ON
CEREBRO-SPINAL FEVER IN CAMPS AND BARRACKS.

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Slight outbreaks in two of the camps in this country have aroused interest in this disease, to which soldiers have been peculiarly liable.

Few infections have so remarkable a history. Belonging to the *nova febrium cohors* of Horace, it appeared (or revived?) in the early years of the nineteenth century. It is not likely that an affection with such striking symptoms could have been overlooked by the seventeenth and eighteenth century physicians. Geographically it has a world-wide distribution, as may be seen by reference to vol. ix of Series I and vol. x of Series II of the *Index Catalogue* of the Surgeon-General's Library, in which epidemics are noted in all quarters of the globe, with special prevalence in France, parts of Scandinavia, and the United States. These islands have enjoyed a singularly happy freedom. Dr. Ormerod's list in vol. i of Allbutt and Rolleston's *System of Medicine* shows how slight and unimportant have been the outbreaks until the Glasgow epidemic of 1907, with 1,000 cases and 595 deaths (Chalmers); and that of Belfast, with, for the eighteen months ending June, 1908, 725 cases, with 548 deaths (Robb).

There has been lately an increase of the disease in England. Dr. Newsholme has kindly furnished me with the figures taken from the investigations of Dr. R. J. Reece. In 1912 there were 272 cases; in 1913, 304; and in 1914, 310. This notable increase above the 30 to 40 cases annually in the eighties and nineties may be accounted for in part by the more accurate diagnosis, and the existence of a meningitic type of poliomyelitis, but there appears to be no doubt that sporadic cases have become more frequent. From inquiries at some of the London hospitals I cannot find that there has been an increase during the past few months. Both of the present outbreaks in camps are in the southern counties. There was a local epidemic

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in Bristol and the neighbourhood in 1913, reported by Michell Clarke and Symes.\(^1\)

Waves of epidemics occur, of which we are in the fifth since 1805. The present period began about 1893, and has been characterized by some of the most severe epidemics on record, notably that of New York, and for the first time in its history the disease became serious in this country.

The disease spreads slowly, or not at all, from foci of prevalence in various parts of a country. For example, in 1893 it broke out in two or three mining towns in Western Maryland, dragged on for the winter months, did not extend, then disappeared, and we heard nothing more of the disease in the State until 1898, when an outbreak occurred in Baltimore and Washington. In this year it prevailed in a mild form in twenty-seven States of the American Union. In 1904–5 a very severe epidemic occurred in New York, while Philadelphia, less than 100 miles distant, was not attacked. The cases may be confined to a gaol or barrack, or to a few scattered villages, as in the outbreak a few years ago in the Eastern Counties, or to a single house. It has prevailed chiefly in the winter and spring months, and an epidemic rarely lasts into the summer.

With a higher death-rate than any acute infection except plague and cholera, the total mortality is not great, as the case incidence in the community is low. With these two diseases it shares the malign capacity to kill within twenty-four hours. Death has indeed followed within six hours of the onset. During the outbreak in 1898 a healthy young man was attacked at 4 p.m. with pain in the head, dizziness and vomiting. At 6 p.m. he had a convulsion; at 10 p.m., when I saw him, the temperature was 105°, a pin-point purpura was beginning in the hyperaemic skin, the neck was drawn back, he was unconscious, and death occurred a little after 4 a.m., just twelve hours from the onset. Among types of inflammation of the meninges this is the only one from which recovery takes place, in from 25 to 50 per cent. of the cases.

The meningococcus, first described by Weichselbaum, has well-defined cultural and morphological properties, and, like the pneumococcus, has various strains. It is found in the cerebro-spinal exudate, in the blood, in the joints, in the visceral lesions, and in the secretions of the naso-pharynx. A curative serum has been prepared with which good results have been obtained, but in the preparation it is probable that sufficient attention has not been paid to the strains of the germ. Prophylactic vaccination has been carried out on a small scale, and Sophian and Black have found immune bodies in the blood more than two years after inoculation. The meningococci are found in the naso-pharynx of patients, but what is of special importance is the discovery that persons in contact with the sick may harbour the germs in the nose and throat. During outbreaks carriers have been found in large
numbers among those living in close contact with the sick; in fact, the intensity of an epidemic appears to bear some proportion to the number of the carriers. As a rule, the germs disappear from the naso-pharynx of healthy contacts in the course of a few weeks. Like the pneumococcus, the germ may be found in the naso-pharynx of healthy persons not exposed to infection—in 158 soldiers among 9,111 in the Munich garrison at a time when the disease was not prevailing!

To these main facts in the story of epidemic cerebrospinal fever there remains to add another—namely, the constant sporadic presence of the disease as the posterior basic meningitis of children, and as an acute meningococcus meningitis of young adults. A large proportion of the 310 cases for 1914 certified in this country were doubtless of these types, though the pneumococcus and the streptococcus may also cause primary meningitis. The posterior basic form of Gee and Barlow occurs in children under 2 years of age, but in young adults the meningococcus meningitis is not very uncommon, and during an epidemic wave cases may occur in places far distant from the centre of prevalence. Thus in 1893, when meningitis was prevailing in Western Maryland, but not in Baltimore, two young adults were admitted to my wards with the disease; and 5 cases occurred in one household in the city—the mother, two sisters, and two brothers, one of whom came under my care.

In certain characters cerebro-spinal fever resembles pneumonia—in the epidemic localization in gaols, barracks, and houses; in seasonal peculiarities, in the fibrinous quality of the pathological exudate, and in the prevalence of the organism in the naso-pharynx of healthy persons. On the other hand, there are striking differences—in the age incidence, in the dominance of sporadic cases, and in the character of the complications. Briefly, then, the meningococcus is a germ of low virulence, widely spread in the community, and of intense virulence in an individual once it has passed the portals of protection. It is doubtless carried from one person to another, not necessarily from patient to patient, as nurses, doctors, and attendants are very rarely attacked, but in a large proportion the germ is transmitted by a healthy carrier. That the carrier does not always, as has been suggested, harbour a mild, non-pathogenic type is shown by the occurrence of meningitis after the presence of the germ has been determined. How the germ gains access is still under discussion—whether by direct invasion of the meninges from the naso-pharynx through the ethmoidal or sphenoidal routes or by the blood stream. I think the latter the more likely, as no evidence has been found of special involvement of the tissues in either of the routes suggested. Then the fulminant form kills with the features of an acute septicaemia. Since 1899, when Gwyn first isolated the meningococcus from the blood of one of my patients, the organisms have been frequently found in blood cultures.
The localization in the meninges is no proof of direct invasion, as tuberculous meningitis, obviously a blood-stream infection, presents the same peculiarity.

Of the causes of the outbreaks, whether increased virulence in a widespread germ, or increased susceptibility under changed atmospheric or telluric conditions, we are as ignorant as when Sydenham summed up the experience of twenty years' close study of the genius epidemius of London:

Wherefore I conjecture that diseases have certain periods according to the occult and unaccountable alterations which happen in the bowels of the earth, to wit, according to the various age and duration of the same.

In cerebro-spinal fever we may be witnessing the struggle of a new disease to win a place among the great epidemics of the world. In the past decade it has everywhere shown an ominous activity. Again, Sydenham touches the marrow of the matter in a famous passage in which he refers to the briefness of our experience in comparison with the long ages of the world.

And as there have been other diseases heretofore which are either now utterly extinct, or at least, being almost wasted by age, fade away, and very rarely appear ... so the diseases which now reign will vanish in time, and give place to other kinds, whereof indeed we are not able so much as to guess. This may be so, whatever we, who are so short-lived, think of it, who are born as it were one day and die another; nor are the most ancient authors that have written observations of diseases of much longer age, if they are compared with the beginning of the world.

Our present interest relates to the disease as met with in barracks, camps, and campaigns, and this comforting fact comes out of a review of the outbreaks—that while soldiers are peculiarly liable, cerebro-spinal fever has never been a great war pestilence. Jaeger (to whom we are indebted for important studies on the meningococcus) has published a monograph dealing with the occurrence of the disease in armies, and for this purpose has tabulated the epidemics of the nineteenth century in different countries. France, which has suffered most severely, had sixty-two epidemics, of which forty-three (69 per cent.) were confined to troops. In Germany there have been many small outbreaks in garrisons, particularly in Württemberg and Bavaria. The incidence of the disease has risen during the past twenty-five years. In Italy the outbreaks have been chiefly in the military population. In these islands there has been no severe outbreak in garrison or camp. In 1868 four cases occurred within three weeks at the Shorncliffe Camp, and in 1876 two cases were reported among the militia at Oxford. Jaeger's analysis shows an increase of the disease in the European armies since 1870. The epidemics are usually small, restricted to a garrison, sometimes to a single barrack in a town.
It is reassuring to find that in the great campaigns of the nineteenth century cerebro-spinal fever played no part as a camp disease. There is no reference to it in the Napoleonic, the Crimean, the Italian, or the Danish wars. In the Franco-Prussian wars there were a few cases, chiefly about Paris. Isolated cases occurred in the Russo-Japanese war, but no serious epidemic, and the same is true of the South African war. The only exception in the history of the century is the Civil War in America, during which there were outbreaks in both the Northern and Southern armies in '61, '62, '63, none of them, however, very widespread, and as a camp disease it did not enter into the same category with typhoid, dysentery, and malaria.

Meningitis is a rare disease among the troops in these islands. Sporadic cases occur, but neither at home or abroad has it ever prevailed as an extensive epidemic, so far as I can find, in any camp or barracks. In 1910-11 there were 10 cases, with 8 deaths; in 1912 there were 6 cases, with 5 deaths; no differentiation is made between the forms of the disease. I have not heard of any cases among the Expeditionary Force. The existing outbreaks are not extensive, in one less than 40 cases occurred in four months among more than 30,000 men. Details of the others have not yet come to hand.

The German troops from the south-west may carry the disease into the field, and the French army has always centres of infection. Metz and Strassburg have a bad name in the history of the disease; but we may hope that the experience of 1870-71 may be repeated.

In the outbreaks among the troops there have always been three strong predisposing factors: overcrowding in camps or barracks, the cold winter weather, and over-muscular exertion among young recruits. Two of these conditions have prevailed in this country during the past three months. The weather has been atrocious, and an enormous number of young recruits have been in active training. One cannot say that there has been special overcrowding, but a great many men have been in tents, in the ordinary regulation form of which nine men live in close contact, and I can testify from personal examination that the ventilation is not always good. It is this very intimate contact that seems to favour the communication of the disease. With fresh air, sunlight, and scrupulous personal cleanliness, the epidemics, as a rule, quickly subside.

I may add that stringent preventive measures have been taken—separation of the sick, systematic examination of the contacts, and the disinfection of the nasopharynx of any carriers, which should suffice to limit the outbreaks. In a circular issued a year or two ago in the French army Vincent recommends the following mixture as an inhalation: Iodine 12 grams, guaiacol 2 grams, thymol 35 cg., alcohol 200 grams, with 6 grams of potassium iodide, used five or six times a day. Disinfection of the pharynx is carried out by swabbing
with a 3 to 5 per cent. solution of glycerine and iodine. In the recent Texas epidemic Sophian found that hydrogen peroxide 1 per cent., with argyrol 9 per cent., used as a spray, destroyed the meningococcus quicker than any other measure. Urotropin, which is secreted into the cerebro-spinal fluid, has been recommended by Cushing as a prophylactic.

The reader is referred to Stillé's monograph, 1867, for the fullest details as to symptoms; to Hirsch's Geographical Pathology for the epidemics; to Jaeger's Die Cerebrospinalmeningitis als Heeresseuche, Berlin, 1901, for an exhaustive consideration of the disease as it affects soldiers; to Koplik's article in my System of Medicine; and for bacteriology and treatment to the recent publication of Sophian, Epidemic Cerebro-spinal Meningitis (London, Henry Kimpton, 1913), and to Heiman and Feldstein's Meningococcus Meningitis (London, J. B. Lippincott Co., 1914).

REFERENCE.

1 British Medical Journal, June 13th, 1914.
Remarks

ON

ARTERIO-VENOUS ANEURYSM

Made at a Symposium on the Subject at Radcliffe Infirmary,
Oxford, on March 26, 1915

BY

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GENTLEMEN,—Better than any other disease aneurysm illustrates how borderless are the boundaries of medicine and surgery. Here am I talking on the most surgical of all its aspects, while very likely not far away a surgeon is practising the best possible prevention against internal aneurysm in giving a syphilitic patient an injection of salvarsan! Aneurysm has been a medico-chirurgical affection ever since some bungling young "minitor" first nicked the brachial artery in performing venesection. One of the earliest and most interesting references in literature is to an instance of this kind. Galen was called in consultation by a young and inexperienced surgeon who had opened the artery at the bend of the elbow instead of the vein, and the blood spurted out "clarus, rubens, lucidus et calidus."

"I took in the situation at once; there happened to be an elderly physician with me, so we prepared a medicine, viscid, conglutinable, and obstructive, and placing it strongly against the lips of the wound bound over it a soft sponge. The surgeon who had opened the artery wondered, but said nothing. When we went out"—note the professional touch!—"I said to the surgeon that he had opened the pulsating vessel, and charged him not to dress the wound before the fourth day, and not without me."

1 In which Colonel Dodds-Parker, Major Mallam, and Captain Bevers took part.
The cure was complete, and Galen remarks that this was his only successful case of the kind, as in all others aneurysm had followed. This account, taken from Symphorien Campegius "Claudii Galeni Pergameni Historiales Campi, Basilae," 1532, p. 43, is doubtless of the case referred to in the "Methodus Medendi." 2 The only other references to aneurysm in Galen are in the "De Tumoribus praeter Naturam" 3 and in the "De Curandi Ratione per Sanguinis Missionem," 4 in which he refers to the possibility of gangrene.

HISTORICAL SURVEY.

Rational surgery was one of the gifts of the Greeks, but in the 800 years between Hippocrates and Oribasius few names have survived specially associated with this branch of medicine. Who among us off-hand could recall more than two or three in addition to Hippocrates and Galen? Yet in this period scores of important schools flourished with great teachers of surgery, men honoured in their generation and the glory of their times. As one reads the partial list in Haller's "Bibliotheca Chirurgica" and scans the few golden remains of their writings fortunately preserved by encyclopædists such as Oribasius and Paul of Ægina, the truth of Sir Thomas Browne's remarks comes home: "Who knows whether the best of men be known, whether there be not more remarkable persons forgot than any that stand remembered in the known account of time?" Two of these comparatively unknown men created the surgery of arteries, Rufus of Ephesus and Antyllus, the Cosmas and Damien of Greek surgery. 5

2 Linacre's edition, 1517, f. lxii., v.
3 Junta, fifth edition, 1576, iii., p. 34.
4 Ibid., vi., p. 21.
5 These practitioners, who became the Christian saints of surgery, suffered martyrdom in Cilicia in the third century. In their Western Mother Church, on the Roman Forum, I have seen the little parcel said to contain the instruments with which they performed the most famous operation in hagiological surgery, substitution of the healthy thigh of a just-dead man for one that was gangrenous.
Rufus of Ephesus.

To generations of practitioners unworthy to hand him ligatures Rufus of Ephesus (Reign of Trajan, early part of second century A.D.) was known by the "pilulæ Ruffi," "the pills I would not be without"—"pilulæ sine quibus esse nolo"—still in the British Pharmacopœia as the pill of aloes and myrrh. In the brilliant Ionian profession of the early days of our era Rufus doubtless had predecessors and teachers, but he stands out a strong, clear figure, a great "magister chirurgiae," a title justly earned by his remarkable contribution to the surgery of hæmostasis. We know it only through a section in Aetius, a sixth-century physician. Nothing is lacking in a description, which might be transferred to any modern textbook—digital compression, styptics, the cautery, torsion, and the ligature—only I am sorry not to find, as is sometimes said, a description suggestive of arterio-venous aneurysm, though he speaks of the possibility of traumatic aneurysm.

Through the Arabians the name of Rufus was on the lips of every mediaeval physician, and we find him among the favourites of Chaucer's well-read Doctor. In one of the earliest and most beautiful of medical manuscripts, the famous "Juliana Anicia Dioscorides" (A.D. 525), of the Vienna Library, he is figured with Galen, Hippocrates, and others.

Antyllus.

Upon the other great surgical figure of antiquity, Antyllus, so blindly has oblivion scattered her poppies, to quote Sir Thomas Browne again, that not a fact of his life is known; yet through the mists of 18 centuries he looms large as one of the most daring and accomplished surgeons of all time. A resector of bone and joints, one of the first to perform tracheotomy, the founder of the surgery of fistula, a successful operator upon cataract, and we may say the creator of the surgery

6 Tetrabiblos, lib. xiv., cap. 51.
of the arteries—these are among his known achievements. His remains are chiefly in the works of Oribasius, the physician and friend of the Emperor Julian.

Nowhere are we impressed with the note of directness so characteristic of the Greek (see R. W. Livingstone’s “Meaning of the Greek Genius,” second edition, 1915) as in the brilliant account given by this author of aneurysm, of which he was the first to recognise two forms—one by dilatation, the other following wound of the artery. So far as I can gather, he was also the first to describe the thrill or bruit so characteristic of the latter form. No ancient writer has anything like the same accuracy of pathological description, and you may search the surgical literature for centuries before there is found such a gem as the account of his method of operation still in use, and by which his name has been permanently enshrined. Not finding one in English, I asked Mr. Livingstone, of Corpus Christi College, to give us a complete translation of the fragment.

About Aneurysms (from the works of Antyllus).

There are two different kinds of aneurysms. The one kind occurs when there is a local dilatation of an artery (this was the origin of the name aneurysm or dilatation). The other kind arises from the rupture of an artery and the discharge of the blood into the flesh beneath it. Aneurysms due to the dilatation of an artery are longer than others; those due to a rupture are rounder. In the former there is a thicker layer of tissue; in the latter you can hear a certain crepitation if you press them with your finger; while in aneurysms due to dilatation there is no sound.

It is foolish to follow the practice of the ancient surgeons and decline to treat any aneurysm, but it is dangerous to apply surgical treatment to all types. So we will excuse ourselves from treating aneurysms in the armpit, groin, and neck on the ground that the vessels are large and that it is impossible or dangerous to isolate and tie them. We also decline exceptionally big aneurysms, even if they occur elsewhere. But we will operate as follows on aneurysms in the extremities, the limbs and the head.

7 Oribasius, iv., p. 52 (ed. Daremberg).
If the aneurysm results from dilatation, we will make a straight incision in the skin the whole length of the vessel; then, after separating the edges of the incision with hooks, we will carefully sever all the membranes between the skin and the artery. Then pushing aside with blunt hooks the vein adjacent to the artery, we will expose the dilated portion of the artery on all sides. Next, we will introduce the head of a probe underneath, and, lifting the aneurysm, insert along the probe a needle with a double thread, so that it passes beneath the artery. We will cut the thread at the eye of the needle, making two threads and four ends of thread; then, taking the two ends of one of the threads, we will pass them gently to one end of the aneurysm and tie them with precision. Similarly, we will pass the other thread to the opposite end of the aneurysm, and then tie up the artery, so that the entire aneurysm lies between the two ligatures. Then we will lance the aneurysm with a small incision at its centre; in this way its contents will all be evacuated without any danger of haemorrhage. Those who tie the artery, as I advise, at each extremity, but amputate the intervening dilated part, perform a dangerous operation. The violent tension of the arterial pneuma often displaces the ligatures.

If the aneurysm originates in the rupture of an artery, isolate with your fingers as much of the aneurysm as you can, including the skin. Then below the isolated part introduce a needle with a double thread of flax or of gut; after passing it through cut it at the needle’s eye, forming two threads. Take hold of the two ends of one of these and pass it to the right, there tie it tightly, so as not to slip. Pass the other end similarly in the opposite direction—to the left. If there is any fear of the threads slipping, pass a second needle with a similar double thread through the same spot, intersecting the first thread and crossing it in the form of the letter Χ (chi). Cut the threads as before, and tie them like the first ones, so that four threads form the ligature. Then open the tumour at its top, and, after evacuating the contents, remove the superfluous skin, leaving the part tied by the threads. In this way the operation is effected without haemorrhage.

And I must read Mr. Livingstone's comment:—

It certainly is a beautiful piece of lucid writing. I felt that if I was alone on a desert island with someone suffering from aneurysm, and the tide had washed ashore sufficient ἀγκιστρα, &c., that I shouldn’t have minded trying the operation. And Antyllus had real literary power. What an admirable phrase is ἐκπτυότα, the “spitting out” of the ligature by the throbbing artery: I don’t think you can get it in English, and I fell back on a lame substitute, “displaces.”
Not unjustly does Paul Broca in his great mono-
graph, “Des Anévrismes,” claim that not only did
Antyllus create operative medicine but the patho-
logy of aneurysm: “À chaque ligne on reconnaît
l’écrivain qui parle de ce qu’il a vu, de ce qu’il
a fait.”

Decay and Revival of Vascular Surgery.

Aetius in the middle of the sixth century
describes the method for cure of aneurysm at
the elbow, known later as that of Anel (1710),
ligation of the brachial artery three or four fingers’-
breadth below the axilla, followed by opening the
sac, which was allowed to heal by suppuration. A
curious error of Sprengel has led to the connexion
of the name of Philagrius, a fourth century surgeon,
with this operation. In the fragments of this
writer given by Aetius aneurysm is not mentioned,
but Sprengel never noticed that the extract on
aneurysm which follows directly after one upon
ganglion by Philagrius did not belong to this author
but to Aetius himself.

A casual perusal of the fragments of the Greek
surgeons of the first three or four centuries of our
era as given in Gurilt's “Geschichte der Chirurgie”
gives the impression of a great and fruitful period
with scores of men whose qualifications were those
demanded by Thomas Fuller for the good operator
—the eagle’s eye, the lion’s heart, and the lady’s
hand. Then came the tragedy, the death in the
West of the science of the Greeks. The Church
took over their philosophy, the Arabs absorbed
much of the best of their medicine and added to it,
but surgery as a progressive science and a successful
art died with its founders, the great Greeks of the
Græco-Roman Empire. So far as the surgery of
arteries is concerned we might take a jump of a
thousand years or more were it not for an Arabian,
Albucasis of Cordova (tenth century), who wrote a
famous surgical treatise, of which we have in the
Bodleian the two earliest manuscripts. A young
scholar of Wadham and student of Christ Church,
John Channing, in 1778 issued from the Clarendon
Press a beautiful edition. The description which he gives of aneurysm with its treatment is practically that of Antyllus. He notes the stridor to be felt, which indicates that he was probably dealing with the arterio-venous form.

In vascular surgery the men of the Middle Ages and of the Renaissance, Henri de Mondeville, Guy de Chauliac, and even Ambroise Paré, were blind followers, who never even approached the position of their masters. Not much more than a century has passed since men of the John Hunter type took up vascular surgery where Rufus and Antyllus had left it, and only to this generation of experimental surgeons, such as Eck, Ballance, Matas, J. B. Murphy, Halsted, Carrel, and Guthrie, could the best of the Greeks go to school. You may think perhaps, that I am scarcely just to the great mediæval surgeons, particularly to such a master as Ambroise Paré, who reintroduced the ligature, but in vascular surgery, the touchstone of the position of the art, they never wholly regained what the profession had lost.

Our modern knowledge dates from William Hunter, in whose "Medical Observations and Enquiries," in a paper on Aneurysm of the Aorta he asks, "Does it ever happen in surgery when an artery is opened through a vein that communication or anastomosis is afterwards kept up between the two vessels?" He then describes, in a case following bleeding, the swelling, enlargement of the veins, and "a tremulous jarring motion" strongest at the part that had been punctured. In a subsequent paper, 1761, he described two cases very fully, and recognised the enlargement of the arteries and of the veins and the characteristic hissing noise "as if there was a blast of air through a small hole and interrupted, answering precisely and constantly to the stroke of the heart or diastole of the artery."

It is true that in the seventeenth century Sennertus, the distinguished Wittenberg professor, noted in this form of aneurysm the characteristic thrill which he compares to the boiling of water, "quasi bullientes aquae," not only palpable but

an audible, as if the vital spirits were passing through a narrow orifice.¹⁰

Rarity of Arterio-venous Aneurysm.

It is remarkable how few specimens of arterio-venous aneurysm of the external vessels are in the museums of this country. I have only been able to get references to some half dozen cases. One is astonished not to find any in the Army Medical Museum, Millbank, or at Haslar or Greenwich. Nor is there an example in William Hunter’s Museum at Glasgow. The Royal College of Surgeons of England has only three, including a recent uncatalogued one sent by Sir G. H. Makins. Its most remarkable specimen was sent in 1867 by Dr. Beaumont, of Toronto, an old teacher of mine. I was not a little surprised and greatly pleased to find a pathological memorial of this fine old St. Bartholomew’s man, a fellow pupil of Paget, who went out to Toronto in the early “forties” and became professor of surgery in the newly founded King’s College. It is an admirable specimen as illustrating the late changes in the veins. The case is fully described by Beaumont in the Medical Times and Gazette for July, 1867. A man, aged 45, had 11 years previously been stabbed in the upper part of the thigh. There was a very large pulsating tumour in the upper part of the right thigh, fully six inches in extent in either direction and extending nearly to Poupart’s ligament. The patient died under chloroform, which was administered for the purpose of ligaturing the external iliac artery. The specimen shows a venous sac as big as a small cocoanut, measuring 14½ by 12½ inches, very thin walls containing some old laminated fibrin, and the walls were in places calcified.

The truth is, this is not a country of brawls and dirks, and pistol wounds are rare in civil life. It is strange that no specimens found their way to the museums from the South African War. The

¹⁰ Opera, Ludg., 1676, p. 51.
Army Medical Museum, Washington, has only two examples (Lamb).

The rarest of all forms, arterio-venous aneurysm, is occasionally met with in the medical clinic as when a small aortic aneurysm opens into the superior vena cava, while on the surgical side trauma is responsible for 99 per cent. of those connected with the external vessels. Until the recent wars stab wounds accounted for the large majority of cases, but in the Japanese, the South African, and the Serbian wars the high-velocity bullet heads the list of causes.

**Personal Experience of Wounds of Arteries.**

Naturally, as a physician my experience with wounds of arteries has been very limited—until recently only 10 cases, in 5 of which arterio-venous aneurysm followed. The other 5 cases came in medico-legal post-mortem work in Montreal, and they may be just mentioned for their interest.

1. A soldier during the vaccination riots in Montreal gave a man a prod with his bayonet, which passed through the top of the left lung and cut the subclavian artery just as it leaves the arch to curve over the pleura.

2. A man in a brawl received a stab with a penknife at the root of the neck, followed by a traumatic aneurysm, which was operated upon unsuccessfully; the tip of the knife had cut the vertebral artery between the lateral processes of the fifth and sixth cervical vertebrae.

3. A man received a blow on the head in a tussle, and some days later died suddenly of hemorrhage from the nose; a fracture of the sphenoid was found with laceration, or erosion, of the internal carotid just where it turns into the sella turcica.

4. A man in riding jerked against the pommel of his saddle and drove a dirk which he was carrying into his femoral artery.

5. A fatal bullet wound of the left internal iliac artery.

The arterio-venous cases I will quote in connexion with their most striking features. Within
a few months I have seen as many instances as in 40 years of hospital work: two cases at the American Hospital, Paignton, in one of which Dr. Beal did a successful Antyllus operation; a patient of Mr. R. B. Wright at Chester, to whom I shall refer in connexion with the physical signs; and the two patients we have the opportunity to study to-day—for one we are indebted to the kindness of Captain Mowat, of Sheffield, the other is under the care of Major Ernest Mallam at the base hospital.

Exhibition of Two Cases.

W. W., aged 28, a private, had served in the Northumberland Fusiliers for eight and a half years, was always well and strong and never had a serious illness. On Oct. 19th at about 11 A.M. at La Bassée he received three shrapnel wounds, one in the left thigh. Was in the trenches until 7 P.M. Lost an enormous amount of blood. The fragment entered the left thigh just 3 inches below Poupart’s ligament, and the piece is still in the leg. There was a great deal of swelling and a good deal of disability at first. The leg did not change in colour, but he was very weak from loss of blood. The wound did not suppurate. Captain Mowat noticed the swelling in the left leg and felt the murmur. He was at Sheffield from Oct. 23rd to Dec. 10th, and gradually got well. Captain Mowat took a remarkable phonograph record of the murmur, which I heard a few weeks ago at Sheffield.

Now the man is healthy-looking, of good colour; he limps on the left leg; there is no swelling or discolouration. The left thigh looks a little smaller than the right, particularly in the antero-lateral region. There is a healed wound just 3 inches below Poupart’s ligament in the lower end of Scarpa’s space, where there is a diffuse swelling not very marked, and then a little groove-like wasting in the line of the femoral artery. The greatest prominence is at the site of the entrance of the bullet. The pulsation is diffuse, but does not extend above Poupart’s ligament. The veins are not greatly distended, but the internal saphenous is visible, and those on the left side are larger than on the right.

On palpation the characteristic thrill is felt of maximum intensity over the injury, and it is felt down the course of the femoral. There is a slight firm induration just beneath the scar, but not a definite tumour. Pressure on the femoral stops the pulsation at once. The thrill is felt above Poupart’s ligament. There is no pistol-shot sound to be felt. Pulsation...
tion in the popliteal and tibials not palpable. On auscultation a machinery murmur of extraordinary intensity is heard of maximum intensity at the site of the injury, propagated down the femoral, heard in the popliteal. The arteries are not sclerotic and the heart sounds are clear.

Major Mallam’s case is an exact counterpart.

Bullet wound of the thigh on Dec. 30th, passing through Scarpa’s space. Much blood was lost, but the orifices of entrance and exit healed rapidly. A large effusion of blood in the upper region of the thigh at first masked the nature of the lesion, and it was not until the swelling subsided that the characteristic signs of arterio-venous aneurysm were noted. There are now moderate swelling in Scarpa’s space, pulsation palpable, thrill felt with greatest intensity at the point of maximum impulse, and a loud machinery murmur.

ANATOMICAL VARIETIES AND RESULTING CHANGES.

We need not take time to discuss the anatomical varieties which are all modifications of two types, the simple tangential opening between an artery and a vein—aneurysmal varix, and the formation of a sac communicating with both vessels—varicose aneurysm. The accompanying diagrams (Figs. 1 and 2) from Lexer’s “Handbuch der allgemeinen Chirurgie” show all possible forms.

The changes that follow are: (1) The blood current is reversed, to a certain extent, in the veins; (2) the blood pressure is increased in them; (3) their walls become arterialised; and (4) the blood pressure in the artery is heightened on the proximal and lowered on the distal side of the lesion. In smaller vessels very slight changes occur. I show you a drawing of an aneurysmal varix of the anterior tibial vessels from a case in the Strassburg clinic, in which a year after the accident the vein was little if at all dilated. In lesions of the vessels of the neck and arms the venous stasis is much less than in the legs, in which the effect of gravitation is so felt that year by year the changes become more pronounced, until, as in the photographs I show, large varicosities and sacculi are formed. Femoral and popliteal arterio-venous aneurysms may last for years without great
involvement of the veins, but in a majority of the cases venous stasis forms the most serious sequel of the disorder.

The changes in the arteries on the proximal side of the lesion are less striking, but sooner or later

![Diagram](image)

**FIG. 1.**

1. Arterio-venous fistula without (1A) and the same with (1B), a venous sac—varix aneurysmaticus. 2. Arterio-venous aneurysm with false intermediary sac—aneurysma varicosum. 3. Arterio-venous aneurysm with arterial sac. Secondary arterio-venous aneurysm.

**FIG. 2.**

1. Arterio-venous aneurysm with false intermediary sac and varix on outer side of vein, due to double injury of the latter. 2. Arterio-venous aneurysm with immediate communication (A), or with false intermediary sac (B), and with a false arterial aneurysm, due to a single venous and double arterial injury. 3. Arterio-venous fistula with opposing sacs, due to a double injury of both vessels.

sclerosis occurs with dilatation, and sometimes with saccular aneurysm opposite the orifice of communication. Even within two months of the injury the femoral artery may be felt to be larger and with stronger pulsation (Paignton case). Remote
effects on the general circulation are rare, particularly in aneurysms of the vessels of the head and arms. One of my patients (Case 3) died from heart disease which may have had some connexion with his long-standing lesion. In the leg progressive dilatation of the vessels may lead to serious effects. In the case of Captain Mosher,\textsuperscript{11} wounded in the middle of Scarpa’s space 1898, at the time of death (1911) the dilated arteries extended from the bifurcation of the common iliac to the lower third of the thigh. Hypertrophy of the heart followed, and death from progressive failure of the circulation.

**Physical Signs.**

In no form of aneurysm are the physical signs so distinctive. *Inspection* may not show much, as in the cases you have just seen: diffuse pulsation at the site of the communication, moderate swelling, but not necessarily any early venous engorgement.

In the carotids, subclavians, and axillaries the condition may persist for years without much swelling or great enlargement of the veins. On the other hand, in the form that was so common at the bend of the elbow in venesection days the circulation is much interfered with. Even in smaller vessels such as the occipital the venous swelling may be enormous, as in a patient operated upon by Dr. Cushing at the Johns Hopkins Hospital in 1905. This case illustrates, too, the progressive nature of the lesion, as year by year the vessels on the side of the head grew larger, and after seven years they formed a large pulsating mass which had to be resected, after ligation of the external carotid artery.\textsuperscript{12} In the leg, particularly in the situation in the cases you have here seen, venous engorgement sooner or later dominates the scene.

\textsuperscript{11} Reported in Lagarde’s Gunshot Injuries, 1914, p. 281.

\textsuperscript{12} Journal of the American Medical Association, Dec. 23rd, 1905.
and after some years the appearance may be very remarkable, as in the following case.

**Case 1. Illustrating the development of enormous venous sacculi.**—The patient, aged 31, was shown at the Johns Hopkins Hospital Medical Society on Jan. 16th, 1905. In his eleventh year he had a knife wound just above the right knee; not long after pulsation was noticed along the femoral artery, with marked swelling. He has had good health, with very little disability, except from the increasing varicose veins, which sometimes burst and caused troublesome bleeding. The leg presented a very remarkable appearance, as shown in Figs. 3 and 4. The superficial veins were everywhere varicose; those of the antero-lateral aspect of the thigh were of enormous size, extending into the flank, and many of them were filled with thrombi. The course of the femoral, particularly in Scarpa's space, was occupied by a prominent pulsating tumour, the outline of which can be just seen in Fig. 4. Over this there were an intense thrill and a loud humming murmur with systolic accentuation; pulsation was everywhere forcible. Above Poupart's ligament, lifting the entire iliac fossa and extending into the hypogastrium, was a second tumour, in which the pulsation was very strong, a marked thrill, and the same loud murmur. The size of the tumour, which extended fully 8 inches transversely, can be well seen in Fig. 4. It increased in the sitting posture. The patient said this had been present for many years, but had, he thought, increased in size. It felt very solid and firm and the pulsation was extensile and strong. His only serious disability was from the varicose veins.

The tumours both above and below Poupart's ligament were huge venous sacs. When I demonstrated this case a doubt was expressed whether these really could be venous sacs, but there are many specimens, as in the one I refer to of Dr. Beaumont, and cases are recorded showing a similar condition. A recent one was reported by Eisenberg of a man, aged 65, wounded 18 years before in the thigh, and in addition to great dilatation of the femoral vessels there was a sac 3 inches in diameter of the iliac vein above Poupart's ligament. Additional features that may be noticed on inspection are the increased size of the limb; an actual increase in growth has been noted by Broca in the young; the skin may be

CASE 1.—Arterio-venous aneurysm of the femoral vessels of 20 years' standing.

FIG. 4.

Same patient as Fig. 3, showing the varicose veins and two huge venous sacculi, one above, the other below, Poupart's ligament.
much rougher, covered with a thicker growth of hair, and in long-standing cases varicose ulcers are common.

On palpation the characteristic thrill is felt, vibratory, rough, continuous, and increasing in intensity with the diastole of the artery. Except in its roughness it is quite unlike any other thrill felt in cardio-vascular lesions, and is pathognomonic. It has an interest, too, as one of the oldest of recognised physical signs, having been described by Antyllus. While of greatest intensity at the site of the lesion, it may be widely diffuse and even felt at the finger tips in an axillary or brachial aneurysm, and at the toes in a femoral. In the patient seen with Mr. Wright at Chester a few weeks ago, there was an additional physical sign which I have never before noted, nor in looking pretty carefully through the literature do I see it mentioned—a pistol-shot sound of great intensity, exactly such as one feels and hears in aortic insufficiency. It was an arterio-venous aneurysm of the popliteal vessels caused by a bullet wound on Jan. 29th. The note which I dictated was:

On palpation an intense vibratory thrill, continuous, with diastolic intensification, is felt over the area of pulsation, not below the middle of the leg. The striking feature is the pistol-shot shock felt during the diastole of the vessel, exactly resembling that which one hears and feels in the femoral in aortic insufficiency. It is felt only over the area of pulsation, not in the femorals, and there is no valvular disease. In addition, one feels the strong, firm, aneurysmal pulsation.

In the second case at the American Hospital, Paignton, there was no pistol-shot sound over the popliteal tumour, but one of great intensity could be heard, without the slightest pressure, over the femoral artery. On the other side it could be brought out only with pressure of the stethoscope. In the early stages the tumour may not be large, or where it is simply an aneurysmal varix little or no swelling may be present. If there has been

14 On March 26th Mr. Wright operated, tying the artery above and below and closing the direct orifice into the vein. There was no sac. The vein was unusually large.
The effusion of blood the tumour, as in Major Mallam’s case, may diminish considerably in size. Subsequently the diffuse swelling may be largely venous, but a circumscribed tumour may be either sacculi in connexion with the vein or artery, or sacculi at some distance from the original site of the injury, and there is not infrequently aneurysmal dilatation of the artery above the lesion.

On auscultation the second characteristic physical sign is heard—a loud, rough, humming-top murmur, continuous, with marked intensification during the cardiac systole. During distension of the vessel the murmur is rough, harsh, and vibratory; during its contraction it has a graver, deeper quality. It may be widely diffused, heard up and down the vessels even to the finger-tips in the brachial and axillary aneurysms, and to the toes in the femoral. It may even be intense enough to be heard at some distance from the site of the aneurysm.

Practically these are the three great physical signs of arterio-venous aneurysm: the dilatation of the veins, the thrill and the murmur. Other minor features may be mentioned—absence or lessened pulsation below the site of the tumour, the remarkable influence of posture on the venous engorgement, the pulsation in the peripheral distended veins, the frequency with which phleboliths and thrombi may be felt.

**Collateral Circulation.**

From the surgical standpoint it is important to determine the adequacy of the blood-supply beyond the lesion. Recumbent the legs, for example, may look alike, but within a few minutes after assuming the erect posture the one on the side of the lesion may become dusky in colour, and the veins dilate. It is not easy to determine the blood pressure in the arteries below the lesion. Korolkow uses a modified Gärtner’s tonometer, and Matas lays down the rule:

If the peripheral blood pressure is shown by the manometer (a modified Gärtner’s tonometer) to be normal or well sustained after compression of the main trunk above the
aneurysm then the obliterative operation may be safely applied. If, on the other hand, the blood pressure falls to zero it is evident that the collateral circulation is inadequate, and that no chance should be taken with the obliterative operation or with any procedure whatever (ligature, extirpation, &c.) which would permanently occlude the parent artery.\(^\text{15}\)

Another test is after application of an Esmarch bandage apply pressure on the artery above the aneurysm, and note the state of the circulation and the time taken for the skin vessels to fill. In one of the Paignton cases (popliteal) in the sound leg it took three minutes to obliterate the anaemia caused by the bandage while the femoral was compressed above Hunter’s canal, but in the affected leg the skin vessels of leg and foot were filled within a minute! The femoral artery on this side felt larger and had a much more powerful pulsation.

**RESULTS.**

Left alone, what becomes of these cases? Much depends upon the position of the aneurysm. Those in the upper extremities are more favourably situated than in the lower. The following may happen:—

*Non-Intervention followed by Good Results.*

1. The aneurysm may remain unchanged for years and interfere little, if at all, with the patient’s health and vigour. Particularly is this the case with the cervical and axillary vessels. Case 3 of my series illustrates this in a remarkable way, as for years he rowed in races and lived a very athletic life. Case 2 also illustrates the wisdom of non-intervention.

**Case 2.**—On April 9th, 1900, Dr. Alderson sent me from Russellville, Kentucky, a man, aged 29. On the night of Jan. 5th he had received four bullets, one in the left

\(^{15}\) Keen’s Surgery, vol. v., p. 273.
shoulder, one in the back of the left arm, one in the left lower axillary region, and the fourth, the important one, entered the middle of the fold of the left trapezius muscle, passed inwards and downwards in front of the spine, and came out under the right clavicle. All the wounds healed rapidly, but at first he had some difficulty in swallowing. The right supraclavicular fossa was occupied by a pulsating swelling extending for about 7 cm. upwards and outwards. There were a marked thrill and a loud humming-top murmur with systolic intensification, which was heard up the neck and down the vessels of the arm. The bullet could be felt just below the clavicle. The tumour had increased, and the question was whether it was safe to leave him alone. This was the policy I urged strongly. Twice he narrowly escaped operation. Two years afterwards I heard from him and he remained well; the tumour was somewhat smaller, but the bruit was still a little troublesome. Five years after the accident I heard again. He had remained well, the tumour had not increased in size, and he was able to use his arm and do everything.

Spontaneous Healing.

2. Spontaneous healing may occur, the orifice closing between the artery and the vein. This must have happened in Case 3, as a careful dissection by Professor J. J. Mackenzie, of Toronto, failed to demonstrate any communication between the greatly dilated vessels. As such a mode is rare, I give an abstract and a sketch of the dissection. (Fig. 5.)

Case 3.—I reported the case originally in the Annals of Surgery, 1893. In 1878 the man, in running down a sloping grass plot, fell and forced a lead pencil into the arm-pit; a gush of blood followed and the arm became black and blue to the wrist. The aneurysm involved the axillary vessels. He subsequently lived a very athletic life, rowed in the Argonaut Boat Club, and served in the South African War, where he came under Sir G. H. Makins's care. He was invalided in consequence of a sudden pain on the left of the head and neck, and the patient was positive that the tumour had enlarged. He wrote to me on Oct. 17th, 1904, saying that he had marched 610 miles in 32 days and fought 16 battles, with the result of increasing his aneurysm very materially, particularly at the base of the neck. He died in May, 1909, 31 years after the accident, of gradual heart failure.
There are many cases in which the condition has lasted quite as long as this with equally good health; but the special point of moment in this case is that in the careful dissection of the vessels made by Professor Mackenzie no communication could be found between the greatly dilated axillary vessels. The final report in this case was given in THE LANCET of Nov. 1st, 1913. Closure of the orifice is exceedingly rare. Another case is reported by Pluyette 16:—

A man, aged 33, applied in October, 1904, with a traumatic arterio-venous aneurysm of the right subclavian produced by a revolver bullet. The physical signs were of the usual character. On Nov. 15th he returned to the hospital, having had severe pains in the right hand and arm during the night. The parts were cyanosed, the pulse was scarcely palpable, but what was most remarkable was the disappearance of the thrill and murmur over the site of the aneurysm. There was pain in the course of the arteries, particularly the axillary and the brachial. The radial appeared to be large and hard, and there was no pulsation. It seems to have been an instance of cure by the formation of a thrombus in the arteries.

Occurrence of Sudden Death.

3. Sudden death may occur, either from heart failure or from embolism. Nothing was found to account for the sudden death in Case 4 of my series.

CASE 4.—A man, aged 29, admitted in November, 1904, had received 15 years previously a pistol shot in the lower third of the thigh; following this a tumour appeared, which had been present ever since. There was much disability owing to enlargement of the leg, with great distension of the veins, much lividity, and a persistent ulcer above the ankle. He died suddenly, apparently of syncope. Clinically there was a large pulsating tumour at the lower end of Scarpa's triangle, not easily compressible, with a continuous machinery murmur and a thrill transmitted up and down the leg. Anatomically the condition found by Dr. Rufus Cole and Dr. W. G. MacCallum was very remarkable. The femoral artery was dilated, and at the beginning of the lower third of the thigh presented two perforations separated by a narrow bridge of tissue; the femoral vein just opposite showed a

perforation at the same level. A probe could be passed from the artery into the vein through these apertures. On the inner side and in front of the artery and vein, and communicating with both, was a sac 12 cm. in diameter formed of dense fibrous tissue and lined by a granular, deeply pigmented clot. "This sac does not form the communication between the vessels, although the probe passes readily through either into it, nor are they (i.e., the sac and the vessels) directly united, but rather by way of a small space or vestibule which lies in front of the orifice of the sac." The veins were enormously distended both above and below the level of the communication.

Evidently this large venous sac, which communicated freely with the artery, formed the pulsating tumour to be felt in the front of the thigh.

4. **Rupture** may occur with fatal hæmorrhage, of which a number of cases are recorded.

**Disability from Varicose Veins and Thrombosis.**

5. In the crural vessels progressive disability may result from the varicose veins, thrombosis, and ulceration. When left too late the condition of the vessels is unfavourable to operation and specially favourable to thrombosis—the surgeon's chief danger. These accidents are well illustrated in the following case.

**Case 5.**—A man, aged 34, whom I saw with Dr. Halsted and Dr. Bloodgood, was admitted in May, 1897. Eight years before he was shot in the popliteal space. He did not notice the tumour for a year. It was a large spindle-shaped mass filling the popliteal space, with a well-marked continuous thrill felt over the tumour and far down the leg. The femoral artery was ligatured in Hunter's canal. The leg became gangrenous and had to be amputated. On dissection, just where the femoral becomes the popliteal there was a communication between the vein and the artery, an opening 1 cm. in diameter. Opposite to this on the wall of the artery was a sac measuring 2 by 3 cm. Above the opening the veins were greatly distended and dilated, with thickened walls. At the time of the operation it was noted
that some of them were thrombosed and there was a small clot in the artery, and the communication between the artery and the vein was also closed by a small thrombus.

Widespread thrombosis probably accounts for the sudden onset of swelling and disability of a limb many years after the accident. Evidently this happened in the remarkable case reported by Rokitansky.\(^\text{17}\)

A man, aged 62, admitted Nov. 28th, 1842, was in 1809 shot in the shoulder. The bullet was removed, but some grains of shot remained. He recovered, but had always a cramp-like feeling in the tips of the fingers of the left hand. For two years there was an increase in the size of the whole arm, which had increased rapidly in the six weeks, and on admission was oedematosus and cold, with the skin of a dark red colour. In the arm-pit was an old pulsating tumour the size of a hen’s egg, with marked thrill. The subclavian was tied on Sept. 23rd. He died 15 days afterwards of secondary hæmorrhage. There was an arterio-venous aneurysm of the axillary vessels, which were greatly enlarged and sclerotic, and there was a clot in the veins.

And lastly, the vascular tissue involved in the aneurysmal area may take on a naevoid growth. Apart altogether from arterio-venous aneurysm, the entire vessels of a limb, arteries and veins, may take on active growth, as in the extraordinary specimen of macroangiosis of the arm in the Charing Cross Hospital Museum, in which the growth of the vessels followed an injury. This has happened in certain cases of arterio-venous aneurysm of the vessels of the head, and though the orifice of communication may be small, within a few years the vessels (as in Cushing’s case already referred to) may become enormously enlarged, much more than can be accounted for by any increase in pressure.

\(^{17}\) Observation 46 of his great monograph Úeber einige der wichtigen Krankheiten der Arterien.
TREATMENT.

It is not my place to speak of treatment, but we all agree, I think, with the conclusion arrived at by Subbotich, senior surgeon of the Belgrade State Hospital, from his experience in the Balkan War, "that arterio-venous aneurysms should be operated upon, as they offer small prospect of spontaneous cure, although they often remain stationary for a long time and cause relatively little trouble." It is a good deal a question of situation and technique. As the cases here reported indicate, with the lesion of the axillary and subclavian vessels good health may be maintained for years without any serious trouble, but there are always risks, particularly of thrombus formation in the distended veins, and even after lasting 30 or 40 years serious trouble may arise. Urgency is greater in the case of the lower limbs, and I should say that it would be very much safer in the two cases we have just seen to operate before the venous engorgement becomes excessive.

A new and truly marvellous technique has been developed in vascular surgery, very largely owing to the work of Alexis Carrel, and the increasingly favourable results in this all-important department of surgery have followed directly upon animal experimentation. It is not too strong a statement to make that up-to-date vascular surgery cannot be done in a hospital whose younger surgeons have not full opportunities to experiment upon animals. The extraordinarily delicate technique of vascular suturing is an art acquired only with much practice. It is a chapter in the history of surgery of which our colleagues may be proud. I was greatly impressed with the statistics given by Matas at the last International Congress of Medicine dealing with operations on aneurysm generally.

Of the 225 cases collected 194 affected the lower limb, 23 the upper limb, 4 involved the carotid artery, 4 the abdominal aorta. Of the whole number, 53.3 per cent. were aneurysms of the popliteal. As to the operation involved,
in 150 cases the obliterate operation was done, in 50 the restorative, and in 25 the reconstructive. Of the 225 cases 206 were successful, in 4 cases gangrene followed, and all four operations on aneurysms of the abdominal aorta were followed by death.  

Within the next year there will be greater opportunities for vascular surgery than have ever before been offered. The results of the last wars should be carefully studied by our surgeons, those given by Stevenson for the South African, by Saigo for the Japanese, and by Subbotich for the Balkan. The statistics will be found in great detail in the monograph by Monod and Van Vert. They are also given by Sir G. H. Makins in the Bradshaw lecture on Gunshot Injuries of the Arteries, 1913; in Bernheim's (of the Johns Hopkins Hospital) recently issued monograph on "Surgery of the Vascular System," and may I refer the younger army surgeons to the section on aneurysm in "Keen's Surgery" by that modern Antyllus, my old and valued friend Rudolph Matas, of New Orleans.

In conclusion, may I put in a plea for the museums? Specimens should be sent to the Army Medical Museum, Millbank, and to the great Hunterian Collection at Lincoln's Inn Fields; and may I ask that very careful reports of the cases be sent to the Central Committee for preparation of the medical and surgical history of the war, 34, Guilford-street, Russell-square, London, W.C.

18 The Lancet, August 23rd, 1913, p. 550.
20 The Lancet, Dec. 20th, 1913, p. 1743.
21 Lippincott Company, 1914.
Nerve & "Nerves"

Address given by

SIR WILLIAM OSLER
BART., M.D., F.R.S.

Regius Professor of Medicine in the
University of Oxford.

1ST OCTOBER . 1915
LOOKING for a subject on which to address you, I thought at first of some local topic, as the influence of a University on industrial life, or a problem of public health—smoke abatement, or housing. Of the former I happen to know something in connection with the rapid growth of your scientific departments, and the good work of the Medical School, which has maintained and extended the reputation which Leeds has long enjoyed as a medical centre. I knew, too, that your city had done much to better the condition of the working classes, and that it had an enviably low death rate. Your M.O.H., Dr. Angus, kindly sent me the public health report for 1914, and it was particularly gratifying to see that your death rate was only 15 per 1,000, a reduction of 50 per cent. in fifty years, only 7,000 deaths instead of 14,000, if your rate of the middle of the last century had been kept up. I could not but look at certain figures of a disease in which I am much interested—tuberculosis—and I should like to refer to them, not to discourage you, but to indicate how much remains to be done. There were 782 deaths from tuberculosis—not a specially high rate for a city of this size—but there is a statement which shows that you are doing a great deal to further the spread!
Of 1,428 cases recently visited there were 812, or 57 per cent., in which more than one person occupied the patient’s bedroom, and in 640, or 45 per cent., there were others sleeping in the same bed with the patient. That is a bad record—not worse, I am sorry to say, than many other places, not so bad indeed—but it is a striking illustration of the importance of the housing question in connection with the white scourge.

But all local problems sink to zero before the great struggle for national existence in which we are engaged.

Where the greater malady is fixed
The lesser is scarce felt;

so I decided to offer a little medicated advice on how to get the best work out of the human machines of the nation in these times of stress and strain.

The other day I asked a battle-bronzed veteran fresh from an inferno of shell fire if he thought any single factor would decide the war. "Yes," he said, "nerve; the men who can best stand the racket will win." I must confess to a little surprise, as I expected him to say men, or money, or munitions. I could not get a definition of nerve from him, but he said, "If a fellow after 18 days' of hell has energy enough left to take off his clothes he is full of nerve." I then turned to the Oxford Concise Dictionary, and found the word given as vigour, energy, well-strung state. "Ah!" he said, "that last is what I mean; you may have men, and money, and munitions, but unless you have taut, well-strung nerves there is no chance for final victory." The phrase is a good one, dating from the days when English bowmen fought where now not arrows but shell and shrapnel darken the air. It means command of the machine and all its resources. Take
in illustration a man on his feet, speaking—command of his legs, command of his thoughts, command of his tongue, all at the same time. Not one of these came to him naturally, but by training. Anyone can do it, but it takes a nerve only acquired by training; and a successful speaker adds by practice such control of the machinery in his head that he translates thoughts into speech without the intervention of hand or pen. Though partly a natural gift, education is the important factor. The nerve of the soldiers and sailors is largely given by training. It is not alone the capacity to draw on all the resources available that enables a man to rise superior, as we say, to an emergency, to mobilise forces which are not called upon in everyday life, but which are on tap. There is with it a consciousness of power, which comes from a knowledge of the machine and of its capacities, with a self-control which never for a moment loses grip of the wheel. In peril it is nerve which enables a man to act promptly and surely. A pilot 6,000 feet up who could swing with the right arm under his machine and do a bit of essential repair had nerve. I saw a surgeon open a big artery accidentally—a terrifying spurt of blood; a glance of the eye brought the assistant’s finger on the main trunk of the vessel, and the surgeon coolly turned, scrubbed his hands afresh, and very quietly gave the nurse directions to get ready the necessary instruments. No fuss or fluster; just the quiet nerve in control of the situation the nerve of knowledge. An extraordinary feature in the human machine is its reserve stores of energy. You cannot get 30 horse-power work out of a 20 horse-power motor, but you can change a 50 horse-power man into one of 100 or more. That is because we habitually work at only about 25 to 30
per cent. of our capacity—mental or physical. Take in illustration the most wonderful engine ever built—the heart; in not one of you is it working 25 per cent. of its capacity. Some years ago, at Columbia University, New York, I heard that American Socrates, William James, deliver a remarkable address on "The Energies of Men," in which he contended that our organism has stored up reserves of energy ordinarily not in use, but that may be called upon; deeper and deeper strata of material ready for use, on tap if we care to call upon it. Run a hundred yards, a sense of tire or fatigue comes, and we get short of breath—some of us would be pulled up at 50 yards—and if we go on there comes a moment when we feel we must stop; but force yourself, and something surprising happens. The sense of fatigue passes away, and we are able to go on—a man has got what is called his second wind, he has tapped a new level of energy. And there is the same phenomenon in mental states. Beyond the point of fatigue-distress may be found "amounts of ease and power we never dreamt ourselves to own—sources of strength habitually not taxed at all, because habitually we never push through the obstruction, never pass those early critical points." Our energy budget has really never been exploited. Kipling has the secret in a verse in the famous poem "If":—

If you can force your heart and nerve and sinew
To serve your turn long after they are gone,
And hold on when there is nothing in you
Except the Will which says to them "hold on."

As with the individual so with the nation. Nerve is a special trait of the Briton, who has always displayed a dogged determination and a capacity to hold
on, so well expressed in the lines I have just quoted. The nation, too, has its reserves of energy, upon which in the present trial we must call. We are standing well the change of gear. New and unthought-of levels of energy are available, on tap at will. We are being tried—like the crew of a submarine which has the nerve test applied—hatches closed, lights out, ballast tanks filled, and down she goes in the darkness. This is repeated day by day, and any man who shows signs of "nerves" is weeded out.

There is a state the very opposite of that of which we have been speaking, seen in man and nations, and best described by the word *nerves*, a word not in the dictionary. It is slang, but we all know the meaning, the unstrung state, the inability to get work, or the best work, out of the machine, a jumpiness and instability. A man may inherit a weak, irritable nervous system, another may spoil a good one with bad habits or bad training, or a good one may be shocked out of action by the blows of circumstance. In any case, the chauffeur loses control of the machine. How tragic are the cases of "nerves" returning from the front! A shell shock may knock a man out completely, hitting *central* in the big telephone system of his brain; dazed in mind, slow in speech and action, it may be weeks before control is regained. Or only a local group may be hit, the telephone girls in charge of hearing, or of speech, or of sight, or there may be nothing more than a jumpiness, with inability to concentrate in any effort, mental or physical. In addition there are scores of cases in which the condition has passed beyond the stage we can rightly call "nerves."

Unfortunately, it is not a matter for the individual alone. "Nerves" may attack whole communities. We
are all apt to be swayed by states of mind which are rarely associated with any clear consciousness of their causes. They may be nothing more than moods, but they spread like measles, or any other infection. What a contagion is fear, a state in which the nerves are unstrung. How its voice rings through history. The spirit of fear may come on a people like pestilence, and in the Middle Ages was responsible for that black record of witches and witchcraft. Waves of emotion play on man’s nerves as the wind on an Æolian harp.

Even strange bodily states may be induced, as in the mania of the Middle Ages, which sent the population of whole districts dancing wildly over the country. The herd instinct, so dominant in animals, is present also in man, and the psychology of the crowd has become a favourite study. In a great crisis like the present, we are all a bit surcharged emotionally. Feed a frog with small doses of strychnine, and to the slightest touch it responds with an unnaturally violent kick or jump. The daily dose of strychnine which we get each morning now at breakfast-table has made us a bit jumpy, and we, too, like the frog, respond to stimuli in a very abnormal way. We get “nervy,” and lose control of the machine. Judgment becomes difficult, and we are swayed by emotions that sweep over the crowd regardless of any basis in truth. We become weak-minded, and believe anything any Ananias says. Who would have dreamt that so early in the war there could have been so many liars in the country as the men and women who saw Russian troops! An instability of this sort leaves us easy prey to the Yellow Press. Think of the legless, armless, eyeless Belgians that crowded their columns—all had been seen by these perverts, few, if any, by the camera. What
a triumph of unstrung nerves was that matter of the war babies. Thousands of girls were pregnant in consequence of the conjunction of Mars with Venus in the last quarter of 1914. In one town of 18,000 inhabitants 2,000 were expected! It was gravely suggested that the workhouses should be converted into maternity hospitals. Oxford expected a huge crop, but the rate has scarcely reached normal! The "Liar" of Lucian should be reprinted and spread broadcast as the true model for these modern Cretans.

Collectively, we need steadying, more self-control, more cultivation of the will, which alone has the key to our reserves of unused energies. We should avoid everything that artificially stimulates, and so irritates the nervous system. It indicated a certain lack of nerve, an oyster-like flabbiness in the nation, not to have followed the King's example in the matter of alcohol. Nothing so weakens the will of the worker, of mind or of muscles, as leaning upon that Egyptian reed. Too much tobacco also increases the irritability of the nervous system, and many of our young soldiers smoke far more than is good for their hearts or brains. Another serious promoter of "nerves" is the combination of gossip, gabber, and gas which we have dealt out by the penny dreadfuls, and too often poured by people into our too willing ears. I wish we could catch and intern one person, a lying knave, an Autolycus, who flits from house to house, in most, alas! very welcome, called "a friend of mine." That appalling third person is responsible for apprehension and mistrust where confidence should reign, and very often for a limp, flabby public opinion instead of "nerve"—that well-strung state so needful for our final victory.
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INTENSIVE WORK IN
SCIENCE AT THE PUBLIC
SCHOOLS IN RELATION TO
THE MEDICAL CURRICULUM

BY

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Regius Professor of Medicine, Oxford.

INTENSIVE WORK IN SCIENCE AT THE PUBLIC SCHOOLS IN RELATION TO THE MEDICAL CURRICULUM.¹

By Sir William Osler, Bart., M.D., F.R.S.

Regius Professor of Medicine, Oxford.

Forty and more years’ experience with the finished article as turned out from your shops should give assurance of a knowledge on my part of your methods of work and endeavours. General impressions are rarely accurate, but it may be worth noting that a composite picture of the thousands of students who have left impressions on my mental films is one to be looked at with pleasure; and not without a feeling of gratitude to schoolmasters who have passed on so many men well fitted to study medicine. I do not say well prepared, but 99 per cent. have possessed the essential factor in a successful education, interest, a living interest in the subject. I am taking advantage of the honour you have conferred to urge that by a more intensive method of the study of the sciences,

¹ Presidential address delivered to the Association of Public School Science Masters on January 4th, 1916.
boys designed for the medical profession may leave your hands prepared to begin their special studies.

In a presidential address, and to this audience, a preliminary reminiscent note may be pardoned. As a boy I had the common experience of fifty years ago—teachers whose sole object was to spoon-feed classes, not with the classics, but with syntax and prosody, forcing our empty wits, as Milton says, to compose “Theams Verses and Orations,” wrung from poor striplings like blood from the nose, with the result that we loathed Xenophon and his ten thousand, Homer was an abomination, while Livy and Cicero were names and tasks. Ten years with really able Trinity College, Dublin, and Oxford teachers left me with no more real knowledge of Greek and Latin than of Chinese, and without the free use of the languages as keys to great literatures. Imagine the delight of a boy of an inquisitive nature to meet a man who cared nothing about words, but who knew about things—who knew the stars in their courses, and could tell us their names, whose delight was in the woods in springtime, who told us about the frog-spawn and the caddis worms, and who read to us in the evenings Gilbert White and Kingsley’s “Glaucus,” who showed us with the micro-

2 Rev. W. A. Johnson, Founder and Warden of Trinity College School Canada.
scope the marvels in a drop of dirty pond water, and who on Saturday excursions up the river could talk of the Trilobites and the Orthoceratites, and explain the formation of the earth's crust. No more dry husks for me after such a diet, and early in my college life I kicked over the traces and exchanged the classics with "divers" as represented by Pearson, Browne, and Hooker, for Hunter, Lyell, and Huxley. From the study of nature to the study of man was an easy step. My experience was that of thousands, yet, as I remember, we were athirst for good literature. What a delight it would have been to have had Chapman's "Odyssey" read to us, or Plato's "Phædo," on a Sunday evening, or the "Vera Historia." What a tragedy to climb Parnassus in a fog! How I have cursed the memory of Protagoras since finding that he introduced grammar into the curriculum, and forged the fetters which chained generations of schoolboys in the cold formalism of words. How different now that Montaigne and Milton and Locke and Petty have come to their own, and are recognised as men of sense in the matter of the training of youth.

I wonder how many of you have a first-hand knowledge of these great masters in your Israel. For a man who, as Montaigne says, has only nibbled upon the outer crust of knowledge in his nonage, and has only retained a
general and formless image, it smacks of impertinence to offer idle whimsies to a group of experts. I have a mental reflex when I meet a young man engaged in teaching, and almost involuntarily out come the questions: Have you read Milton’s “Tractate”? Do you know Locke’s “Thoughts”? Have you ever tried a boy on Montaigne’s classical diet? What do you think of Petty’s “Ergastula Literaria”? I know what he thinks of me at the close of a few minutes’ conversation! But seriously, who does not envy the happy issue of the noble experiment in education made upon the person of the great essayist, whose influence may be seen in the contributions of Milton and Locke? I was glad to read a few months ago the strong tribute paid by Sir Henry Morris (Lancet, September 18th, 1915) to these two great English reformers. May I for a moment in passing say a word or two about the fourth, Sir William Petty, whose “Advice . . . to Mr. Samuel Hartlib for the advancement of some particular parts of learning” touches us very closely to-day. It is interesting that it should have been addressed to the man—himself a great educational reformer—at whose request Milton published his “Tractate.” When written, the country was in the midst of civil turmoil, with a larger proportion of the population fighting than at any period in its history until the
present. The Universities were deserted, education neglected, and upon the old soil thus upturned Petty scattered the seed—to fall among thorns. Only in our day we have seen his three far-seeing propositions realised. Many of our schools are *ergastula literaria*, literary workshops, “where,” as he says, “children may be taught to do something towards their living as well as to read and write”; and he was keen that the children of the better classes be taught some “genteel manufacture in their minority,” and a delightful list is given. His *Gymnasium mechanicum*, or College of Tradesmen, is represented by our technical schools. Petty’s fertile mechanical genius foresaw the enormous advantage of such institutions in stimulating trades and inventions. “What experiments,” he says, “and stuffs would all these shops and operations afford for active and philosophical heads.” And what a wonderful design is his third institution—a *Nosocomium academicum*, “a hospital to cure the infirmities both of Physicians and patients,” a great scientific school for the study of disease and its cure.” Neither Montaigne nor Milton nor Locke had the wide national outlook on education displayed by Petty, who alone almost of his generation realised that the problems of natural philosophy, as it was then called, must be attacked in a systematic and co-operative
study by a group of men "as careful to advance the arts as the Jesuits are to propagate their religion." One cannot but regret that the Professor of Anatomy at Oxford, and the Vice-Principal of Brasenose College, should have been diverted to a turbulent and disheartening career in Ireland, and to-day the identity of the founder of English political economy and of public health statistics is merged in the author of the Down Survey, and the Beginner—to use Fuller's word—of a great family (Lansdowne).

To come now to the subject-matter of my address—the earlier and more intensive study of science at school to save time at the university.

For fifteen years the slowly evolving sprightly race of boy should dwell in a Garden of Eden, such as that depicted by the poet—no sense of any ills to come, no care beyond the day, buxom health, wild wit, the sunshine of the breast, the lively cheer—

The thoughtless day, the easy night,  
The spirits pure, the slumbers light.

During this blissful period a boy is an irresponsible yet responsive creature, a mental and moral chameleon taking the colour of his environment, very difficult to understand, often

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[^3]: Petty's "Advice" appeared in 1648 (4to, Lond.), and is also in vol. vi. of the "Harleian Miscellany." I hope to see this remarkable contribution to educational methods reprinted.
never understood by parent or teacher—yet, tied about his neck is a *clavis symphonia* with which anyone may unlock his heart and control his life. Rather an ideal sketch you may think, and doubtless Plato’s description fits better with your experience—“and of all animals the boy is the most unmanageable, in so much as he has had the fountains of reason in himself not yet regulated; he is the most insidious, sharp-witted, and insubordinate of animals.” What concerns us to-day is that about the fifteenth year there comes a change in this mysterious being—physical, mental, and moral. Consciousness that he is a man and has man’s duties is forced upon him, and repeating the tragedy of the Garden, he awakens to the knowledge of good and evil. It is fitting to mark this change with a change in his education. Plato did it. Following two three-year periods devoted to general and humane studies came the maturer pursuits fitting the young citizen for service in the State. My plea is to follow this plan, as for one profession at least it is most desirable.

At fifteen a boy should have had sufficient general education—the three R’s, a fair knowledge of the history and literature of his country, and in the public schools enough classics to begin a technical training and to pass the ordinary entrance examination. Now comes the fateful period in which the bent of
the boy's mind is determined. A difficulty exists in only a small proportion; a large majority have already selected careers, and the work of the sixteenth and seventeenth years should be determined by this choice, whether professional, commercial, academic, or the Services. The classical, modern, and scientific departments of the schools now meet these demands.

The profession of which I can speak is in a serious quandary. With the rapid development of science the subjects of study have become so multiplied that the curriculum is overburdened, and the five years is found to be insufficient. Men come up later, remain longer, and the twenty-fifth or twenty-seventh year is reached before the qualification to practise is obtained. A measure of relief to this heavy burden—and it is one not likely to lighten during the next decade—is in your hands. Devote the sixteenth and seventeenth years to the preliminary sciences—physics, chemistry, and biology—and send us at eighteen men fit to proceed at once with physiological chemistry, physiology, and anatomy.

To do this three things are needed: teachers, laboratories, and a systematic organisation of the courses.

I put the personnel first, as the man is more important than his workshop. Your society indicates the position which the science master
has reached in our public schools, not without long years of struggle. The glamour of the classics lingers, but the shock which the nation has had in this great war will make us realise in the future that to keep in the van we must be in the van intellectually in all that relates to man's control of nature. Science "Heads" at Winchester, Eton, and Harrow would give the death-blow to the old-time Anglican tradition so well expressed in a Christmas sermon by the late Dean Gaisford, that classical learning "not only elevates above the vulgar herd, but leads not infrequently to positions of considerable emolument." There is an initial difficulty apt to block good men, the fear of overburdened teaching, since it is not always possible for a school to pay an adequate staff; but the past twenty years have seen the whole situation changed. The posts have become more and more attractive and better paid, so that a definite career is now offered to able young men. Many original contributions to science made by the members have given a proper *caché* to the association, and, I may say, have added enormously to its intellectual status. Men feel proud to have as colleagues distinguished workers. Let us not forget that Priestley got his F.R.S. while a master at the Warrington Academy. The exhibits by members at this meeting indicate a fertility of invention in the highest degree creditable.
Brains, not bricks, should be the school motto in the matter of laboratories. A young Faraday in a shed is worth a dozen scientific showmen in costly buildings with lavish outfits. The accommodation, I am told, is at present ample in the larger schools. I have, indeed, seen laboratories which the most up-to-date college would envy. In the smaller schools it has not always been easy to get either the men, the space, or the equipment for teaching all the branches, and if an attempt is made to give earlier and more intensive science teaching there will have to be improvement all round.

The real crux is not with men or with buildings, but so to organise the teaching of the school as to have a continuous science course through two years. What is done now occasionally by the individual, I should like to see done by all the science men coming up to the universities or to the medical schools. A few men take the preliminary scientific subjects on entering Cambridge. Though possible, this at Oxford is rarely done; indeed, the examination is not at a suitable time! For some years now I have watched the results of the chemistry "prelims" at Oxford, and have consulted with many examiners, and I am sorry to say that the opinion usually expressed has been that in this subject the teaching in the schools is not yet up to college standards.
Here is where my appeal comes to the school authorities. Give us the boys of the sixteenth and seventeenth years for well-organised thorough courses in biology, chemistry, physics, and the associated mathematics. You have the teachers and the “plant.” Think what could be done with a class of bright boys in two full years, who had nothing else to do. No, I would let them have two other subjects, French and German, taught à la Montaigne, by making the boys use elementary French and German text-books. With reading clubs, Selborne clubs, and historical clubs, conducted by the boys themselves in the laboratories, the literary side of their education would be continued, and a sympathetic teacher would not be above putting a little English polish on, say, a short essay on Lavoisier. Judiciously mixed, chemistry through two years, biology through two, and physics in one—how I envy the teachers, how I envy the taught! A full year would be gained, as the two spent at the school in science would be the equivalent of the one now spent upon the preliminary subjects after entering the medical school. It would indeed be possible to allow those who came up to a certain standard to cut off the fifth year. By shortening vacations, and rearranging methods of instruction, we could return to a four-year curriculum. Practically that is what it is
now, as a majority of men spend the first year in preliminary sciences, to teach which is really no business of the medical schools. With this arrangement the average man could qualify at twenty-two years of age, spend a year in hospital or at post-graduate study, and start in "life" at twenty-three. We are now losing valuable time and wasting much needed money. What a present to make to our young men—two full years! It is worth while; and it can be done, and should be done.

My colleague, Prof. Arthur Thomson, has suggested that during the present emergency special arrangements should be made to pass on the boys at an earlier age, with their chemistry and physics well in hand. The plan I urge would make a radical change in the constitution of some schools. Not that science is not taught and well taught, but it should be given its proper place, as the dominant partner in the educational family, not a Cinderella left in the kitchen. From an intellectual standpoint the advantages are obvious. The mental exercise of the physical and mathematical sciences, combined with the technical training in the use of apparatus, gives a type of education singularly stimulating to boys. How many of our great inventors have lamented colourless careers at school! Things, not words, appeal to most boys. What an evolution of mind and hand is wrought by
a year in a well-conducted physical laboratory. The fascination of making and fitting the apparatus, the wonders of electricity, and the marvellous laws of heat and light—into this new and delightful world a boy of sixteen may pass safely for a thorough training. Only it must not be a mere dabbling, to which the physical laboratory too often lends itself, but a serious day by day, week by week, gradual progress. The senior boys could keep their knowledge of the subject fresh by acting as demonstrators in the junior classes. Many lads show an extraordinary aptitude for physics; there is always a boy Pascal in a big school, and no subject is so suited to arouse a fervid devotion to science. It would do the nation great good to have each generation, at the sixteenth or seventeenth year, pass automatically through a laboratory of physics.

I have spoken of the doubts expressed whether chemistry in the public schools can be taught at a college level. Of course it cannot as a subsidiary subject, to which only a few hours a week are devoted, but in a course extending over two years, as a major subject, with laboratory work four or five mornings a week, surely a youth in his sixteenth and seventeenth years should be able to put in the foundation stones, and in individual cases it is done already. As a mental discipline chemistry almost rivals physics; indeed, the
new physical chemistry is a blend which appeals with magic potency to all science students.

But no subject attracts the young mind so strongly as biology, in its varied aspects. Elementary teaching is now admirably arranged, and in a two-year curriculum it should be an easy matter to cover much more ground than in the preliminaries demanded for medicine. Field classes in botany, gardens, museum work, should all be utilised. I would like to see at every school that excellent plan adopted by the late Sir Jonathan Hutchinson at his village museum, Haslemere—nature lectures on Sunday afternoons, with exhibition of the flowering plants of the season, with any other specimens of interest. The biology class gives an opportunity of a clear statement of the facts of sex, always so hard to discuss with boys.

There are objections, of course, to extensive and intensive teaching of science in schools. It is the business of the college, not of the school, to prepare boys for technical studies; but if it is the business of the school to teach science at all, why not teach it thoroughly? The general influence of the school may be trusted to counteract the evil possible in a too early concentration upon special subjects. Nature is never special, and a knowledge of her laws may form a sound Grecian founda-
tion upon which to build the superstructure of a life as useful to the State, and as satisfying to the inner needs of a man, as if the groundwork were classics and literature. The two, indeed, cannot be separated. What naturalist is uninfluenced by Aristotle, what physician worthy of the name, whether he knows it or not, is without the spirit of Hippocrates. It has been well said that instruction is the least part of education. Upon the life, not the lips, of the master is the character of the boy moulded; and doubtless the great master of masters had this in mind when he said: “It may be, in short, that the possession of all the sciences, if unaccompanied by knowledge of the best, will more often than not injure the possessor.” (Plato, “Alcibiades,” ii.)
At the command of Prospero, the authors of the one and a half millions of books and manuscripts that rest in and beneath these historic buildings would arrange themselves in three groups—creators, transmuters, and transmitters. The first would not crowd the benches of this school; for the second it would be easy to find accommodation in the city; while the third would swarm black over Port Meadow and 'the soft, low-lying Cumnor hills'. So restricted is the intellectual capital of the race that it goes easily on the seven-foot shelf of President Eliot's (of Harvard) library. The vast majority of all books are dead, and not one in ten thousand has survived its author. Like the race of leaves the race of books is. The Bodleian is a huge mausoleum. Books follow a law of nature. Thousands of germs are needed for the transmission of an individual of any species. In the case of the salmon only one in a thousand is fertilized and of these not one in a thousand reaches maturity. So it is with books—a thousand or more are needed to secure the transmission of a single one.
of our very limited stock of ideas. Were all the eggs of all
the salmon to reach maturity the sea could not contain
this one species, while the world itself could not contain
the books that would be written did even one in a thousand
transmit a fertile idea. It is enough, as some one has said,
if 'every book supplies its time with a good word'.

In the days when Sir Thomas Bodley concluded to set
up his staff at the Library door at Oxford, there lived in
this country the last of the great transmitters, Robert
Burton; the first of modern transmuters, Francis Bacon;
and the greatest of the world's creators, William
Shakespeare.

Emerson's remark that 'every book is a quotation' is
true in a special sense of the encyclopaedias and dictionaries
that first unused on our shelves. From the huge tomes
into which, at the behest of St. Louis, Vincent of Beauvais
in the thirteenth century boiled down all knowledge—the
earliest edition we have in Bodley weighs above one cwt.—
to the last issue of the *Encyclopaedia Britannica*, writers have
striven to transmit the stores of human knowledge. Such
'systems' have their day and then cease to be. The
individual fares better than the encyclopaedia, but not often.
The Discoveries of Ben Jonson, a timbered mosaic, so
skilfully designed that even the glue is invisible, is dead.
No one now reads the *Sylva Nuptialis* of Joannes
Nevizano, a mere string of quotations; few have even
heard of the *Zootomia* or *Moral Anatomy of the Living by
the Dead*, by Richard Whitlock—though he was a Fellow
of All Souls; or of scores of the sixteenth- and seventeenth-
century patchworks. Only the golden compilation of
Robert Burton lives, and lives by the law so well expressed
in the lines:

    Sappho survives because we sing her songs,
    And Eschylus because we read his plays.

The silent, sedentary, solitary student (as he terms
himself) in the most flourishing college of Europe, augu$tissimo Collegio, with Saturn lord of his geniture, to relieve a gravidum cor, swept all known literature into a cento. No book was ever so belied by its title as the Anatomy of Melancholy. In reality the anatomy of man in all possible relations it is easy to read the secret of its salvation. The panorama of human life is sketched in broad, firm outlines by a man of keen humour and kindly satire. Though page after page is laden with what Milton calls ‘horse loads of citation’, the golden links are of Burton’s own fashioning. Even the dry bones of bibliography come to life as he pours out a torrent of praise upon the ‘world of books that offers itself in all subjects, arts and sciences to the sweet content and capacity of the reader’. Except Shakespeare, no writer has realized more keenly that all thoughts, all passions, all delights, and whatever stirs this mortal frame, minister to the one great moving impulse of humanity. It is not a little surprising that from a student of Christ Church, an old bachelor, and the Vicar of St. Thomas the Martyr, should have come the most elaborate treatise ever written upon love. There is no such collection of stories in all literature, no such tributes to the power of beauty, no such pictures of its artificial allurements, no such representation of its power of abasement. The thoughts and words of more dead writers are transmitted to modern readers by Burton than by any other seventeenth-century author. That the Anatomy is not in the cemetery of dead books is due to the saving salt of human sympathy scattered through its pages. Burton comes within the net of the Baconians, but it was much discussed by the late Mr. George Parker, of the Bodleian, and Mr. M. L. Horr of Denver whether it was not more likely that he wrote the plays of Shakespeare.

1 ‘Who wrote Shakespeare?’ by ‘Multum in Parvo’ (M. L. Horr), from the Denver (Colorado) Tribune-Republican, 1885. 4 pp. (In Bodley.)
The melting-pot of the transmuters has changed the world. They have been the alchemists at whose touch the base metal of common knowledge has been turned to gold. Among them Francis Bacon takes a high place, not so much for his inductive philosophy, really a new creation, as for the convincing demonstration that the relief of man’s estate was possible only through a knowledge of the laws of nature. A great transformer of the mind, he realized, as no one before had done, that ‘within the reach of the grasp of man lay the unexplored kingdom of knowledge if he will be but humble enough, and patient enough, and truthful enough to occupy it’. With a Pisgah-sight of Palestine, he lacked the qualities of a Joshua to enter himself upon campaigns of conquest; but he was one of the world’s seers with a vision of the possibility of man’s empire over nature. The singularly human admixture of greatness and littleness was in his works as well as in his life.

History repeats itself. Greek philosophy, lost in the wandering mazes of restless speculation, was saved by a steady methodical research into nature by Hippocrates and by Aristotle. While Bacon was philosophizing like a Lord Chancellor, two English physicians had gone back to the Greeks. ‘Searching out nature by way of experiment’ (’tis Harvey’s phrase), William Gilbert laid the foundation of modern physical science, and William Harvey made the greatest advance in physiology since Aristotle. Reeking not his own rede Bacon failed to see that these works of his contemporaries were destined to fulfil the very object of his philosophy—the one to give man dominion over the macrocosm, the world at large; the other to give him control of the microcosm, his own body. A more striking instance of mind blindness is not to be found in the history of science. Darkly wise and rudely great, Bacon is a difficult being to understand. Except the Essays, his
books make hard reading. In the *Historia Naturalis*, a work of the compiler class, one would think that a consideration of Life and Death would so far fire the imagination as to save an author from the sin of dullness. Try to read it. A more nicely tasteless, more correctly dull treatise was never written on so fruitful a theme. There is good sense about medicine and nature, but with the exception of the contrast between youth and old age, which has a fine epigrammatic quality, the work is as dry as shoe-leather, and the dryness is all his own, as other authors are rarely quoted. Only a mollusc without a trace of red marrow or red blood could have penned a book without a page to stir the feelings and not a sentence with a burr to stick in the memory. Bacon students should study the lengthy consideration given in it to the spirits, and then turn to Schmidt’s *Lexicon* to see how very different in this respect are the motions of Shakespeare’s spirit. The truth is Bacon had in a singular degree what an old Carthusian (Peter Garnefelt) called ‘the gift of infrigidation’.

What a contrast when a Creator deals with Life and Death! The thoughts of the race are crystallized for ever. From Galen to Laurentius, physicians have haggled over the divisions of the ages of man, but with a grand disregard of their teaching. Shakespeare so settles the question that the stages are stereotyped in our minds. We can only think of certain aspects in terms of his description. The vicissitudes of every phase are depicted. The shuddering apprehension of death we can only express in his words.

The transmuters have given to man his world dominion. The raw ore of Leucippus and Democritus has been refined to radium by Crookes, Ramsay, and the Curies; the foundations of Krupp are laid in the *De Re Metallica* of Agricola; the defenders of Verdun use the expanded formulæ of
Archimedes and Apollonius; Lamarck and Darwin, Wallace and Mendel are only Anaximander, Empedocles, and Lucretius writ large; Poppy, Mandragora, and other drowsy syrups had been in use for centuries to make persons insensible to pain, but the great transmutation did not take place until October 16, 1846, when Morton demonstrated at the Massachusetts Hospital the practicability of aether anaesthesia; Pasteur, Koch, and Lister are Varro, Fracastorius, and Spallanzani in nineteenth-century garb. Only by the labours of transmuters has progress been made possible, and their works will fill the shelves of the concentrated Bibliotheca Prima of the future.

Whether the benches of this school would seat the members of our third group, the creators, would depend very much on the judgement of Prospero. Thus to Harvey claiming admission, he might say, 'You simply took the idea of a movement of the blood which had been current knowledge since Solomon, and by experiment demonstrated a motion in a circle and not by ebb and flow'. And this is true. Without Aristotle, Galen, and Fabricius there would have been no Harvey. Transforming their raw ores by methods all his own, he made the De Motu Cordis, 1628, a new creation in the world of science. Not by the material, not by the method of its manufacture, but by the value of the finished product is the author's position to be judged. In Science the best transmuters have been the fruitful creators. The same law holds in Art and in Literature. The Alchemy of Shakespeare made him a great creator. 'Self-school'd, self-scann'd, self-honour'd, self-secure,' in heaven-sent moments he turned the common thoughts of life into gold. From Carlyle and Emerson, the teachers who stirred our hearts, the youth of my day had a final judgement upon Shakespeare. After the two noble knights of literature ¹ have spoken, it will be safer for

¹ Sir Walter Raleigh and Sir Sidney Lee.
a layman to express his feelings in the words of one of these masters:

What point of morals, of manners, of economy, of philosophy, of religion, of taste, of the conduct of life, has he not settled? What mystery has he not signified his knowledge of? What office, or function, or district of man's work, has he not remembered? What king has he not taught state? What maiden has not found him finer than her delicacy? What lover has he not outloved? What sage has he not outseen? What gentleman has he not instructed in the rudeness of his behaviour?—Emerson, *Shakespeare; or the Poet.*

Five thousand volumes in Bodley testify to a vast dominion unequalled in the history of literature. Once before in the world a poet held all the thoughts of his race. From Plutarch and Lucian we can judge how an educated Greek was really constrained to express himself in Homer's words. Such universality is to-day the prerogative of Shakespeare:

All pains the immortal spirit must endure,
All weakness which impairs, all griefs which bow,
Find their sole speech in that victorious brow.

As a little needful leaven and just to indicate the very present help he may be in these troublous times, let me quote Hotspur—any officer to any wife:

And, to conclude,
This evening must I leave you, gentle Kate. I know you wise; but yet no further wise Than Harry Percy's wife: constant you are, But yet a woman: and for secrecy, No lady closer; for I well believe Thou wilt not utter what thou dost not know; And so far will I trust thee, gentle Kate.

The exhibition which Bodley's Librarian and his Assistants have arranged with such care and the many
celebrations the world over will have one good effect—a heightened appreciation of the value of Shakespeare in the education of the young. In life’s perspective we seniors are apt to resent that the rising generation should work out its own salvation in ways that are not always our ways, and with thoughts that are not always our thoughts. One thing is in our power, to admix in due proportions with their present somewhat rickety bill of fare the more solid nourishment of the English Bible and of Shakespeare.
Annual Oration
ON
THE CAMPAIGN AGAINST SYPHILIS

Delivered before the Medical Society of London, May 14, 1917

BY

SIR WILLIAM OSLER, BART., M.D., F.R.S.
REGIUS PROFESSOR OF MEDICINE, OXFORD.

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MR. PRESIDENT AND GENTLEMEN,—With the flotsam and jetsam of the sale-room there came to my library the other day a book for the times, with the title "A Discourse of Constancy ... written in Latin by Justus Lipsius, Containing Comfortable Consolations, for all that are afflicted in Body, or Mind. London. 1654." To have known of the "Discourse" through two admirable articles by Basil Anderton, of Newcastle, gave an added welcome to Humphrey Moseley's 12mo. "in the original state."

In the dialogue the two friends discuss the miseries of the age, which had made the Low Countries almost as desolate as they are to-day, and the great Louvain Professor a homeless wanderer. To the despairing Lipsius his friend urged that "equal calamities and far greater had already fallen on the race," and that after all it was the lot of man, his destiny, and that cities and people owe their ruin "by Commission of Providence." As a tonic to their constancy they rehearse through many chapters the wonderful slaughters, the strange cruelties, the plagues and famines and rapines; and the conclusion reached was that Good comes out of Evil, and that the righteous are never forsaken. Having accepted this comfortable consolation, hard for us to read anywhere except on the title-page of the book, our neo-Stoical friends went to dinner!

THE CONQUEST OF THE GREAT INFECTIONS.

The past three years have seen the slaughter of man by man on a scale heretofore unknown except in the lively imagination of the Chronicler of the Kings of Israel. On the

1 A Stoic in his Garden, and Justus Lipsius. The Library, 1915 and 1916.
illustrated title-page of the little book, Fate and Necessity
beam from the sky dispelling the clouds and mist, and the
light of Providence shines on the figure of Constantia. To
us in these dark days comes a consolation denied to Lipsius and
his friend. They did not realise as we do, that it is Apollo,
not Mars, who slays most in war, that nature in the form of
disease is more fatal to man than man with his weapons.
The needless deaths of Peace far exceed those of the most
disastrous wars. More people died of plague in two years
in India than have been killed on both sides since the great
war began. In 1915, while nine of our soldiers abroad died
every hour to save their country 12 babies died at home
in the same time, to the scandal of their country.

The knowledge of nature's laws has enabled men to devise
really magnificent ways of wholesale butchery; yet with a
delicious inconsistency the same knowledge has taught him
the science of her ceaseless warfare through disease, and
has enabled him to win the greatest victory in the history of
humanity. Even in war time man displays just as much
hostility to a hostile nature as he does to the enemy in the
field. Bitter experience has shown him that disease is more
fatal than powder and shot. The new knowledge has enabled
him for the first time to reverse the ratio between bacilli and
bullets. Full details are not to hand for the Allied Forces,
but we know that the destructive pestilences have played a
minor, not as heretofore the major, rôle. And it has been
the same in the German armies in which the deaths from
disease have been about 1 to 15 killed and died of wounds.

The story of the conquest of the great infections is the
brightest single chapter in the history of science. The
humanitarian aspect appeals to our better feelings, and
hopes for the betterment of the race have been centred
about health and homes and habits. There is a fly in the
amber of course, and the vision is blurred (narrowed, indeed,
to darkness!) as one looked in two directions—towards cancer
and towards venereal disease. In choosing a subject for my
address I could not let the opportunity slip of lending the
weight of this ancient and honourable society to anything I
might say upon the great awakening that has taken place
with regard to syphilis and gonorrhœa. Among infections
they stand alone. Against all others man wages a keen
warfare. They present the remarkable and subtle combina-
tion of man and nature in an incessant and successful
propaganda against the health of the nation. The report by
Dr. R. W. Johnstone to the Local Government Board, 1913,
and the report of the Royal Commission embrace every
aspect of the question.
Statistical Data.

I propose to touch upon only two points—the importance of the enemy and the possibility of a successful campaign. I had the inestimable advantage of early professional association with a hero-worshipper. Dr. Palmer Howard, my teacher and for ten years at Montreal my revered colleague, was a man of keen intellectual attachment. Wide-awake when the dawn appeared, he saw with remarkable clearness the immense possibilities of preventive medicine under the guidance of such men as Chadwick, Budd, Simon, Farr, Ward Richardson, Buchanan, and Russell. When not talking of Bright and Addison, of Stokes and Graves, he was lauding these men, their ways, and their works. Important literary events were the arrival of Dr. Farr’s Report and the Report of the medical officer of the Local Government Board, as they furnished ammunition for the year, and it was my privilege, if not always my pleasure, to dig out statistics of the various diseases or to abstract some special article. This, you may think somewhat irrelevant, statement is preliminary to an excursion I am about to ask you to make with me, not over uncharted waters, but through the familiar pages of the Registrar-General’s Report—the just-issued volume for the year 1915. Custom has not made stale the awe experienced in the contemplation of its long rows of figures, the mystery of the position of the dots, and of such new expressions as standardized rates. And let me add a warning. No author of my acquaintance has been so uniformly unhappy as myself in dealing with statistics. And I have tried so hard! But there is scarcely a percentage in my Text-book that has not been challenged, and corrected, from various sources more than once. Like Lucian, then, in introducing his Vera historia, it may be well to solicit at the outset my hearers’ incredulity.

The first thing to arrest attention in Sir Bernard Mallet’s big Blue-book is the absence of all reference to venereal disease in the “Review of the Vital Statistics for the Year 1915,” by Dr. T. H. C. Stevenson. Of 18 causes of death specially discussed, all but three belong to the infections, of which tuberculosis, pneumonia, and cancer head the list—not a word about syphilis! For the report of 1912 Dr. Stevenson prepared a special discussion for the Royal Commission on Venereal Disease, and the difficulties of the whole subject, from the statistical standpoint, were exposed. The truth is, syphilis has been, and remains, the despair of the statistician. Trustworthy data are not forthcoming. Even in death a stigma is associated with it, and the

2 I put cancer with the infections to use its mortality rates.
returns are everywhere but under the special caption of the disease itself. Among the 11 causes of infant mortality during the first year syphilis is not mentioned, though on p. xxii. it is twice alluded to casually—the only place in which the word occurs in the 46 pages of the review! This is no reflection on Dr. Stevenson who works with material furnished by the profession.

Where, then, do venereal diseases appear? At p. 142 (International List No. 37) syphilis is stated to have been responsible for 1885 deaths at all ages, and other venereal disease for 61. Not a very heavy bill, and of the 1885 deaths, 1162 were under a year, 1277 under five years. Of the ten best killers among the infections (exclusive of the motley group of diarrheal diseases of children) syphilis comes last. In order of potency they are (I give the round numbers), tuberculosis, 54,000; pneumonia, 49,000; cancer, 40,000; measles, 16,000; influenza, 10,000; whooping-cough, 8000; diphtheria, 6000; scarlet fever, 2400; cerebro-spinal fever, 2000.

Reduction of Typhoid Fever.

But, Mr. President, I cannot pass these dry figures without a digression. To find syphilis among the ten great infections may cause surprise, but this is nothing to the astonishment at the absence of what has been in so-called civilised countries the very David among infections, typhoid fever—a paltry 1400 deaths! a rate of 35 per million. For 40 years physicians everywhere have consulted these reports for the statistics of this disease as the sanitary index of the most sanitary country in the world. Where and how was this great victory won? Where do you suppose? In a Government office—of all places! At the Local Government Board—of all places! and by a group of Government officials—of all men! by Simon, and his successors! Staff work, team-work, organised administration, have solved one of the greatest of the problems of public health.

To realise the magnitude of the victory one must have lived and moved and worked year by year in typhoid-stricken countries—helpless and hopeless without proper sanitary laws, or without the power to enforce them. To have succeeded within the memory of some who hear me in reducing the mortality of typhoid fever from between 700 and 800 per million living to the low figure 35 per million is one of the decisive battles of humanity. Conditions in this country have become so healthy that even with hundreds of thousands of recruits at the most susceptible age concentrated in camps the death-rate from typhoid disease has been the lowest in our history—and there is the added triumph of an enteric-free army in France. Inocula-
tion has done much; but the conquest of enteric fever in this country was won by honest sanitation, carefully directed from a centre by experts, and by Government experts.

Mr. President, here, if ever, we may say with Simonides, "The State is a man's teacher," and for the benefit of the timid Ionian individualist we may add Plutarch's comment—that this lesson is only learned through many a bitter struggle and experiences. The immediate purpose of this digression will appear later in my address. Let us now return to the report.

**GONORRHEA AND RACE CONSERVATION.**

Content at this stage the superficial reader will have a very erroneous idea of the position of venereal disease in the nation's life; but before going deeper into its pages let me recall a few pathological and clinical details. Among the infections gonorrhoea and syphilis stand out as the great race poisons. No other germs act in precisely the same way. The gonococcus is not a great destroyer of life; the figures given for 1915 convey the truth, only some 61 deaths. This tallies with clinical experience, as the fatal complications are very rare. But the gonococcus is the greatest known preventer of life—in fact, one of its cruel properties is to sterilise a very considerable proportion of its hosts. To realise the ravages of gonorrhoea, do not consult the Blue-books or the text-books, but study the reports of the gynaecological clinics and hospitals for diseases of women. As high as 25 per cent. of the major operations may be for gonorrhoea complications, which are among the commonest sources of chronic ill-health. Conservative estimates place the percentage of sterility in women due to gonorrhoea at 50. A large majority of these women are innocent victims of infection, often innocent infection, by husbands who thought themselves free from all traces of what they regarded as a harmless indiscretion of youth, and who could have been cured under a proper system of control treatment. Then the complicating epididymitis in the male is a common cause of sterility. One recalls the dictum of Neogerrath—the founder of our modern knowledge of gonorrhoea in the female—90 per cent. sterile women have husbands who have had gonorrhoea.

From the standpoint of race conservation gonorrhoea is a disease of the very first rank, and costs the country annually thousands of lives. With 30 to 40 per cent. of all the cases of congenital blindness, with the chronic pelvic mischief in women, and with the unhappiness of sterile marriages—with these and many minor ailments scored up against it, we may say that while not a killer, as a misery producer Neisser's coccus is king among the germs.
SYMPHILIS.

The spirochaete of syphilis is easily the most notable among germs. A protozoon—it is the only protozoon, indeed, it is the only germ of world-wide dominion, irrespective of race or clime. From its well worked out biology, just two points suffice for our present purpose. The first, in some ways the most important single feature in its history, is the frequency of the transmission from parent to child. Congenital tuberculosis—how rare! Congenital pneumonia—unknown!—in fact, a killing transmission in the great infections is very rare. In syphilis it stands out less as a biological peculiarity than as a fact of supreme importance in the national health. The spirochaete may kill the child in utero, a few days after birth, or within the first two years of life, or the blighted survivor may be subject to innumerable maladies.

Stillbirths.

The stillborn are at last to be numbered. Until now they have remained the "hidden untimely births," to use the language of Job. Sir Arthur Newsholme estimates them at close upon 100,000. What percentage of these deaths are spirochetal we do not know. This we do know, that syphilis is perhaps the most common cause of abortion, and that in examinations which have been made in large maternity hospitals more than 25 per cent. of the stillborn have been found infected. In this stage of big figures we can afford to be liberal, so let us reject the 80, or even the 50, per cent. of some estimates and let us put the "untimely hidden births" due to syphilis at 25 per cent. and tally them at, say, 20,000 for the year 1915.

Have we any data to justify these figures? I have looked through a great deal of literature, and was not a little pleased to find from my old hospital by far the most satisfactory information. Let me state that the obstetrical department of the Johns Hopkins Hospital was begun in a very quiet way. We put a good man in charge, Dr. Whitridge Williams, who has had first-class assistants, whole-time men, and a method of teaching which has enabled him to get a great deal of work out of his students. The result has been the output of valuable knowledge and the collection of a body of experience which bears directly upon the question before us. Of the first 10,000 cases in the clinic there were 705 foetal deaths—i.e., from the

seventh month on—7.05 per cent. In all cases the placenta was examined as well as the foetus. "By far and away the most common etiological factor in the producing death in the foetus is syphilis," responsible for 26.4 per cent. in the series. This, too, is a low estimate, as at least 53 of the 127 macerated foetuses were probably syphilitic, though this could not be determined microscopically. I purposely refrain from quoting the statistics, also of 10,000 cases, of the Sloan Maternity, New York, from which the syphilitic are excluded. The small but very thoroughly worked out details of 500 cases by Dr. Slemons, of Yale Medical School, give 26 per cent. An investigation is in progress in London for the Local Government Board, and I am allowed to quote the figures to date, which give only 44 positive cases in 300—a much lower percentage than I have found elsewhere. A 20 per cent. estimate would, I think, be reasonable.

Infantile Mortality.

In 1915, of 800,000 children born, 90,000 died within the first year, the lowest number yet recorded. Add this heavy loss to the intra-uterine deaths, and it makes stock-raising for the human animal a very poor business. I have no time to discuss (but I may offer congratulations on) the efforts to lower this early death-rate by Mr. Broadbent, of Huddersfield, and by his colleagues in the great child-saving work they are doing for the nation. The reports on the physical welfare of mothers and children by Dr. E. W. Hope and Dr. Janet Campbell, just issued by the Carnegie United Kingdom Trust, will prove a boon and a blessing to sanitary workers.

Of what did these 90,000 children die? First let us note that about one-fifth of these died within the first week and a fourth within the first month. Ten causes are mentioned: whooping-cough; other common infections; diarrhoea and enteritis; premature birth; congenital defects; atrophy, debility and marasmus; developmental and wasting diseases; tuberculous diseases; convulsions; bronchitis and pneumonia; and then other causes. Again, the interest in this list centres in what is not there! Shades of Fracastorius! Syphilis is not even mentioned! When I was a pathologist and physician to an infants' home, we did not have—nor did we need!—Schaudinn or Wassermann or Noguchi to tell us of what 95 per cent. of infants died during the first month. Jonathan Hutchinson and Parrot and Diday and Fournier had told us that. The Registrar-General cannot go behind his returns, but it is worthy of comment that in Dr. Stevenson's discussion on the causes of infant mortality syphilis is only mentioned twice (p. xxii.), and that casually. When we turn to the total deaths from syphilis then we do get light, as among the 1885 deaths 1162 were under 1 year,
1277 under 5 years, but these figures are far below the mark. Careful work is in progress to determine the number of deaths within the first year from syphilis, and we shall not be far wrong in placing the figure at between 15,000 and 20,000. Dr. Helen Y. Campbell, in charge of the Bradford Infants’ Clinic, reports for 1915 34·30 per cent. with the clinical features of syphilis among the 207 deaths in 3010 infants under one year.

WIDESPREAD MANIFESTATIONS OF THE SPIROCHÆTE.

The second point in the biology of the spirochæte is a peculiarity it shares with many other parasites of resting dormant in the body for years. As a rule such germs, even while retaining their virulence, do little or no damage. Not so the spirochæte, whose capacity to work evil is not to be measured by years. Since Schaudinn’s great discovery there is a sharper point to Sigmund’s oft-repeated aphorism, “Syphilis is the worm that never dieth.” *Venus impura* is a hard mistress. Venus of the long arm she should be called, as 10, 20, 30, even 40 years from the date of infection the book bills are rendered, and she wrings the uttermost farthing out of her poor victims. One plain outcome of all recent work is that the untreated or the half-treated syphilitic is a bad life. No insurance company to-day will take a man who has a Wassermann reaction. So widespread are the manifestations of the spirochæte in the body that there is truth in the paradox I was in the habit of telling my students, Study one disease, study syphilis thoroughly and you take a knowledge of all others on the way—general medicine, nearly all surgery, and certainly all the specialties.

But I see an incredulous look on some faces, and I hear the whispered comment—’tis heard often enough! “Where is all this syphilis? It does not come my way.” Yes it does. The syphilis we see but do not recognise everywhere awaits diagnosis, so protean are its manifestations. My colleague at the Johns Hopkins Hospital, Lewellys Barker, in a recent paper enumerates 19. A good test of the importance of a disease is to take the 37 volumes of the two series of the Index Catalogue of the Surgeon-General’s Library, Washington, in which is indexed practically all medical literature between 1830 and 1917. In Vol. XVII. of the second series issued in 1912 are 207 double-columned pages of reference, against 117 pages in Vol. XIV. of the first series in 1893. No other single disease except tuberculosis has so much space devoted to it.

Syphilis illustrates the truth of the axiom that “Men do not die of the diseases that afflict them.” Look up and down the columns on pp. 138–167 of the Report, and except in the

figures I have already given there is no reference to syphilis, and if from the 1885 deaths you take out 1277 before the fifth year, there is left the apparently comforting assurance of only 608 deaths among adults for the year 1915. Nothing could be more misleading.

The two-century-old conviction that syphilis was responsible for a great many internal disorders (Morgagni, 1761, and Lancisi, 1728) did not really bear fruit until the seventh and eighth decades of the last century. Fournier started the ball rolling; but it was the discussion on Erb's paper, "Syphilis and Tabes," at the 1881 London Congress that roused the profession. To the distinguished Heidelberg clinician, still more to the great syphilographer, Fournier, and to that model physician in mind and method, William R. Gowers, we owe the demonstration of the important part played by syphilis in the etiology of the chronic diseases of the nervous system. I remember the discussion as if it were yesterday, and I have re-read it with no little astonishment. And yet as the actual demonstration of to-day was lacking the clearest eyes saw but through a glass darkly and we must sympathise with an opposition which was able to bring so large a body of negative evidence against the new view. The evening after the discussion an interesting incident happened at Dr. Bristowe's house. Bouchard, Erb, and one or two others talked over the subject. Bristowe, who was a wavering, emphasised the point that many physicians had locomotor ataxia who certainly had not had syphilis. Turning to me he said: "Now our mutual friend X has surely not had it—he would have told me!" I felt sorry to have to say that I had seen our mutual friend on the continent under treatment with secondary symptoms!

The improved technique by which the spirochaete is demonstrated in the tissues and the serum reactions have opened a new chapter in our knowledge of the prevalence of the disease. The profession has read it with amazement, the sanitary authorities with bewilderment, but best of all the public is actually reading the chapter in the open!

**EXAMINATION OF REGISTRAR-GENERAL'S MORTALITY RETURNS.**

Let us see now what the Registrar-General can tell us about the book-bills of the Cyprian. Germs show singular preferences for different parts of the body—the tubercle bacillus for the lungs and lymph glands, the Plasmodium malariae for the blood, the lepra bacillus for the skin, and the Spirochaeta pallida for the nervous system and the blood-vessels. Of the 562,000 deaths in 1915 about 58,000 were due to diseases of the nervous system. Two of these need not detain us. Locomotor ataxia and general paralysis of
the insane are syphilis and account for 735 and 2263 deaths respectively. Now that is as much as we can say positively about the lists on pp. 146 and 148 of the Report, but let us take the other diseases in order.

A certain number of cases of meningitis are syphilitic, but they cannot be picked out from Class C—returned as "Other forms," numbering more than one-half of the total deaths from this disease. We may leave this out altogether. After locomotor ataxia comes "Other diseases of the spinal cord," 2846 deaths, a larger proportion of them in the fourth to the sixth decades. Any neurologist would say that a reasonable estimate would take at least one-half of these—say, 1500.

By far the largest single cause is cerebral hemorrhage—apoplexy—25,423, a majority of the deaths occurring after 50, beyond which age it is the privilege of any man to rupture a blood-vessel in his brain without suspicion. 3713 of these deaths were between the ages of 25 and 50, of which 3000 could be claimed as due to syphilis. "Softening of the brain" should long ago have gone into the limbo of unused terms with "rising of the lights," but there are 1472 returns under that caption; who could deny us 500 of these? The "Paralyses without specified cause," 2983 cases, is a hopeless section, but as more than two-thirds were hemi­plegia we could be given at least 500. That a certain proportion of other forms of mental alienation, 1100 deaths, were cases of G.P.I. is very probable. Judging from the studies of Leonard Finlay and of Fraser and Watson, epilepsy, spastic diplegias, and mental deficiency are common results of congenital syphilis. The extraordinary amount of latent neuro-syphilis in the community is well brought out by the studies of Southard and his colleagues at the Boston Psychopathic Hospital. From epilepsy, infantile convulsions, and "other diseases of the nervous system," which mount up to about 15,000, we could claim a couple of thousand at least. This gives us a total from this section of about 10,000 deaths in which syphilis is a probable cause of death.

The spirochæte attacks the vascular system in preference to all other parts, and many of the deaths noted as apoplexy and meningitis, &c., are really from blood-vessel lesions. Aneurysm, the first important internal disease to be attributed to syphilis, and the aortitis on which it depends are usually spirochætal. Between the twenty-fifth and the fifty-fifth years the cases are always spirochætal; in the young they may be embolic and in the aged atheromatous. Of the 1141 deaths we could put down 1000 to syphilis. There is a terrible bill opposite organic disease of the heart, 56,000 deaths. About 17,000 of these are between the ages

6 Journal of Mental Science, 1913.
of 30 and 55, and a majority of these are in men. Unfortu-
nately, valvular disease and the myocardial cases are not
differentiated from the others, nor the aortic from the
mitral. For reasons to be referred to later we shall be safe
in taking one-third of the cases between 30 and 55—say,
5000 at least—and we may take an equal number from the
10,000 dead of diseases of the arteries, atheroma and
aneurysm. A low estimate would put the cardio-vascular
deaths due to syphilis at above 10,000.

It is unnecessary to bring in the comparatively small
number contributed by other organs, the liver, lungs, larynx, kidneys. We have enough to put the grand total
of the ravages of the Spirochaeta pallida above 60,000, and to
move syphilis from the tenth place in the Registrar-General's
Report to which it belongs—at the top, an easy first among
the infections. Many years ago in the "Life and Death of
Mr. Badman," I came across Bunyan's phrase the "Captain
of the Men of Death," which "caught on" in the litera-
ture. In his day it may have been true of consumption; it
is so no longer; the headship in temperate climates belongs
undoubtedly to syphilis.

POST-MORTEM EVIDENCE.

It was not without reason, some of you may now think,
that I entreated my hearers' incredulity. There is a hazy
uncertainty about these figures, I admit, but we shall find
they are understated, not overstated. So impressed have
clinicians and pathologists been with the absence of clear-
cut evidence that in all parts of the world investigations are
in progress dealing with the incidence of syphilis in ordinary
hospital work. I cannot begin to quote all the papers, but
I may refer to a few just to make you feel less incredulous
about the character of my claims.

Dr. Warthin, one of the best known of American patho-
logists, whose technique is only equalled by his patience
and thoroughness, investigated the tissues in a series of con-
secutive post-mortems with the most scrupulous care to
determine the existence of the spirochæte. One-third of the
autopsies in adults showed its presence somewhere in the
organs. Of these 41 cases only 11 were known to have had
syphilis, 5 had active lesions in the nervous system, and 25
had shown no clinical changes suggestive of syphilis. In
36 there were syphilitic lesions in the heart (spirochætes
demonstrated), 32 in the aorta, 31 in the testicles, 4 in the
liver, and 6 in the adrenals. He concludes that interstitial
myocarditis, aortitis, and fibrous orchitis form a triad dis-
tinctively spirochætal. The material from which this study
was made represents an average intake of a hospital supplied

7 American Journal of the Medical Sciences, 1916.
largely from the country and from smaller towns of the State of Michigan. It would be interesting to repeat in one of the large London hospitals a similar study in 500 bodies, though the prolonged and tedious character of the work makes it almost impossible unless a special staff (after the war) could be appointed. It is the type of work that carries conviction, as the parasites are demonstrated in the lesions.

THE WASSERMANN REACTION.

The other method of inquiry does not carry the same weight. Not that the Wassermann reaction is not a satisfactory test of the presence of syphilis, but the technique is delicate and beset with difficulties that may vitiate the results. I will only refer, then, to studies made under the control of men I know, and with as great care as possible to perfection of the technique. C. H. Browning’s paper gives many details from English and Scotch sources.

My native country has a Conservation Commission which deals with everything from babies to beavers. I do not know the circumstances under which the Commission called for a report on the prevalence of venereal diseases, but they asked the members of the staff of the new Toronto General Hospital to undertake the work, and their report just issued (Jan. 17th, 1917) deals with all aspects of the problem. The point of interest here is that from 12 to 14 per cent. of patients admitted to the hospital show serological reactions characteristic of syphilis. In 60 per cent. of these persons the disease was not suspected. That the observations were made by Dr. Detweiler in the laboratory of Professor J. J. Mackenzie is a sufficient guarantee of the character of technique carried out.

The Brigham Hospital, Boston, is a new research hospital on the most advanced lines. Of 4000 patients examined by Walker and Haller, 600 had been infected—15 per cent. Here again the latent cases far outnumber the active. In Baltimore Dr. George Walker, a well-known specialist, examined 1080 patients, 10 per cent. of whom gave the reaction. Of 327 prostitutes, 67 per cent. were infected. Dr. John H. Musser, jun., reports that the examination of cases at the University Hospital, Philadelphia, gave 14 per cent. with the specific reactions for syphilis.

I know there are those who look askance at the results of the Wassermann reaction which has not, and does not claim, mathematical accuracy, and it is a test on which much depends in the personal skill and honesty of the pathologist.

9 Journal of American Medical Association, 1916, i.
10 Ibid., lxxvi., 1738.
These figures, from sources well known to me personally, may be trusted as far as one can with such slippery articles. Modern research everywhere leads to three conclusions: (1) that there is an immense body of latent syphilis in the community; (2) that a very large number of persons have not been thoroughly treated; and (3) that to the enormous groups of cerebro-spinal and cardio-vascular deaths syphilis is an all-important contributor.

**GROWTH OF CAMPAIGN AGAINST VENEREAL DISEASES.**

The discovery of the spirochete in 1905 gave an enormous impetus to the study of syphilis, while the improved treatment announced by Ehrlich in 1910 aroused hopes that at last—with the cause known and the cure assured—we had in our hands weapons for an effective fight. The public and its incorporated activities, the State, had persistently ignored its existence. Centuries of silence had made venereal disease taboo. Press and pulpit alike ignored the unsavoury subject. I doubt if the word syphilis occurs in the index of the *Times* until 1910, when a brief announcement of Ehrlich's discovery was made. Venereal diseases are rarely mentioned until the recent Commission, though, of course, a great deal of discussion took place upon the Contagious Diseases Acts. History repeats itself. Imperial Rome is said to have been one huge brothel, in which sexual diseases were rife, though whether syphilis was one of them we do not know. The bibliophile Jacob (Paul Lecroix, who is also Pierre Dufour of the great work on prostitution) calls attention to the hesitancy with which the Latin writers, medical and lay, refer to the *morbus indecens*, or, indeed, to any sexual disorder. To the rapid increase of venereal disease in them he attributes the appointment of State physicians by Nero.  

11 Recherches Historiques sur les Maladies de Venus, Bruxelles, 1883.

12 The question of the existence of syphilis in Graeco-Roman times has been re-opened with the proof of the presence of the disease in Europe before the discovery of America. I have asked Mr. Warde Fowler, the well-known authority in Roman social life, what he thinks of the bibliophile Jacob's statement. His reply is worth quoting:—"In my judgment the question depends on the evidence of Celsus entirely; all the rest which Jacob adduces is vague and indirect, and apt to give way when you probe it. For example, he makes a great point of slave doctors kept in big establishments, who would keep unpleasant diseases secret, and so on. I have looked up the evidence about these, and there is nothing more in it than that in a few very big establishments it was convenient to have a doctor on the spot, as in a big ship. The economy of those big households or farms was self-sufficing, in this as in other ways. And it was far from universal even in large farms, for Varro expressly says that farmers preferred to use the doctors of the neighbourhood. Again, he quotes St. Augustine for the Syrian luxury that came to Rome in the second century B.C., and jumps to the
The beginning of the twentieth century saw us in a condition of hopeless apathy. Within a decade what a changed attitude in profession and public! You, Mr. President, started the former by the issue of your six-volume "System of Syphilis," which has proved such a useful armoury. Dr. Johnstone's report was an "eye-opener." The Royal Commission appointed in 1913 gave practical expression to a realisation of the importance of the problem by the public. Best of all, Lord Sydenham's report has not been sterile, as is so often the case with Royal Commissions. The rapidity with which it fertilised the House of Commons is unparalleled in the history of even that prolific lady. An outcome, too, of the work of the Commission was the founding in 1914 of the National Council for Combating Venereal Diseases, the primary function of which is educational. Under the wise guidance of Sir Thomas Barlow the Council has provided accurate and enlightened information to the public, and has been a rallying centre for the various professional bodies interested in the subject. The work of the Eugenic Education Society under Major Darwin has been most helpful.

The outset of the great war has stimulated, not retarded, the plan of campaign. Since that memorable scene which shook the gods in Olympus with inextinguishable laughter Venus and Mars have been inseparable. War means an enormous increase in the number of infections. The last quoted figures for the British Army at home are (Hansard, April 23rd): 71,000 cases of gonorrhoea, 21,000 cases of syphilis, and 6000 cases of soft chancre. In the Canadian Army to March 31st, 1917, there have been 18,335 cases of venereal disease—figures which have stirred public opinion in the Dominions to the boiling point.

Conclusion that all kinds of evil diseases came with it. That may have been so, but it does not come out of Augustine's words; and I am pretty sure that if Augustine had wanted to say so, he would have said it without any scruple. But, on the other hand, supposing that the passage quoted from Celsus distinctly points to syphilis or something like it, the fact that there is no mention of such things in Roman literature would not be enough to damage Celsus's evidence. What survives of Roman literature is mostly clean and in good tone, and one would not expect to find any such allusion in it. The absence of any allusion in certain poems of Catullus, and in the great passage about love at the end of the fourth book of Lucretius, might suggest that one should be careful about interpreting Celsus, but would by no means be decisive. (I have just been over the Lucretius passage, and can find no trace of allusion to a morbus; and L. was very plain-spoken in such matters.) So I think that you must go by Celsus alone. Apart from him I should say there is no evidence of any weight, positive or negative." The difficulty with Celsus is a matter of interpretation. The lesions described are not necessarily sexual.
LEGISLATIVE ACTION.

Stricter prophylaxis should reduce these figures. I have had from Colonel Bradley, U.S.A., and Major Lyster, U.S.A., now stationed in England, the full details of the methods now carried out so successfully in the United States Army.

The annexed chart speaks for itself:

| Admis- | YEARS.—Lower line shows rates for enlisted force in the United States. Upper line shows rates for all enlisted force both in the United States and abroad. |
|———rion rates per 1000. |
| 175 |
| 150 |
| 125 |
| 100 |
| 75 |
| 1888 | 1891 | 1894 | 1897 | 1900 | 1903 | 1906 | 1909 | 1912 | 1915 |

1888-98.—During this decade the Army was stationed throughout the United States principally at small posts. No compulsory physical inspection; no systematic propaganda to reduce venereal disease. The rates represent practically those patients unable to do duty. Cases not treated or those doing duty were usually not recorded.

1898.—Spanish War. Militia called into service.

1898-99.—Great change in Army; marked expansion. Old soldiers disappear; volunteers come in. Young recruits sent to Cuba, Porto Rico, Philippines.

1899-1901.—Philippine Insurrection. Troops in Cuba, Porto Rico, China.

1901-03.—High rates prevail in United States and abroad.

1909-11.—Principles of preventive medicine applied; prophylaxis urged.

1911.—Syphilis increases. Wassermann test used in diagnosis.


1914-15.—Concentration on Mexican border.
Various stimuli, public and private, have had at last the desired effect. The Government felt that opinion in the country was strong enough to act on the advice of the Commission and hand over the venereal problem to the public health authorities represented by the Local Government Board. The most sensible single bit of evidence given to the Commission was expressed by the Hon. Miss Brodrick, a trained nurse, that we should deal with the disease "as if it were small-pox or scarlet fever, simply as a disease quite apart from the moral side." This is what the Government has done. Recognising the existence of the disease as a great menace to public health, legislation has been enacted to fight the enemy on a settled plan at many centres under the control of the Local Government Board. It is a new departure to deal with an individual disease in this way.

What a change a single word may effect! Tuberculosis, the white plague, is really a more hopeful disease to fight than syphilis. Though it has the same strong allies, poverty and drink, there is absent the complicating problem of prostitution. The word "may" instead of "shall" in the Tuberculosis Act gave us an ineffective guerilla warfare of local bodies for a Kitchener and a general staff. The Government made no mistake this time—shall is the word, and all over the country the clinics are in course of formation. Nurtured upon the Reports of the Local Government Board, I dwell with a purpose on the successful campaign which it had waged against typhoid fever. In that great warfare Sir John Simon was chief of staff, and the battle was won by able lieutenants who directed the actual fighting in various parts of the country. Read the story in his writings, and you will wonder how it ever could have been accomplished, against the opposition of Dogberries inside and outside the House. Had the country listened to Sir John Simon half a century ago, when he advocated the "urgent need of control of the public health by a responsible Minister of State," our arrears in infant mortality and housing would not now be so heavy. Still, let us be grateful to him and to his successors for all the good work that has been done.

**Establishment of Venereal Clinics.**

No more hopeful legislation has ever been enacted than the establishment of these venereal clinics, with which the country will be equipped, though not fully, for the battle. But let the people and their representatives realise that they are dealing with the subtlest foe of humanity and the greatest sanitary problem which confronts civilisation. A general staff, controlling the campaign, will work from the Local Government Board (or before long, let us hope, from
a Ministry of Health\textsuperscript{13)} with laboratory, statistical, and social service departments, a publicity bureau and a library. The centres will be units working with a single object, and the doctors, nurses, and social workers will be members of a great national army.

Already the Commission—for it is its work—has done what the profession has not been able to do in these long years—opened the doors of the general hospitals to these victims. The governors and trustees have lined up at last with the good Samaritan. There are many institutions in which an up-to-date scientific clinic with laboratories will be a great boon. The profession welcomes the scheme from the educational side, as there will be within easy reach opportunities for the study of all aspects of both disorders, and from the practical side they will be able to bring their patients freely for special treatment, for special consultation, and for the laboratory tests which are so essential. There will, I hope, be at each centre lectures and demonstrations as have been organised in Liverpool. A sympathetic and loyal feeling on the part of the practitioners in each district is really essential to the success of the work.

Between the clinical and the laboratory side there will be enough at each clinic to occupy a large part of the time of a male and female doctor, who will, I trust, become the skilled advisers of the profession and of the public in each district. It should be our business to make these positions sufficiently attractive to catch the very best, and I am sure the hospital authorities will welcome them warmly as members on the staff. In large cities they might well be whole-time positions, though I should prefer to allow their colleagues and the public to have the benefit of their ever-increasing experience. A great missionary field will be opened for women doctors, who should do the work among their own sex at the clinics.

\textbf{Education of the Public.}

Nowadays, in the hospitals the individual is studied and cared for, not solely his or her disease. Social workers of the right sort with the right spirit, the helpful sympathetic spirit which—

\begin{quote}
"Gently scans your brother man, Still gentler sister woman,"
\end{quote}

will do much to make the clinics known and appreciated. The National Council could very well supervise this work which should be done by carefully selected volunteers. The

\textsuperscript{13} The Waldorf Astor Report just issued, "The Health of the People: a New National Policy," should give a great stimulus to the unification of the many departments at present dealing with public health.
clinic should be the centre in each district of an active educational propaganda which should be stimulated and planned by the general staff, and not left to the timid discretion of the local authorities. By meetings, literature, placards—in every legitimate way—a knowledge of the dangers of venereal disease should be distributed, and the importance of early and thorough treatment insisted upon. The public lavatories, the toilet-rooms of restaurants, railway stations, hotels, and factories should be utilised in a crusade against advertising venereal quacks. The stage should be used actively, and such a play as Brieux's "Damaged Goods," while strong meat for the young, enforces on young men the lesson of the terrible risks better than the chapters in Proverbs or than any number of leaflets.

In every possible way the sympathetic coöperation of the public is to be sought. Get people to realise that it is a great communicable disease two-thirds of the victims of which are innocent, and much will be done to break down the present barriers of ignorance and false sentiment. For any legislation to be successful the people must be prepared. The problem bristles with difficulties, but the primary duty is to gain the confidence of the public and respect their feelings so far as they are consistent with the welfare of the State.

UNQUALIFIED TREATMENT.—NOTIFICATION.—COMPULSORY TREATMENT.

We are committed, then, to a campaign of education, and an elaborate scheme of treatment. Two circumstances make it probable that these measures—and a good beginning, let us grant—will not suffice in themselves to reach the enemy.

So deep is the stigma associated with the disease that patients avoid hospitals—even their family doctors—preferring quacks and others who promise a speedy cure. Legislation is in progress to prevent unauthorised treatment of the disease. The active sympathy should be sought of the 5000 men calling themselves herbalists, referred to by Mr. Hayes Fisher in the House. (Hansard, April 23rd, 1917.) I am sure the profession has no wish to interfere seriously with a calling which ministers to a thirst for "simples" so Gargantuan. These men have families and could be interested in public health; many of them are good botanists and of above the average intelligence. They know that syphilis and gonorrhœa are quite beyond the reach of herbs, and that even guaiacum—the holy wood—no longer avails.
To be successful in any fight the primary essential is to know where your enemy is placed. The Commission did not feel able to recommend confidential notification, nor does the new Act enforce it. Perhaps they were wise and knew their business better than some of us who advocate it. Realising as fully as anyone the strong arguments against notification, the gravity of the situation outweighs with me all private considerations, and I feel sure that within a year we shall be ready for the change. It works well, we are told, in Scandinavian countries, and it will be interesting to have the results from those Australian dominions in which it has been introduced.

Another point really more serious is also associated with notification. Both syphilis and gonorrhoea require protracted treatment. It is the partially or badly treated cases that come to us 10 to 20 years later with aneurysm or nervous breakdown. The primary symptoms are often so slight that it is impossible to get patients to continue a course of medication lasting a year or even more. Here is where the clinics will be on trial, and we shall watch their experience anxiously. I see reports from a Boston hospital at which 28 per cent. of the patients did not return, and to a New York venereal clinic 29 per cent. of the syphilitics came but once. To be successful in this fight we must have control of the patients—the treatment must be compulsory. It is so in the Army, from which the men with syphilis and gonorrhoea are not to be allowed to return to private life until a reasonable guarantee is given in each case of cure. If the House of Commons in any way represents outside opinion the public is a long way from appreciating the appalling risks they run. Though on the street to-day, the spirochæte may be in your home to-morrow. The very reasonable proposals of Captain Guest, Mr. Rawlinson, and Sir H. Greenwood (Hansard, April 30th), that sanitary and curative measures should be adopted in the case of persons, men and women, convicted of certain definite offences, was met by cries of ruthlessness and Prussianism. The probation officers and workers of the London Diocesan Police-court Mission know what they are talking about when they urge compulsory detention and treatment. Practised with Mars, it is no sex inequality to do the same with Venus, but the Government is committed, for a time at least, to a policy of persuasion, feeling that notification and compulsory treatment are too far in advance of public opinion. Mr. John Burns (Hansard, April 30th) thinks that the Local Government Board has the power to deal with the question of notification. I doubt if it could enforce the treatment of syphilis any more than it does in the case of tuberculosis,
THE OUTLOOK.

To many the venereal situation looks dark and hopeless. It is not. For the first time in history the outlook is bright, despite the fact of an inevitable increase of cases during and after the war. Three things have happened to justify this hope.

The public is at least awake to the necessity of an educational campaign, in which the appalling dangers of the disease shall be brought home plainly. Other means than those heretofore must be brought to bear in a full and free enlightenment upon the subject. Such literature as Corbett-Smith's "Problem of the Nations" and the various publications of the National Council are having an enormous influence. That the preaching of chastity appears a ghastly failure, in the face of the record of 800,000 fresh cases annually in this Christian kingdom (Melville White's estimate), is no reason why the earnest appeal for personal purity should not take the first place in the educational campaign. Where the Apostles had to confess defeat their successors need not feel discouraged, and had they not laboured so hard for so long the percentage of the poxel in the community might have been doubled. The reproach is not upon Christianity but upon earthen vessels too frail to hold it. Venereal disease has been called a bi-sexual problem. Patrol beside St. Martin's Church at this hour and you would be inclined to deny it; but remember, for the aggressive harlotage that still disgraces our streets man is primarily responsible. The blame, but not always the burden, is upon him. The pity of it is that the strong offences' cross is borne, not always by the offender how much soever he may sorrow, but by innocent women and children who form more than one-half of the victims.

That the State has at last intervened is another ground for hope. In the matter of health you may trust the people. Once get democracy to realise that it is badly diseased and it displays a Job-like regard for its skin. Has not Tammany, a very synonym for corruption, given New York City the most progressive, up-to-date system of sanitation in the world? You will have gathered, Mr. President, that I am a strong advocate of strong central control in these matters. My inspiration does not come from Hegel or his bastard modern disciples, but from the fountain-head, the great teacher who tried in vain to bring the Athenians back to "thoughts of order, to disinterestedness in their functions, to that self-concentration of soul in one's own part, that loyal concession of their proper parts to others on which such order depends." Plato tells us "States are as the men are;
they grow out of human characters." How chastened has been the strong Ionian element in British life! The war has brought to the individual a Dorian realisation of duty never before witnessed. All that a man hath—all that he holds dearest are drawn into a new ideal of service to the State. It will not be so hard after this schooling to accept an ever-increasing control of the disease by a Ministry of Health, with notification and compulsory treatment.

Most hopeful of all is the changed heart of the people. At last the sinner is to receive Christian treatment. Above the mantelpiece of his library hung what the founder of my old school, the Rev. W. A. Johnson (Trinity College School, near Toronto), used to call the Magna Charta of humanity. In the centre of the most dramatic scene in the Gospels stood the woman taken in adultery. About her thronged the Scribes and Pharisees, with eyes turned from her to the Christ, stooping as he wrote with his finger on the ground the watch-words of the New Dispensation—"He that is without sin among you, let him first cast a stone at her." I should like to see a copy of this picture in every one of the new clinics in testimony that we have at last reached the full meaning of the priceless message, "Neither do I condemn thee; go, sin no more."

Fighting in this spirit, the soldiers of our "New Model" will put up an irresistible barrage against the most formidable enemy of the race—an enemy entrenched behind the strongest of human passions, and the deepest of social prejudices.
The story of surgical anaesthesia illustrates how long it takes an idea to become effective. The idea of producing insensibility to pain during a cutting operation is of great antiquity—e.g., vide chapter ii, 21, in the Book of Genesis. Nor is the word anaesthesia modern, as is sometimes said, and invented by Oliver Wendell Holmes. It occurs, Withington tells me, first in Plato ("Timaeus"), and is used by Dioscorides in the modern sense.

The extraordinary controversy which has raged, and re-raged every few years, on the question to whom the world is indebted for the introduction of anaesthesia, illustrates the absence of true historical perspective, and a failure to realize just what priority means in the case of a great discovery.

Why do we not give the credit to Dioscorides, who described both the general and local forms, or to Pliny, or Apuleius, or to Hiotho, the Chinaman, who seems to be next in order, or to the inventor of the Spongia somnifera, or to Master Mazzeo Montagna, in Boccaccio, or to any one of the score or more of men in the Middle Ages who are known to have operated on patients made insensible by drugs or vapours? Why do we not give the credit to Davy, who had the idea; or to

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1 Remarks made on presenting Morton's original papers to the Royal Society of Medicine, May 15, 1918.
Hickman, who had both idea and practice; or to Esdaile, who operated on hundreds of patients in the hypnotic state; or to Elliotson, who did the same; or to Wells, who, in 1844, operated under nitrous oxide; or Long, who frequently practised ether anaesthesia? Why? Because time out of mind patients had been rendered insensible by potions or vapours, or by other methods, without any one man forcing any one method into general acceptance, or influencing in any way surgical practice.

Before October 16, 1846, surgical anaesthesia did not exist; within a few months it became a world-wide procedure; and the full credit for its introduction must be given to William Thomas Green Morton, who, on the date mentioned, demonstrated at the Massachusetts General Hospital the simplicity and safety of ether anaesthesia. On the priority question, let me quote two appropriate paragraphs: “He becomes the true discoverer who establishes the truth; and the sign of the truth is the general acceptance. Whoever, therefore, resumes the investigation of neglected or repudiated doctrine, elicits its true demonstration, and discovers and explains the nature of the errors which have led to its tacit or declared rejection, may certainly and confidently await the acknowledgements of his right in its discovery” (Owen, “Homologies of the Skeleton,” p. 26). “In science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs” (Francis Darwin, Eugenics Review, 1914). Morton convinced the world; the credit is his.

Morton’s original essays are among the rarissima, not existing, so far as I can ascertain, in any of the general or special libraries of this country. I have been looking for them in vain for many years. In a parcel of his father’s papers recently received from William J. Morton, of New York, there were duplicates of “Letheon,” and “On the Mode of Administration of Sulphuric Ether,” which I have great pleasure in presenting to the Library. Also a duplicate copy of the Boston Medical and Surgical Journal of November 18, 1846, which contains the first printed account of the new procedure, by Dr. Henry J. Bigelow. In the same journal for December 9, Dr. J. Collins Warren (primus) gives an account of the operation at the Massachusetts General Hospital. These four papers stand out in the literature of surgical anaesthesia as fundamental, and truly epoch-making.

Morton called the drug “Letheon” and applied for Letters Patent to secure his rights—not an unethical procedure in the dental profession of America. This led to the publication of his first pamphlet called “Letheon,” the bibliography of which some one should undertake.
The medium through which Dr. Morton communicated the results of experiments on etherization to the public, was a "circular" which he had printed, at his own expense, almost every week. It was at first, as its name imports, a mere letter of advice; but, as it became the receptacle of newspaper articles, and correspondence from every portion of the Union, announcing the success of etherization, it was necessarily enlarged into a large and closely-printed sheet of four pages. Soon this "circular" became a pamphlet, and of this five different editions were published, under Dr. Morton's immediate supervision, embodying a digest of all the authentic information, both from Europe and America, on "Anaesthesia" (Rice, "Trials of a Public Benefactor," 1859, p. 114).

The Index Catalogue, Surgeon-General's Library, only mentions a 14-page pamphlet, 1846, printed by Dutton and Wentworth, Boston. The early form of the circular may be seen on the back page of the Boston Medical and Surgical Journal, December 9. In the number for November 18, with Bigelow's paper, there is only an advertisement of Morton's courses of instruction in dentistry. The circular appeared first November 26, and is copied at pages 14 and 15 of the "Letheon" pamphlet, fifth edition. This pamphlet is made up of more than eighty short articles from medical journals and newspapers, and is of special value in giving the popular, first-hand impressions relating to the great discovery. There is very little of Morton's—only the circular already referred to, and, on page 16, the terms for the "Apparatus, a Bottle of the Preparation, Instruction, &c."

In 1847 Morton published a 44-page pamphlet on "The Proper Mode of Administering Sulphuric Ether by Inhalation" (Boston: Dutton and Wentworth), in which the original apparatus (now a treasured relic at the Massachusetts General Hospital), is described. In the early part of April he found that a sponge would serve the same purpose, and was less dangerous. The greater part of the pamphlet is taken up with general directions, the outcome of the author's experience.

The claims of Morton were very fully stated in a pamphlet published in Paris, 1847, with the title, "Mémoire sur la découverte du nouvel emploi de l'éther sulphurique," and in 1850 he published a small work "On the Physiological Effects of Sulphuric Ether and its Superiority to Chloroform," Boston. So far as I can ascertain, this completes his output on the subject of anaesthesia, except a posthumous pamphlet "On the Use of Ether as an Anaesthetic at the Battle of the Wilderness" (Journal of the American Medical Association, April 23, 1904).
The third item is No. 16 of vol. xxxv of the Boston Medical and Surgical Journal (then, as now, issued weekly) for November 18, which introduces to the profession modern surgical anaesthesia. Henry J. Bigelow, the distinguished surgeon, had been interested in Morton's private dental cases, and read a paper before the American Academy of Sciences, November 3, and at the Boston Society of Medical Improvement, November 9. It was called "Insensibility during Surgical Operation produced by Inhalation," and after referring to the early cases of Warren and of Hayward at the Massachusetts General Hospital, fuller details of the dental cases are given which he had seen with Dr. Morton. No small share of the early confidence inspired in the profession is due to this temperate statement by Dr. Bigelow, who fully realized the enormous value of the discovery.

In the literature of anaesthesia these are the three fundamental contributions. With them should be placed J. Collins Warren's account of the first operation, Boston Medical and Surgical Journal, December 9, and vol. xxxv of this publication, which contains some twenty-two papers on the subject, illustrating the rapid spread of the practice.

The opportunity here offers to suggest the arrangement of certain subjects in our libraries on an educational basis. For example, why should not the members of the Section of Anaesthetics of this Society collect and classify their literature on historical lines? Start with the documents that magnetized into life an antique practice—these pamphlets of Morton, Bigelow's paper, Warren's paper, and vol. xxxv of the Boston Medical and Surgical Journal. Put these together—all in vellum and lettered in gold—as the blastoderm from which the enormous literature has developed which could be arranged on the shelves in ten or more sections. The Index Catalogue of the Surgeon-General's Library has a good classification, but for my own collection I have used the following:

1) The general story, as given in such publications as the Jubilee numbers of the British Medical Journal and of the Boston Medical and Surgical Journal, and the text-books, in which the history of the subject is well given, as Snow, Foy, &c.

2) Pre-ether period. On cards references to Gurlt's "Geschichte der Chirurgie," Bd. iii, p. 621, and vol. i of Simpson's works, from which sources most of the text-book and other descriptions are taken; and to Dioscorides, Pliny and Apuleius, to the Spongia somnifera, to Boccaccio and the numerous other early writers. Brief descriptions could be written on the cards. Then in order would follow the works
of Davy, of Beddoes, the tragic story of Hickman, the remarkable documents relating to anaesthesia produced by compression of arteries, veins, and nerves, Bartholinus's use of cold for local anaesthesia, and the section would conclude with the writings of Esdaile and of Elliotson on hypnotism in surgery. What an education, even to glance at this literature in due sequence on the shelves!

(3) The modern period beginning with Morton, Wells and Jackson, the story of the miserable priority claims, the congressional reports, the publications of the Morton Association, the topical literature, showing the introduction of the practice into different countries, the Long literature, &c.

(4) In chronological order the subject of anaesthesia in midwifery, embracing everything from Simpson's original pamphlet to the latest popular magazine article on twilight sleep.

(5) Chloroform and its introduction. The papers of the discoverers, Guthrie, &c., the Simpson pamphlets, his famous "Encyclopædia Britannica" article dealing with the subject of anaesthesia under the word "Chloroform," which led to the sharp Bigelow-Simpson controversy, the Hyderabad Reports, the British Medical Association and other reports and documents.

(6) Local anaesthesia from Dioscorides and Bartholinus to Kohler, Corning, Halsted, Cushing, and others.

(7) Agents other than ether and chloroform, used for inducing anaesthesia, arranged in order of introduction.

(8) Technique, including, the various methods of administration, intravenous, intratracheal, and the literature of apparatus.

(9) Physiology.

(10) Pathology.

I speak as an amateur. Doubtless expert members could easily arrange a more comprehensive scheme. To separate in literature the quick from the dead is one of the functions of a well-ordered library, but much that we carelessly regard as dead is magnetized into life when put in its historical relations. The plan here suggested, which could be applied in other directions, sustains that continuity, to the study of which this Section is devoted. You remember the rings of Lucretius—well, there is a vis et vincula librorum, binding together books, a force just as potent as the vis et vincula lapidis, which supported the rings; and in the literature of anaesthesia this force is derived from the works here presented to the Library.
Observations

ON

THE SEVERE ANAEMIAS OF PREGNANCY
AND THE POST-PARTUM STATE.

BY

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Those of us whose professional careers coincide with its modern study will remember how important was the part played by these conditions in severe anaemia. Channing (1842), Lebert (1853), and Gussrow (1871) dealt with this aspect of the subject. Many of Biermer’s original cases were in pregnant women, and a large proportion of the cases forming the basis of the monographs of Müller (1877) and of Eichhorst (1878) were in this class. After 1885 the literature shows a striking reduction in the references, and Ehrlich and Lazarus, in Nothnagel’s System, suggested that local influences in the cantons were responsible for the frequency of this association in the cases reported by the Swiss clinicians. So experienced a teacher as Ahlfeld, they state, had never met with a case. Considering how much has been written by British physicians on the various forms the literature on the anaemia of pregnancy and the post-partum state is very scanty—only one of nineteen in the Index Catalogue of the Surgeon-General’s Library, both series. In Allbutt and Rolleston’s System French makes only a passing remark on the association. With few exceptions the textbooks in obstetrics have very little to say, and the gloomy prognosis is an echo of the unfortunate experiences of the older writers. Among recent works Edgar’s has the best section. That cases are rare in this country is shown by the absence of reference in the writings of so experienced workers as Byrom Bramwell and William Hunter. In the United States Channing’s really remarkable study seems to have aroused an interest in the subject, and five American papers are quoted in Vol. I of the Index Catalogue before the appearance of Gussrow’s in 1871. In Cabot’s series of 1,200 cases of progressive pernicious anaemia, in 35 the disease began during pregnancy or shortly after parturition, 18 during the former. This proportion—about one in thirty-five—is probably the average for the United States. Davis, in reporting a
case, gives a very good summary of the older American literature; and Findley, who deals with the subject more recently, concludes that "in all well established cases the disease has proved fatal." In the discussion on this paper Richard Norris stated that there had only been one case among three thousand women at the Preston Retreat. Of the first twenty-three cases of "progressive pernicious" anaemia of which I have notes, all but one seen in Montreal, five were post partum. I saw two in Philadelph and there were a few at my Johns Hopkins clinic, but I have not the figures. The theses of Decroix, Husson, and Robert indicate that the association is not very common in France. The recent German and Swiss literature is given in Naegli's well known monograph on the blood. Possibly the existing conditions of underfeeding, etc., have led to an increase of cases during pregnancy, and the intense wave of streptococcus infection may have increased the cases of acute septic anaemia post partum.

The cases may be divided into four groups:

I. ANAEMIA FROM POST-PARTUM HAEMORRHAGE.

(a) The bleeding may be profuse and rapidly fatal. The physician sees fatal haemorrhage in aneurysm, in typhoid fever, in peptic ulcer, and in ruptured oesophageal varix, none of which conditions present the tragedy of the post partum case. Only once has it been my misfortune to witness this peculiarly pathetic accident. Peace and quiet reign in the lying-in chamber and happiness in the household, for all has gone well, and the young mother is just beginning to realize the joy that "a child is born into the world." The doctor may have left, feeling safe and satisfied. The attention of the nurse is attracted by a sudden restlessness of her patient, whose face shows a beginning pallor, and she finds the dressings soaked with blood. Very soon the symptoms are those of acute anaemia—a rapid, jerky pulse, extreme restlessness, yawning, sweating, sighing respiration, increasing pallor, and with muscular twitchings, convulsions, or a sudden collapse all is over. This was what I saw one afternoon, called hurriedly to the house of a neighbour—a strong, healthy young woman in articulo mortis, after a normal delivery, as bloodless as if the carotids had been cut. No wonder that novelists have made such a tragedy the climax of a story. Hitchins, in The Fruitful Vine, makes Dolores die in this way; and it is possible that Walter Savage Landor had in mind this type of death in his beautiful little poem in Pericles and Aspasia:

Artemidora! God's invisible,
While thou art lying faint along the couch,
Have tied the sandal to thy veined feet;
And stand beside thee, ready to convey
Thy weary steps where other rivers flow

Fate's shears were over her dark hair unseen
While thus Elpenor spoke.
(b) The Anaemia Following Repeated Small Haemorrhages.—This not infrequently follows abortion, more rarely the repeated bleeding after a delivery at term. The following is a good illustrative case:

Mrs. B., aged 45; admitted October 8th, 1918, having had an abortion in the fourth month of her seventh pregnancy, one month previously. She had been losing blood intermittently, not any large amount, but every few days a clot or two would come away. There had been slight irregular fever, and a progressive anaemia. At times there was a slight purulent discharge. She was curetted, and with douches the discharges soon ceased. She looked profoundly anaemic, and with a sallow brown tint of the skin. The blood count was: Red blood corpuscles 2,106,000 per c.mm.; leucocytes 12,800. Ten days later the red blood count was 1,800,000 and the leucocytes 12,000. On the 21st thrombosis of the left femoral vein with swelling of the leg. The blood films showed the red cells irregular in shape and size, many normoblasts, and numerous platelets. In the open air with plenty of good food, iron and arsenic, she improved rapidly, and left the infirmary on December 3rd with a nearly normal blood count.

As in many cases, the anaemia here was due to a combination of repeated small haemorrhages and a mild sepsis. The general appearance was that of an ordinary Addisonian anaemia, for which any casual observer would have mistaken the case. In III and IV of my Montreal series the profound anaemia followed many small haemorrhages after abortion.

II. The Severe Anaemia of Pregnancy.

The blood of the pregnant woman shows in the early months a diminution of red corpuscles, a low haemoglobin, and a slight leucocytosis (as is well shown in the composite chart in W. L. Thompson's study from Williams's clinic), to be followed by a rise to or near normal in the ninth month. A slight pallor in the early months is common, and is often associated with the morning vomiting or dyspepsia. That this so-called chloro-anaemia of pregnancy might pass on to a grave and fatal form was recognized by Channing and Lebert, but it was the full report by Gusserow of five fatal cases that roused the attention of the profession to the seriousness of severe anaemia in pregnancy. The following is a typical case:

On April 13th, 1917, I saw with Dr. Arthur F. Stabb and her husband Mrs. A., the wife of an army surgeon, a primipara of good previous health, though she had had a "tendency to anaemia." The pregnancy, which began in September, 1916, was uneventful until March, when anaemia began and increased rapidly, so that by April 1st she had dyspnoea and swelling of the feet. On April 3rd albumin appeared in the urine in large amounts. On April 10th the blood count was: Red blood corpuscles 364,000 per c.mm.; leucocytes 13,360; haemoglobin 20; colour index 1.12. The lymphocytes were increased 30 per cent., and the normoblasts were 6 per 100 leucocytes. There was the usual extreme irregularity in size and shape of the red cells. Labour began on the 9th, and on the 11th she was delivered of a stillborn child of normal appearance for the seventh month. There was very little
haemorrhage, and she stood the strain very well. When seen on the 13th she was well nourished, but with all the objective features of profound anaemia. There were no internal haemorrhages. The case was regarded as a typical example of the so-called toxic or haemolytic anaemia of pregnancy, and, based on an unusually fortunate experience, I ventured to give a favourable prognosis. The recovery was rapid and uninterrupted, as the blood counts show: April 18th, red blood corpuscles 1,036,000; April 26th, 2,368,000; May 3rd, 2,592,000; June 17th, 3,250,000; and December 4th, a practically normal count. The leucocytes rose on April 18th to 45,000 per c.mm., and fell to 3,360 on May 3rd. On April 26th the normoblasts rose to 16 per 100 leucocytes, after which date they disappeared.

III. Post-partum Anaemia.

In this, the common form, after a normal delivery without excessive loss of blood, the patient begins to get pale, and within a few weeks the blood count may fall below 2,000,000 per c.mm., and the anaemia may progress and prove fatal in from eight to twelve weeks. How serious this type may be is seen from the high mortality in the series of Channing and of the Zurich clinicians. On the other hand, the experience elsewhere has been more favourable. Dr. Palmer Howard, one of the earliest and most careful students of the subject, insisted that the large percentage of recoveries in the *post-partum* cases, and the absence of recurrence distinguished this form from the true Addisonian anaemia, though clinically the cases appear to be identical. The five *post-partum* cases in my first series all recovered. One was alive more than thirty years after and had passed through two subsequent pregnancies without trouble. The following case gives a good picture of the disease:

*Amelia T., aged 35; admitted February 2nd, 1888. In the October previous she had been delivered of her fourth child; no complications. She had begun to nurse the baby, but gradually got pale and weak and had frequent fainting fits and much shortness of breath. On admission the anaemia was so extreme that she could not sit up in bed without feeling faint. The red blood corpuscles were 1,170,000 per c.mm., with extreme irregularity in form and size and many nucleated red cells. The haemoglobin was 15 to 18 per cent. With rest in bed, good food, iron and arsenic, she improved rapidly and left the hospital with a normal blood count.*

Not infrequently in severe anaemia there is a continuous fever, which may lead to error in diagnosis, even suggesting typhoid fever, a point to which Cabot refers. The fever may be more irregular, and even associated with chills, which in the following case led to the diagnosis of malaria.

*L. T., primipara, aged 24, seen with Dr. Jenkins, October 6th, 1898. Though a difficult labour there were no complications, and for ten days everything was normal. Then she began to get pale and grew rapidly worse, and in the sixth week after confinement, when I saw her, the red blood cell count was 1,200,000 per c.mm., leucocytes 15,000, haemoglobin 15 per cent. Every fourth or fifth day the patient had a chill in which the temperature rose to 103–104°, after which she sweated profusely.*
IV. THE ACUTE ANAEMIA OF POST-PARTUM SEPSIS.

In certain types of sepsis there is rapid blood destruction. In acute endocarditis the anaemia with a large spleen may completely mask the clinical picture, as in cases which I reported a few years ago in the Interstate Medical Journal (1913). In no condition do we see such rapid haemolysis as in post-partum sepsis—a form of anaemia not sufficiently recognized or studied.

In 1882 I saw with Dr. Alloway, on the seventh day after delivery, a young woman in a state of profound anaemia. The blood loss had not been severe, but for some days there had been an unusually foul though slight discharge. The red blood cells were just 1,000,000 per c.mm., the leucocytes 20,000. I never saw the objective features of anaemia more pronounced, and her chief complaint was the painful throbbing of the abdominal aorta, which pulsed with extraordinary violence. She died on the twelfth day. There was "diphtheritic" endometritis, septic thrombi in the pelvic veins; no endocarditis.

Such extremely rapid cases are not common, but Cabot refers to one with identical features, in which the acute sepsis was not suspected. The red blood count was 300,000 per c.mm. "Diphtheritic" endometritis was found at the post-mortem examination, without which, as Cabot remarks, the case would have gone into the category of puerperal pernicious anaemia. While every patient with puerperal fever has some grade of anaemia, only in a few does the blood loss dominate the picture. In many of the best textbooks on obstetrics—for example, Edgar (1903)—the condition is not referred to. An excellent account is given by Lea, who states that the loss of red cells may be at the rate of from 200,000 to 1,000,000 per c.mm. a week, and that the count may fall to 300,000 per c.mm. Three cases of puerperal sepsis recently in the Radcliffe Infirmary illustrate the condition very well.

Mrs. C., aged 24, admitted under Colonel Collier August 31st, 1918, had a miscarriage late in her second pregnancy. Fragments of retained placenta were removed. She had the typical sallow, pale yellow (not the brown-yellow) tint of skin, and the usual features of moderate anaemia. The red blood cells were 2,700,000 per c.mm., leucocytes 8,600, haemoglobin 46. She improved rapidly, and left the infirmary on September 21st, 1918.

Mrs. M., aged 49, admitted August 8th, 1918, under Colonel Brooks. Since the delivery of her eleventh child, July 16th, she had had severe sepsis with high irregular fever and a progressive anaemia. The blood cultures were negative. The blood count was: Red blood cells 1,580,000 per c.mm., leucocytes 13,400, haemoglobin 16 per cent., colour index 48.
Nothing special in the differential count other than a high percentage of lymphocytes. The irregularity in size and shape of the red cells was extreme, and there were many normoblasts. She died on September 8th in a state of profound anaemia. *

Mrs. W., aged 31, primipara, admitted under Colonel Collier, November 30th, 1918, having been delivered a week before. No complications. Acute sepsis developed with high fever and a very offensive discharge. When admitted the patient was very anaemic, with a sallow, sub-icteroid tint and all the symptoms of a severe infection. Streptococci were isolated from the blood, and she was given antistreptococccal serum on December 1st and 3rd. The red blood count was 2,250,000 per c.mm., leucocytes 5,600, haemoglobin 40. The differential count showed nothing special; normoblasts were present in moderate numbers. The anaemia progressed rapidly; the fever remained high, and she died on December 7th.

With an increased frequency of streptococcus infections and an unusual virulence of at least some strains in respiratory affections, it would be interesting to learn if puerperal fever has been more prevalent throughout the country. So far as I know, the post-partum sepsis cases have not shown a special tendency to haemorrhage, as have so many of the streptococcic infections of the past six months.

Remarks.

To the nature of the haemolytic agent in the pregnancy and post-partum cases there is as yet no clue, any more than we have to the cause of that most baffling of all blood diseases, Addison's anaemia. The progress and the blood picture suggest the haemolytic type, which can be produced experimentally and which is caused by the poisons of the Bothriocephalus. In the profoundly changed metabolism of pregnancy and in the intensely katabolic metabolism of the post-partum states we assume the production of haemolytic agents—toxins—but, as French remarks, "the use of the word toxin almost connotes ignorance." Though progressive and often pernicious, the anaemia is caused by an agent which differs in one all-important particular from that which causes the anaemia of Addison. When recovery takes place it is permanent, and the woman may escape in subsequent pregnancies. The second patient in my series (whom I knew well) had an attack of extreme gravity, recovered, bore two children subsequently, and was alive thirty years after the attack. Recovery from the Addisonian form may last ten, fifteen,

* There may have been septic endocarditis in this case, as a few days before death there was a soft diastolic murmur along the left sternal border. The danceling, vibrating pulsation of the peripheral arteries was extreme and the pistol-shot sound unusually loud. In connexion with the production of this in the arteries, about which so much has been written recently, the following note, dictated September 2nd, 1918, is of interest: "A loud systolic bruit is heard over the abdominal aorta without pressure; but neither heart sound. Over the femoral, without the slightest pressure, two sounds are heard, quality and intensity about equal, and almost as loud as the sounds heard over the heart itself. With pressure both increase in intensity, then a loud systolic murmur develops, and on pressure to obliteration, a loud single pistol shot remains."
or even seventeen (McPhedran) years, but such instances are exceptional, and in the cases of reported permanent recovery there is always the question of mistaken diagnosis.

The blood picture may be of value in estimating the outlook. Signs of active regeneration may be present, as in Mrs. A.'s case, indicated by blood crises and a large proportion of red cells with signs of recent formation, and the basophilic granulation described by Boggs and Morris and by Milne, the mitochondria (Sappington) and the reticulation described by Robertson and Bock. The number may rise from 1 per cent., the normal, to 20 or 25 per cent. with marked bone-marrow stimulation. A high colour index is the rule in the pregnancy and post-partum cases. The blood condition is uncertain, however, as well shown in two exceptionally well studied cases in Meyer's clinic, reported by Jungermann, in which the contrast was striking, the one with low colour index and features of an aplastic anaemia, the other the characteristic Addisonian picture. Both were pregnancy cases, and both had normal deliveries and recovered completely. The absence of platelets is a feature of the common idiopathic anaemia, contrasting, in this respect, with the post-haemorrhagic and septic forms. In the hands of skilful students the criteria offered by the blood examination should, as a rule, be of great value in the prognosis.

My individual experience is exceptional and much more hopeful than indicated in the literature, and particularly in works on obstetrics. The seven cases seen in Montreal and Philadelphia recovered. I have not at hand our large material from the Johns Hopkins Hospital; but I do not remember a fatal pregnancy or post-partum case. The later appear to be the more fatal, and the cases reported by Elder and Mathews show that a fatal termination may follow in spite of the most careful treatment.

Acute haemorrhage post partum may be rapidly fatal from reduction in blood volume; very large amounts may be lost extending over several days, and yet recovery takes place.

The report of Robertson and Bock, just mentioned, contains much information of value in estimating the blood loss in haemorrhage and the means of treatment. From what is recorded, and from personal experience, I should say the danger of a grave anaemia progressive in character is not great after a fairly profuse haemorrhage. Once the bleeding stops, recovery is progressive and often surprisingly rapid. On the other hand, repeated small losses of blood after abortion or a normal delivery may be followed by an anaemia out of all proportion to the quantity of blood lost. The starting point, indeed, of a few cases of Addison's anaemia appears to be repeated epistaxis or bleeding piles.

The treatment of the cases is that of the severer forms—fresh air, rest, food, iron, and arsenic (in which I still have faith); and if the blood count is very low, 20 per cent. of corpuscles and haemoglobin, transfusion may be employed.
The newer technique has many advantages, but the results do not, in Addison’s anaemia at any rate, appear to be more favourable than those we had with the old Aveling or Roussel apparatus.

References.

TYPHOID SPINE*

By Sir William Osler, Bart., M.D., F.R.S.

Regius Professor of Medicine, Oxford, and Consulting Physician to No. 15 Canadian General Hospital

Let me begin at the end by reading a letter received January 3rd, National Hospital, Queen Square, London:

Dear Sir William—Sapper C., typhoid spine, was admitted yesterday. You will be interested to know that he is now walking normally. It was a good case, although he walked after ten minutes' treatment.

Yours sincerely,

L. R. Yealland.

Had Sapper C. gone to Lourdes—had he gone to our own Canadian Shrine, St. Anne de Beaupré, what a miracle! Paralyzed for nearly two years! unable to move body or legs; never out of his bed! and yet he walked in ten minutes! Well, it is a miracle all the same, an illustration of the faith that heals—not the same sort of faith, however, that the lame man at Lystra had, the firm persuasion that Paul and Barnabas were able to cure him, for I am afraid from what Dr. Yealland says, and from what we know, Sapper C. was not very anxious to get well.

Now to refresh your memory of the case, which is an important one from many standpoints. I saw the patient in April, 1916, with Dr. Whithall, at the V.A.D. Hospital, Maidenhead. The condition was as follows: Excessive nervousness and apprehension, so that he broke into a profuse sweat, trembled, and was very fearful lest we should attempt to move him. He was well-nourished, no mental disturbance, special senses normal, pupils widely dilated. When stripped a diffuse blush spread over the trunk, and there was an unusually persistent condition of goose skin. He was unable to move the body, any attempt being followed by agonizing pain in the back. The legs looked normal, and there was no wast-

* Clinical Remarks, January 7th, No. 15 Canadian General Hospital, Cleveden, Taplow.
ing, no disturbance of sensation. An attempt to sit up was followed by severe pain in the back; with great difficulty he was turned on the left side, but it was impossible to get him in the sitting posture. The spine was straight, no projection or unusual prominence. Below the mid-dorsal region it was very painful on pressure, and over the lumbar spines the slightest touch caused him to cry out. The examination of the abdomen was negative; nothing could be felt on either side or in the iliac regions on the deepest pressure. The spleen was not palpable. The legs could not be lifted from the bed or drawn up. On making the attempt they went into clonic spasm. The toes could be moved and the ankles flexed. The temperature of the legs was normal, and there were no trophic changes.

Sensation: Normal in hands and face. On the skin of abdomen, in a band about a hand’s-breadth in width below the costal margin, there was extreme hyperæsthesia; the slightest touch caused him to cry out; he could not even bear the weight of the bedclothes. It extended to the back, but was not nearly so marked as in front. Below the navel the sensation was normal. On the skin of the legs he felt the pin-prick everywhere, and recognized the difference between heat and cold.

Reflexes: Knee-jerks exaggerated, slight rectus clonus, no ankle clonus; Babinski sign not present. Cremasteric and abdominal reflexes present. Bowels and bladder normal.

In February, 1916, the patient had an attack of typhoid fever, and was treated in the V.A.D. Hospital, Maidenhead. Though prolonged, it was not a severe attack, the temperature never rising above 104° F. The convalescence was slow, and he remained in the hospital all the summer. In October he had another febrile attack which was thought to be influenza. Following this, he began to have pains in the back and stiffness; these symptoms have persisted, and he has never been out of bed, and has become more and more incapacitated.

I asked to have the patient transferred here to the Duchess of Connaught’s Hospital, Cleveden, where he was admitted May 7th, 1917. A spinal jacket gave great relief to the pain in the back, and the hyperæsthetic girdle rapidly disappeared. In the eight months the changes have been an improvement in his general condition, manifested in a gain of weight, in less marked basal motor changes, and less apprehension and dread of pain. The area of hyperæsthesia has disappeared. The rigidity and immobility of the back has persisted. We have never been able to get him to sit up.
An attempt to move the legs at once brought on the clonic spasm, and there always was an appearance of unusual effort in attempting to make the movement. Night and morning one of the nurses made him draw the legs up and down, and this of late he has been able to do pretty well, and with less tremor. The reflexes have remained the same, and there has been no anaesthesia, though at times the tactile sensations seemed less acute than at others.

Shortly after admission to Taplow an x-ray picture was taken which showed a very dark shadow in front of the lower dorsal and lumbar vertebrae, practically identical with the shadows shown in Figs. 2 and 6 of Dr. J. B. Carnett's article in *The Annals of Surgery*, 1915. I submitted the picture to a number of experts, some of whom expressed doubts as to the significance of so large and dark a shadow. Major Morgan, when he took charge of the department, very kindly made a special study of the case, and the subsequent x-ray pictures showed a spine normal in every particular.

The case has attracted a great deal of interest, and in the weekly demonstrations I could not always carry conviction to the minds of visitors that the condition was purely functional, and that the patient would ultimately get well. My personal education in the disease is worth noting:

The first case one sees of a special disease or complication usually fixes itself in the memory. In 1887, I was asked by Dr. Grassett, of Toronto, to see with him a young officer invalided from India with paralysis after typhoid fever. Healthy looking, excessively nervous, unable to walk or to move in bed, the striking feature was a painful stiff back, so that any attempt to turn or move made him scream. There was nothing to be made out on examination except tenderness in the dorsal region. The legs were weak, but there was no paralysis, and the bladder and bowels were unaffected. The pain and stiffness had lasted for more than five months, and he was brought home believed to be permanently disabled. He was so nervous that I regarded the whole condition as functional, ordered a jacket with massage to the legs, urged him to get up and go out and gave a favourable prognosis. The improvement was rapid and progressive, and he got quite well. This was my introduction to the condition which Gibney, of New York, first described in 1887 as typhoid spine. In 1890, at a meeting of the Association of American Physicians, Dr. Loomis called our attention to Gibney's observations. In Series I of our "Studies in Typhoid Fever", *John Hopkins Hospital Reports*, vol. iv, p. 73, I wrote a paper with the title, "On the Neurosis following Enteric Fever, known as
the Typhoid Spine” (the first communication on the subject to follow Gibney’s), in which I reported two cases, and, in opposition to Dr. Gibney, took the view that it was a functional disturbance, analogous to “railway spine” or “hysterical spine”. I was much impressed with the rapidity with which the cases recovered—far too rapidly in Case II for a spondylitis. In Series II of the “Typhoid Studies”, John Hopkins Hospital Reports, vol. v, p. 315, I reported three additional cases, two very mild, all negative on examination, which improved rapidly with the Paquelin cauterity. In Series III of the “Typhoid Studies,” John Hopkins Hospital Reports, vol. viii, p. 485, I reported a mild case of “tender spine”. To this time I had seen nothing to make me change my view of the functional character of the trouble. Meanwhile we had seen many cases of the bone lesions following the disease, and it always seemed a strong point in favour of my view that the typhoid spine never presented any swelling, and never went on to suppuration. In 1902 I had to change my mind. I saw a patient of Dr. Reinhardt, in the fourth week of convalescence, with stiff, painful back, weak legs, excessive nervousness, but in addition a well-marked painful swelling just above the right sacro-iliac articulation. Convalescence was slow, but no suppuration followed. Several other cases were seen, and with the help of Dr. T. McCrae I reached the belief that Gibney’s original view was correct for some cases. Careful x-ray examinations showed spinal changes, and in a patient at the Clinique in July, 1904, Dr. Baetjer demonstrated a definite deposit of bone filling the space between the second and third lumbar vertebrae. In 1906 Dr. McCrae reported this case and another with bone changes in the spine,* and in the “System of Medicine” we edited together he gave an excellent analysis of the condition, and grouped the cases into three categories. First, those in which the hysterical features predominate. Secondly, cases with periostitis, or peri-spondylitis, with fever, pain, rigidity, and evidence of nerve root involvement. And thirdly, a group of cases with definite objective changes in the spine, as shown by the x-ray pictures, as well as by examination.

I confess freely to have taken too one-sided a view of the condition, but it was not without a strong basis of support. Such a prompt recovery, such as followed in several of the reported cases, seemed quite inconsistent with the existence of a spondylitis. In showing a case at the Johns Hopkins Medical Society, 1901, the

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following features were dwelt upon as indicating the functional character of the condition: First a state of neurasthenia with vasomotor changes, and in not a few cases the definite stigmata of hysteria. Secondly, stiffness of the back, persisting for weeks and months, is associated with pain, sometimes of an agonizing character, on movement. Thirdly, pain on pressure over certain spinal processes. Fourthly, a negative local examination, with the absence of fever. And lastly, in many cases, prompt recovery, with the use of the Paquelin cautery, and measures directed to the neurotic condition.

This case of Sapper C. is a strong confirmation of this view. You saw him last Monday after the spinal jacket was removed—still very neurotic, the spine absolutely rigid; we could not induce him to sit up; he could just lift his legs off the bed with the same type of general clonic tremor. I know that some of you felt hopeless about him, and he had got hopeless about himself, but new surroundings, a new mind, and very skilfully applied methods did in ten minutes what we have failed to do in a year—put him on his feet. I saw him on the 3rd looking well, walking well, and very happy to be on his legs again.

The literature of typhoid spine to 1905 is fully analyzed by Karl Fluss, *Centralblatt f.d. Grenzgebiete der Medizin und Chirurgie*, Bd. viii, and by Elkin and Halpenny in vol. i of the *British Journal of Surgery*, 1914. More than 100 cases have been reported, a large proportion in males. The onset is usually during convalescence, but has been weeks after, and has followed a sudden jar or twist or a blow. Constitutional disturbances are present in all cases. Fever is usually absent, but a range of 100° to 100°5° F. is not uncommon. Paroxysms of fever have been described, and there may be marked leucocytosis. A change in the mental condition has been noted in the majority of instances. The patients are excitable, apprehensive, self-centred, with the features of neurasthenia, and very often positive hysteria. In Sapper C.'s case this has been a striking phenomenon throughout. He was like a shell-shock subject, and at the first examination had an emotional storm with profuse sweating, goose skin, and then a vasomotor hyperœmia spread over the entire trunk. I have not seen a case without neurotic manifestations in some degree, even when signs of local disease were present.

Perhaps the most interesting case on record is the study by Dr. Leonard Ely, of New York, of his own attack (*Medical Record*, September 20th, 1902). One hesitates to suggest the existence of
hysteria in a professional brother, but one may say, at any rate, that the condition simulated it, and he confesses to have been "considered hysterical by his nurses". The professional baseball pitcher, whose protracted case is reported by Carnett; the cases of Lovett and Withington and Taylor's case had hysterical features combined with organic changes.

Of the local features, pain in the back, particularly on movement, is the most constant, and it may be of extraordinary severity, so that the patient screams on the slightest movement. It comes on in paroxysms, and is aggravated by the slightest jar or at any attempt to move. Patients have had to be chloroformed when they use the bed pan, and the threat of suicide has been recorded in several instances. The pain may be of a definite nerve-root character, extending round one or both sides, or it may pass down one or both legs.

Tenderness on pressure is present over the spinal processes of varying numbers, sometimes limited in the lower dorsal and lumbar regions. Rigidity of the back is a constant feature; the patients are unable to stoop, and have a difficulty in raising themselves to the sitting posture. One patient came into the hospital supported by two friends almost bowed double, and it was only with the greatest difficulty that the back was straightened.

If, as some orthopedic surgeons hold, a rigid back indicates organic disease, all of these patients had it, and no case I have seen has been more marked than in Sapper C. Clonic contraction of the muscles has been present in a number of instances. It may be nothing more than the fine tremor on attempting moving of the legs; but there is one type of muscular contraction in these cases that is of great importance, as to my mind it is an unerring stigma of hysteria. I refer to the rhythmic contraction of the abdominal muscles, noted by Ely in his own case, and present in two of Carnett's cases. In a patient admitted in October, 1902, with pain in the back and the ordinary features of typhoid spine, the abdominal muscles were contracting at the rate of 75 to the minute, which gave a very remarkable appearance to the flanks, which were moved in and out like a pulsation.

Inability to use the legs is present in severe cases, but there is no actual paralysis, no wasting, and the features are quite unlike post-typhoid paraplegia from myelitis or from neuritis. Reflexes are increased, but not changed in type. Disturbances of sensation in the form of hyperesthesia are common, particularly in the back. Anæsthesia may be present, and it is interesting that Dr. Yealland,
in Sapper C.'s case, found a stocking anaesthesia, which certainly was not present on any occasion on which I or others examined him.

The last and important point is the evidence which exists in some cases for disease of the spine. This is of two forms: Kyphosis has been present, and of a type that could only occur from positive disease of the bone. Swelling of the soft parts on either side of the spine has been described and was present, as I have stated, in the patient seen by Dr. Reinhardt, the only one of the ten or twelve cases I have seen in which on physical examination changes were present. Of ordinary scoliosis and of associated atrophy of the lumbar muscles one cannot be so certain, as they are common enough in hysteria.

The x-ray picture has been studied now in a large number of cases. Osteoporosis, absorption of the intervertebral discs, and local bone proliferation have been described. It is extraordinary how few satisfactory skiagrams of the condition exist. I have looked in vain for one through the special journals, and some that have been published elsewhere are in the highest degree unsatisfactory. It is not fair to criticize a print without the plate, but Figs. 2 and 6, illustrating Dr. Carnett's paper, have had an extraordinary resemblance to the first plate taken of Sapper C., but subsequent study showed them to be artefacts, and the spine and adjacent bones show no trace of disease.

Upon one remarkable feature all writers dwell. Unlike ordinary typhoid periostitis the spondylitis rarely (if ever) goes on to suppuration. When present the lesion must differ essentially from that which we see in the long bones and the ribs. Typhoid bacilli have been frequently found in the bone marrow of the vertebrae, and there is no inherent reason why similar inflammatory changes should not be produced as in other bones. We know, indeed, from the presence of the kyphosis and from the x-ray picture that such changes do occur. Why they are not seen more often is, I believe, that they are not always present, and that we must recognize functional variety, which has its counterpart in certain forms of hysterical and railway spine.
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