 6th and 7th, 1893. The following papers have been promised: Antiseptic Treatment of Skin Diseases, by Dr. C. W. Cutler. The Principles of Antisepsis in the Treatment of Eczema, by Dr. H. G. Klotz. Cosmetics, by Dr. R. B. Morison. A Case of Tuberculosis of the Skin simulating Lupus Erythematosus, by Dr. W. A. Hardaway. A Case of Rhinoscleroma, by Dr. G. T. Jackson. Atrophia Maculosa Cutis, with a case, by Dr. W. T. Corlett. General discussion on: Pityriasis Rosea—(a) Its etiology; (b) Its relation to ringworm, seborrhœa, eczema, etc.; (c) Its treatment. Dermatitis Exfoliativa: (a) Its clinical forms; (b) Its etiology; (c) Its treatment. What do we understand by Pemphigus? A Contribution to the Pathology of Acne Varioliformis, by Dr. J. A. Fordyce. Angiokeratoma, by Dr. J. Zeisler. Subject to be announced, by Dr. M. B. Hartzell. Dr. H. R. Crocker, of London, will read a paper on 'Lupus Erythematosus as an Imitator.'

## JEAN M. CHARCOT.

J. M. Charcot, the distinguished French physician, died at Morvan, in France, on the 17th of August, aged 68 years. Charcot was not only a distinguished neurologist, but also an able general physician. His publications on diseases of the kidneys, liver and chronic joint affections display the qualities of a master mind. His name will, however, be chiefly remembered in connection with diseases of the nervous system. His contributions to this department of medicine are voluminous and very important. The subject of hysteria he made particularly his own. As Director of the Hôpital la Salpêtrière, he had great opportunities for studying disease, and made good use of them. Fortunately, he has established a distinct school of neurologists, to whom we owe much and from whom we expect much in future, although the great master has passed away.



## Literary News.

**A NEW MEDICAL DICTIONARY.**—A completely new Medical Dictionary is announced for early publication by Lea Brothers & Co. The author, Dr. Alexander Duane, of New York, is already widely known as the medical expert for Webster's International Dictionary. His new work has been drafted to supply medical students with all desired information concerning the words they will meet in their course of reading, and as the vocabulary has been selected most liberally, the work will be of value to practitioners also. The pronunciation of each word is given by a simple and obvious phonetic spelling; then follows the derivation, an unexcelled aid to memory, and finally a full definition. Descriptive matter has been appended to such words as cannot be adequately explained by simple definition. Thus diseases are described, and their symptoms and treatment are given; drugs are followed by their properties, effects, doses, etc. Extensive tables of bacteria, doses, etc., are placed in the alphabet most conveniently for reference. A work of real value is promised, and we shall take an early opportunity of reviewing it in this journal.

**GRAY'S ANATOMY, NEW (13TH) EDITION.**—Another edition, the thirteenth, of this standard work is announced for early publication by Messrs. Lea Brothers & Co. It is hardly too much to say that this work has been the most popular of all medical text-books whatever since its first appearance in 1851. Its text has been revised successively by the foremost anatomists of a generation, and the present edition embodies whatever changes were necessary to make it represent its advancing science. The illustrations have always been noted for their clearness. Their large size has rendered it possible to print the names of the parts directly upon them, thereby indicating not only their names, but also their extent—a most important matter. A liberal use of colors has been made to secure additional prominence for certain parts. Notwithstanding these improvements, the constantly increasing demand has justified a reduction in the price of the colored edition. An early review will appear in this journal.