by the patient, who was a phlegmatic agriculturist in civil life, was that he had "sat on the sentry's bayonet."

The next I heard of the case was a few days later, when my colleague, Captain J. T. Williams, reported to me that on examining the man prior to transferring him to an auxiliary hospital, he had detected a foreign body at the site of the previous swelling. Investigation with an x-ray tube then revealed the fact that a portion of a bayonet blade, broken off near its base, and measuring some 15 inches in length, was embedded in the right gluteal and erector spinae masses, the point lying under the angle of the scapula (Figs. 1 and 2).

The story, which he had casually epitomized as "sitting on the sentry's bayonet," when dragged out of him amounted to the following: He was taking part in a night attack from our trenches. The party had only just got over the top when the attack was discovered by the enemy, who opened fire, and in scrambling back he had come down on to a sentry's bayonet which was leaning against the parapet. When removed the bayonet was quite bright, having evidently been cleaned only shortly before the accident.

The main interest in the case attaches to the fact, at first sight almost incredible, that a wounded man with just under fifteen inches of bayonet in his body could have found his way from the first line trenches right back to a home base hospital, and almost to an auxiliary hospital, without its presence being suspected. The chief factors contributing to such a possibility were, of course, first, the cleanliness of the sentry; secondly, the temperament, and thirdly, the build of the patient.

It was naturally easy enough when we knew it was there to feel the blade as it bridged the lumbar region, but then only by posturing him, as it lay flat against and in close contact with the iliac crest and ribs. During the day or two he was up and about before its discovery, the only inconvenience he seems to have experienced was in sitting down. This he avoided as much as possible, but walked freely about with other patients.

Impalement on Tramcar Control Crank.

In this case the patient, a young man of 26, was impaled on a tramcar control crank which traversed the rectal wall, the bladder, the peritoneal cavity, and the anterior abdominal wall except skin. He was admitted to the Swansea General Hospital on June 8th, 1912, at midnight in an unconscious state. The people who brought him knew nothing about him, except that he came from a neighbouring town, and that they had been asked to pass him on to the hospital. His general condition appeared to be due to a mixture of severe shock and alcohol. The house-surgeon, Dr. Lewis Jones, to whom I am indebted for notes of the case, found a doughy circumscribed swelling about two inches in diameter in the abdominal wall, three inches within and two inches above the left anterior superior spine. He further ascertained that the bladder was empty. In spite of the collapsed condition of the patient immediate operation was decided upon. The swelling proved to be a mass of small bowel covered only by skin, which had herniated through a recent laceration in the peritoneum, muscles, and fasciae. Further investigation discovered a little free fluid smelling faintly urinous and faecal. A tear about one and a half inches in length was found to the left of the fundus of the bladder. This was sutured, the peritoneum cleaned, and the abdominal wound closed around a drain.

Attention was then turned to the rectum. A little blood was discovered between the folds of the buttocks, and an extensive lacerated wound of the anterior wall of the rectum, above the internal sphincter, leading into the bladder. The bladder was drained by catheter through the urethra and the rectum by laying open both sphincters well back towards the coccyx.

Examination of the man's trousers confirmed the obvious conclusion already arrived at—namely, that he had been impaled on some stake-like object. Twenty-four hours later it was learnt that while getting down from the outside of a tramcar in the dark he had fallen on to the cranked control on the dash-board. (Fig. 2.) He made a good recovery, except that the wound in the abdominal wall suppurated freely, a ventral hernia resulting. For this he still refuses operation.

I was able a few months ago to secure the actual control crank upon which he was impaled, which is well shown in the photograph. (Fig. 2.)

THE PHYSICAL BASIS OF SOCIAL INEFFICIENCY.

BY

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In a monograph entitled *Intelligence and Social Valuation*,¹ by Mr. Porteus and myself, we ventured to assert, as the result of a long and extensive research, that it was now possible, in a limited number of cases—but particularly in the so-called mentally deficient—to determine the relative state of development of the cortical layers of the cerebrum in the living subject. While this claim has not been seriously controverted—possibly because it has not yet become widely known—it is certain that some of our critics have failed to understand how even this limited claim can be true of the individual. In view of the practical importance of the subject, it would appear advisable to furnish some explanation of certain points dealt with in the monograph referred to.

There is no part of the human body where function is so directly dependent on structure as the central nervous system. The neurone doctrine has very profoundly altered our conceptions of the working of the nervous system. Recent research has gone even further, and has created something like a revolution. The busy practitioner has neither the time nor the opportunity for following the stages of these scientific advances, and hence their accumulated findings suddenly come as something of a shock. I propose therefore, briefly, and probably very imperfectly, to endeavour to furnish an outline of these changes, particularly in so far as they concern the physical basis of social inefficiency.

The human brain is made up of peculiarly modified nerve cells and processes, termed neurones, embedded in neuroglia. The former are developed from neuroblasts, and the cells of the latter from spongioblasts. Prior to the time at which the two groups can be distinguished from each other they are spoken of as indifferent cells. The development of these cells into neuroblasts and spongioblasts does not occur in all cells simultaneously, some being more precocious than others. Further, the spongioblasts develop somewhat in advance of the neuroblasts, and there is not infrequently found a fairly complete spongioblastic framework having as yet no differentiated nerve cells or fibres. Should this condition persist into adult life, it is clear that there will result a large, heavy brain with an excess of neuroglia, an insufficiency of neurones, and a consequent lack of intelligence. On the other hand, should the neuroblastic development exceed the spongioblastic, there will result the large, heavy, multi-neuroned brain of high intelligence. Developmentally there are therefore two types of large and heavy brain—the multi-neuroned brain of superintelligence, and the multi-neuroglial brain of average intelligence or even stupidity. These two types must no longer be confused, though a study of some of the most modern physiological and anatomical textbooks would appear to show a confusion of thought on the subject, and a lack of appreciation of the clinical support given to the developmental truths herein enunciated. The large, heavy brain of a bricklayer, quoted in the works referred to, is, of course, an instance of the multi-neuroglial brain with an insufficiency of neurones.

The neuron conception of the brain has become so important that it is now more usual to think of that brain in terms of neurones and neuron reflex arcs than in the obsolescent lobes and convolutions of former times. That the cell body and dendrons of the neurone are the source, under suitable stimulation, of the energy displayed by the nervous system is undoubted, as is also the fact that, if a human individual possess a diminished number of neurones, or imperfectly developed neurones, he will be incapable—just as is the microcephalic idiot—of the same "intelligent" action as the more fortunately endowed individual. Just as with electric action, an insufficient number of batteries, an imperfectly connected series of batteries, or an improper insulation, give indifferent results, so also is it with the human central nervous system. An insufficient number of cell bodies, an imperfectly connected series of neurones, an insufficient number of collaterals, or an imperfect medullation of axons, especially within the white matter of the brain and cord, give imperfect

results as regards the display of "intelligent" action. All these facts, provided there has been no compensating over-development of spongioblasts into neuroglia, also denote a smaller brain.

It is unfortunate that a certain school of psychologists discuss "mentality" as though it had no physical basis, whereas the formula is "no neurone, no mentality." The intellectual activities of the individual are entirely dependent on the number of normally developed, connected, and insulated neurones, and all the neurones which the individual is to possess are present, in an immature condition, at birth, gradually assuming functional activity with growth, maturation, and collateral connexion. It follows, therefore, that any process which tends to interfere with the proper growth and development of the neurone has an extremely serious result, not only on the individual but also on those with whom he comes in contact. Amongst the causes which interfere with the proper growth and development of the neurone are lack of oxygen from interference with breathing, as from adenoids, chronically enlarged tonsils, long confinement in improperly ventilated rooms; hookworm, which reduces the haemoglobin; many poisons, particularly alcohol and syphilis, and other less well-known pre-natal and post-natal factors. Amongst the agencies of destruction of normally developed neurones the best known are old age, chronic alcoholism, and syphilis. Breeding from neuronic underdeveloped stock (mentally defective stock) is the most powerful method of continuing the evil, as if both parents are mentally deficient there is no escape for the offspring.

Different groups of neurones fulfil different functions. The known functional areas of the cortex occupy but a relatively small area, and are surrounded, like islands, by the very much larger association areas. The presence of the latter is one of the most striking features of the human brain, and it is certain, both from their structural neuronic connexions, as also from experimental and clinical lesions, that they play an important part in the production of those higher psychic phenomena which distinguish Man from any of the lower animals. The association areas are the true cortical areas of thought and of all that that implies. Were Broca's conception of a definite cortical speech centre true, it would be possible to educate a higher mammal to speak. That this is not possible is due to the fact that association centres are not present to any extent in the lower animals, and hence the absolute certainty that the mechanism of speech is a much more complex neuronic series of connexions than was supposed by Broca, and that it includes some portion of the association areas, in addition to the occipital end of the third frontal convolution.

Whilst it is undoubtedly true that different portions of the cerebral cortex fulfil specific functions, it must not be forgotten that, structurally and functionally, different parts of the brain are so intimately connected as to make it not improbable that injury or developmental defect in any one part may influence prejudicially the functional value of all other regions in the brain. The generalized idea of a localization of function has long been accepted, but the modern view is that the human cerebrum is composed of a plurality of organs, not completely separated from each other, but intimately associated, and to a certain extent dependent on one another for their functional importance. So far all attempts to localize the functional activities of the brain have had reference to planes of separation *vertical* to the cortex, but the most recent work on the lamination of the cortex makes it probable that it is also necessary to consider the separation of function along the *horizontal* planes of the cell layers of the cortex, because these layers certainly appear to perform quite different psychological functions. This work and its far-reaching consequences may now be considered.

In the post-central gyrus—a gyrus of afferent nerve terminations—there are, histologically, eight layers, the fifth of which is a granular layer, in which most of the afferent nerves have their terminations. This granular layer represents the original external cortical layer of the mammalian brain, and hence the dictum that the neopallium of the mammalian cortex is primarily built up on an infragranular basis, that is, of pyramidal and other cells lying deep to the granular layer. In the higher animals, and particularly in Man, those pyramidal and other cells lying superficial to the granular layer are a

more recent evolutionary addition to the cerebral cortex, and subserve different and altogether higher psychic functions than the ontogenetically and phylogenetically older infragranular series of pyramidal cells.

The infragranular layer of the cortex, or the middle fibre lamina and inner cell lamina of polymorphic cells, comprises the deep large pyramidal cell layer, the deep medium-sized pyramidal cell layer, and the polymorphic cell layer of the histologist. In every human individual this infragranular layer of the cortex is the first to appear and the first to attain maturity. It subserves the lower voluntary and instinctive activities of the animal economy, and thus forms a lower level basis for the carrying on of cerebral function. It is absolutely and relatively as well developed in the higher animals as in Man, and is developed equally well in the feeble-minded and in the normal individual. It is, therefore, concerned with the activities of animal instinct, such as the self-protective, the selfish, and the sexual. Shortly after birth it has attained 82 per cent. of its ultimate adult development in depth. Judgement, common sense, reason, as evidenced in behaviour, are dependent on the control of the activities of this layer by the supragranular or outer cell lamina. The layer is often actually increased in depth in such *abnormal* cases as high-grade amentia, and of chronic insanity with moderate dementia. A considerable decrease, on the other hand, exists in more marked aments, and in gross dementers who are unable to carry on the ordinary animal functions, such as attending to their own wants.

The supragranular layer (or the outer cell lamina and the outer fibre lamina) comprises the molecular or plexiform layer, the small pyramidal cell layer, the superficial medium-sized pyramidal cell layer, and the superficial large pyramidal cell layer of the histologist. This layer is the most prominent feature of the human cortex, and constitutes a higher level basis for the carrying on of the cerebral functions. It subserves the higher thought processes, and is, therefore, the layer through which school "education" largely works. It is the last layer of the cortex to be evolved, the last to commence to develop, the last to attain maturity, and consequently the first to undergo retrogression. Having been, from the evolutionary standpoint, recently added, it is in a state of instability. It is the only cell layer of the cortex which varies definitely in measurable depth in *normal* brains. It is under-developed to different degrees, according to the mental capacity of the individual in persons exhibiting various grades of mental subevolution, and it undergoes degrees of retrogression which correspond to the amount of dementia existing in cases which permanently suffer from diminution or loss of mental powers.

It is thus clear that, of the various evolutionary factors which have contributed to the enlarged brain of Man, the addition of the outer cell lamina and outer fibre lamina (supragranular layer) is, from the physical and psychic standpoints, one of the most important. If it be not present, or be badly or imperfectly developed, there must be a smaller brain, with deficient or imperfect psychic or "intelligent" function, because under these conditions about a third or a half of the variously estimated 3,000 to 9,000 million neurones of the cerebral cortex are absent or are very imperfectly developed. Provided such absence is not compensated for by an increase in neuroglial tissue, there should be a smaller head, which will be revealed by head measurement. If complete individual examination, mental and physical, confirms the findings of head measurement the diagnosis becomes certain, and there is thus revealed, even in the individual, the relative state of development of the cortical layers of the brain. The exact percentage of cases in which this is possible will be referred to later.

If such be the psychic functions of the horizontal layers of the cerebral cortex—and there is no reasonable ground for doubt—it is clear that they are very far-reaching in their consequences. There is seen to be a physical basis for a large proportion of crime and prostitution; for much of the social inefficiency with which we are now confronted; for many problems of resistance to disease, and so on; and the time has surely come when these doctrines must be transferred from the laboratory to the living subject.

In endeavouring to effect this transference, the first difficulty with which Mr. Porteus and I were confronted was the absence of data on the cubic capacity of brain of

the living individual at different periods of growth. We had to supply this information, and so became involved in a long and laborious research amongst some 10,000 living Victorian school children and university students. With the data before us we were profoundly impressed with the extraordinary range of variation of the brain capacity of children of the same chronological age. In every year of life from 6 years onwards there were a large number who possessed 30, 40, and even 50 per cent. more brain capacity than others of the same age.

In the cubing of the living head, by diametral measurement and mathematical calculation, there are various sources of error, most of which are known and can be guarded against. There are others, particularly those induced by varying degrees of neuronie and neuroglial development, which are unknown, and which may be the cause of serious error. These sources of error are fully discussed in our original monograph. But all the sources of error combined, even if they occurred in the same individual case—which is highly improbable—do not, and cannot, account for the whole of the large individual differences as we found them. The range of variation in the cubic capacity of brain of individuals of the same age is much too great to be swept away on the grounds of errors in technique. Some other explanation must be sought, and in my experience it is to be looked for in partial failure of neuronie development.

This problem of the range of variation and its significance, and of the limits of normality, is an extremely important one in all biological processes, and does not appear to be fully realized by the medical profession. Though neither my fellow author nor myself would venture to pose as statistical experts we are both fully satisfied that the statistical method is the only scientific method of attacking such problems. For the purpose, therefore, of establishing a first estimate of the confines of normality of brain capacity, we adopted, for reasons fully set forth in our monograph, the percentile, or more properly the decile method, which may be popularly explained as follows:

Let it be assumed that the stature of 500,000 adult men is the subject of investigation. Every individual's stature is recorded on a separate card. These cards are then arranged in order from the lowest to the highest. A scale, numbered 0, 10, 20, 30 and so on up to 100, is then prepared. The stature of the smallest individual is recorded opposite the zero percentile. The cards are then counted for one-tenth of their number, and the stature there found is placed opposite the 10 of the scale, and so on right through the whole series until the last card is reached, which is that of the tallest man, whose stature is recorded opposite the 100 of the scale. The stature recorded opposite the 50 percentile will give, without any calculation whatsoever—always provided a sufficiency of observations has been taken—the average stature of the community. It is further obvious that the readings at zero and 100 will give the range of the variation within the series examined, whilst the confines of normality may be regarded provisionally as being between the 10 and 90 deciles of the scale, which may be checked, if necessary, by the estimation of the standard deviation about the norm or average. It is clear that the dwarfs will be below the 10 percentile, and the giants above the 90 percentile. Persons whose stature falls below the 10 percentile or above the 90 percentile, may, therefore, be provisionally regarded as being abnormal as regards their stature. It is a matter for regret that school medical officers do not adopt this simple method of displaying the stature and weights of school children, as much labour would be saved, their results would be available for comparative purposes by other investigators, and an indication would be afforded of the range of the variation.

Such a method applied to head measurement and cubic capacity of brain gives the small-headed, and small-brained, at one end of the scale, and the large-headed, though not necessarily the multi-neuronied brain, at the other. On purely theoretical grounds, and as a basis for further investigation, we elected to regard the cases below the 10 percentile, and above the 90 percentile, as the *potentially* abnormal members of the series. We then proceeded to test this hypothesis clinically. Two hundred children, whom we had not previously seen, and in whom there was no suspicion of cerebral abnormality prior to that provisionally revealed by head measurement, were

submitted to certain well known standardized mental tests, and what resulted? Of the small-headed, one in every two was found to be at feeble-minded levels, and of the big-headed, one in every four was at a super-intelligent level. In 50 per cent. of the microcephales (deciles 0 to 10), that is, in 5 per cent. of the total series of children, head measurement had revealed evidence of the lack of development of the supragranular layer of the cortex, and of its abundant development in 25 per cent. of the big-headed (deciles 90 to 100)—that is, in 2.5 per cent. of the population. It is a singular fact that these percentages, small though they may appear to be, agree fairly closely with the estimated proportions of cerebral abnormality as determined by other methods.

To have determined the proportion of feeble-minded in the remaining 80 per cent. of the cases—that is, between the 10 and 90 deciles—would have necessitated the psychological examination of nearly 10,000 children, which, for us, was impossible. Mr. Porteus thought he could elicit the same result in another way, and after his appointment to the Vineland Training School he examined a known group of 50 feeble-minded children with the object of determining the exact percentiles of their head measurement. He found that 39 per cent. of the cases fell below the 10 percentile and 14 per cent. above the 90 percentile. In these latter neuroglial development has replaced neuronie development. The remaining 50 per cent. are scattered throughout the remaining 80 percentiles. The agreement between the 200 Melbourne cases and the 50 Vineland cases is so remarkable as to afford a sufficiency of evidence that the majority of mentally defective persons have abnormally developed heads, and that in such cases the determination of the brain capacity affords valuable information as to the state of development of the cortical layers of the brain in a majority of such individuals. In the greater proportion of normal individuals it affords but little information, but in the abnormal its value has been established beyond doubt.

It is not to be assumed that this investigation has been carried out without being checked at every stage by actual clinical practice. It was the clinical problem with which we were concerned from the outset, but we determined that it should everywhere be checked by laboratory investigation of the phenomena of neurology. We have seen many hundreds of feeble-minded children, either private or institutional cases, and in our experience there have been few indeed in whom head measurement, combined with the other avenues of clinical approach, did not afford some indication of the state of development of the cortical layers of the brain. On p. 86 of our Memoir will be found two typical diagnosis charts, regarded by us as the minimum on which diagnosis should be based, these being two of our actual cases. The first one is the case of a middle grade imbecile of the microcephalic type, where the brain capacity (13 percentile) shows a retardation of brain growth of six years, and affords evidence of the lack of development of the supragranular layer, whilst the personal history confirms the fact, inasmuch as it indicates that the individual is working on the animal instincts of his infragranular layer.

The second case is that of a high-grade moron of the macrocephalic (92 percentile) type, which is specially selected because head measurement as such gives no certain indication of the state of development of the cortical layers of the brain. It merely elicits the fact that the child is an abnormally big-headed type. The complete examination, however, makes it an almost certain inference that this big head is not the product of a multi-neuronied brain, but is due to the presence of either fluid or neuroglia. In any case, valuable information has been obtained.

Deeming, the murderer, was an exceptionally small-headed individual, and it is certain that, in him, all the animal depravities were displayed from the presence of an infragranular cortex, with but little or no supragranular cortex; hence the small brain and head, because many of his neurones were absent, or were improperly developed. Deeming was an adult with the brain capacity of a boy of 13 years.

Oscar Wilde is an exceptional case of another category. He belonged to the big-headed type of genius—that is, both his supragranular and infragranular cortical layers were in excess of normal. The production of his literary and dramatic works involved the use of his supragranular

layer, which, exhausted with the effort, underwent a species of chromatolysis, leaving the clamant calls of the now uncontrolled sex instincts of his infragranular layer to work their way into Reading gaol. Students of literature will be enabled to recall many other cases of sex immorality in literary men of genius.

In the many cases of cerebrally under-developed children whom I have seen during the last few years there are few indeed where the examination did not give some indication of the state of development of the cortical layers of the brain, and there were practically none—of the bad cases at least—where the animal instincts of an uncontrolled infragranular layer did not manifest themselves in either the form of uncontrolled sexual activities or some form of theft. Both these are purely animal instincts. If cerebrally under-developed human individuals, through no fault of their own, are to continue to be allowed to exercise their animal instincts at the expense of society, it is time to abandon efforts at social reconstruction. Society demands, and is entitled, to protect itself against the ravages of the cerebrally under-developed, who should be the object of institutional treatment. If that were begun with the children of to-day, of whom there should be a complete national mental and physical record, the next generation would be freed from the incubus of much of the present-day maintenance of the criminal, the prostitute, and the social derelict, because it is now possible, during childhood, to diagnose many of the physical factors which, *given the environment*, make, from the child of to-day, the criminal of to-morrow. The really ironical part of society's indifference to a scientific problem, which it understands only dimly or not at all, is that such individuals, under proper control and guidance, can be made to be self-supporting.

"It is a curious fact," says Groszmann, "that the American nation is spending only 600 million dollars annually for schools, churches, and other constructive agencies; in other words 500 million dollars *less* is spent to develop human assets than is spent to keep up the human failures. It would seem reasonable to expect the American people to apply their recognized business perspicuity to invert these figures, investing more for *constructive conversion and conservation*. Such investment in proper methods of conversion of waste would reduce the enormous refuse-heap now accumulating in the form of human derelicts, causing it automatically to shrink to reasonable bounds. All the failures in the business of life, among them the 500,000 or so of criminals 'doing time' in the prisons of this land, were once pupils in our schools, or playfellows in our city streets, in the villages, and the rural districts."

In view of these facts I must take the strongest exception to the concluding remark of an anonymous writer in a medical journal, when he says, "conduct, the person's reaction to the circumstances of real life, must be the deciding factor in the diagnosis of mental abnormality." This is a pernicious doctrine which ignores alike the gravity of the social menace and the findings of neurology. It is a mere locking of the stable door after the stealing of the steed. With a properly established child study clinic, and the taking of a physical and mental census of the school population of to-day, the next generation would be rid of many of its derelicts and criminals, and the business of life placed on the basis of efficiency. "The saving is not merely one of money, but, what is vastly more important, human souls."

REFERENCE.

¹Publications of the Training School at Vineland, New Jersey, No. 20, May, 1920.

A PLEA FOR MORE FREQUENT USE OF CAESAREAN SECTION.

WITH A DESCRIPTION OF A NEW OPERATION.

BY

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CAESAREAN SECTION is an operation which is having an ever-widening application in the complications of pregnancy and should, and undoubtedly will before long, replace many of the complicated and risky manipulations at present practised.

Craniotomy, a relic of a barbaric past, is after all not so far removed in its sacrificial brutality from a so-called difficult forceps case where there is great risk to mother and child. The ordinary treatment of placenta prævia,

entailing as it does risks from sepsis to the mother and grave risks to the child owing to difficulty with the after-coming head, and the frequently difficult and dangerous manipulation necessary to bring down the arms, and cross birth, with its intrauterine manipulations, present examples of conditions in which Caesarean section may well merit the careful consideration of the surgeon.

Eclampsia is rightly regarded as one of the most dangerous complications of pregnancy, and too often in private practice the first one hears of the case is when the patient is in convulsions. Frequently, no doubt, prompt treatment on medical lines leads to a cure, but there is no certainty about the issue and accouchement forcé has rightly been abandoned.

In my experience the best results are got by the early performance of Caesarean section. I have no hesitation in recommending this when convulsions are present, and I am not at all sure that it is not the best practice in a case of increasing albuminuria which resists treatment and before convulsions supervene.

There is no question about the simplicity and safeness of Caesarean section as an operation. One enters and leaves the uterus by an aseptic route, and has the added advantage of inspecting the whole interior so that no placenta or membrane is retained. Under the best conditions the vagina is not an aseptic route, and if the child is delivered after intrauterine manipulation the bruising and abrading of the tracts considerably lower resistance to infection.

The drawback to Caesarean section is the unreliability of the scar for future pregnancy, and unless the patient is sterilized the risk is a real one.

I have devised the following operation with a view to leaving a scar which, I believe, will stand the strain of future pregnancy. It is based on the fact that there are three layers of uterine muscle; the *outer* layer with its muscle fibres running transversely, the *middle*, which contains the vessels, with its fibres running longitudinally, transversely, and obliquely, with no regular arrangement, and the *inner*, arranged as two hollow cones with their bases joining at the middle of the body of the uterus, and their apices surrounding the orifices of the Fallopian tubes. In the non-pregnant uterus these layers are difficult to differentiate surgically. In the pregnant uterus, on the other hand, the outer and middle layers are easily differentiated.

I have taken advantage of this to perform what might be described as a form of gridiron incision. The abdomen is opened in the middle line, and a large strip of gauze wrung out of warm saline is packed between the uterus and the anterior abdominal wall in order to form a dam completely round the incision. The external layer of uterine muscle is now incised transversely, the incision being just below the centre of the body in front and two inches above Bandl's ring. To start the incision I make a small V exactly in the middle line and about one-eighth of an inch into the muscle. This V facilitates accurate apposition in stitching later. A pair of straight, blunt-pointed scissors are inserted into this and passed transversely under the superficial layer of muscle, first to one side and then to the other. The scissors pass easily, and leave a tract between the two layers. The superficial layer is then incised along this tract. It is necessary to carry this incision the full distance across the front of the uterus. The superficial layer is then peeled from the middle layer upwards towards the fundus. This is easily and quickly done with gauze, and the effect is not unlike peeling an orange. The middle layer is now exposed, and the large tortuous vessels it contains are plainly seen. Any bleeding points on this layer should be seized and ligatured, although this is rarely necessary. The middle and inner layers are now incised longitudinally, and the line of incision selected which seems most clear of blood vessels. This is usually, but not always, the middle line. The child and placenta are now delivered, the assistant grasping the uterus firmly to control haemorrhage. The uterus is turned inside out and its interior inspected. The longitudinal incision is now closed by a continuous No. 4 catgut suture, and the transverse incision in the same manner. The uterus is covered with large gauze squares wrung out of normal saline at a temperature of 120°, and kneaded until it contracts. The abdominal wound is closed in the ordinary way.

My experience with this operation is that the bleeding