pneumococci, meningococci) has exerted an important influence on artificial immunization. In the case of the pneumococcus three well defined types can be recognized, and, by immunizing animals with the separate types, an antiserum has been obtained to Type I which, given intravenously in large doses, is capable of reducing the mortality of cases of pneumonia due to this type.

I should like to state a general rule that applies to immunization and then instance exceptions of practical interest. Antibody immunity can only be produced by the introduction into the tissues of an alien or foreign antigen. Thus an animal cannot produce antibodies to the red cells of its own species or *a fortiori* its own cells.

In the condition known as paroxysmal haemoglobinuria, the result usually of syphilis, for some unexplained reason a specific substance of antibody nature is developed to the individual's own red corpuscles. This body is haemolytic (autolysin), and under certain conditions is capable of producing intravascular haemolysis and haemoglobinuria. Blackwater fever, a recognized complication of malaria, has also been regarded by some as due to a similar autolysin, but the evidence is inconclusive.

Red corpuscles are susceptible to agglutination by serum antibodies in the same way as bacteria. A haemagglutinin may be produced by immunizing in the usual manner with the red corpuscles from another species, but one of the most remarkable serological observations has been that the serum of certain individuals, for example, in the human species, may agglutinate the red cells of others, and that according to this mutual reaction of serum and cells, human individuals can be grouped into four well defined classes. This subject became prominent during the great war, when blood transfusion was a routine procedure, and when the injurious effects due to intravascular haemagglutination had to be avoided by ascertaining the effect of the recipient's serum on the donor's red cells. Here we have an instance of a serum substance, possibly of the nature of a natural antibody, acting on an antigen from the same species, and thus the agglutinin is spoken of as an isohaemagglutinin. It is of further interest that such group characters are hereditary and follow Mendel's law, and out of this has come a method by which, in certain cases, disputed paternity might be decided.

There are other interesting applications of antibody reactions to which I might refer, but the instances I have given are sufficient to show the ramifications of the subject and the practical results of its study.

NON-SPECIFIC IMMUNIZATION.

Perhaps one of our most difficult problems in applied immunity at the present time is that of "non-specific immunization," by which is meant the production of increased resistance by other than specific measures. The accumulated clinical evidence that an infection may be favourably influenced in this way cannot be ignored. For example, there is some reason to believe that the intravenous injection of certain proteins (for instance, proteose preparations, bacterial vaccines) is efficacious in cases of arthritis, including rheumatoid arthritis, and it might be argued that frequently the beneficial effects of vaccines are non-specific in nature.

The commonest method of non-specific therapy has been the intravenous injection of foreign toxic proteins, and the empiric aim is the production of what is called "protein shock." By this is meant a reaction to the foreign substance manifested clinically by rigor, fever (or, if pyrexia already exists, a further elevation of the temperature), aggravation of any local lesion, and various other symptoms associated with the fever. Along with these external effects there may be an increase in the nitrogen excretion indicating an effect on tissue metabolism, a "leucocyte stimulation" and increase of leucocytes in the circulating blood, an increase of proteolytic ferments in the serum, and possibly an increased output of antibodies. In short, the result might be regarded as a temporary exaggeration of the general reactive process which is the essential element in acquired resistance.

Apart from the parenteral injection of toxic proteins, other measures have been employed with a view to producing non-specific effects—for example, the artificial

abscess following the subcutaneous injection of turpentine, and even the artificial interposition of another infection. The fact that an intercurrent infection might influence an existing infection has long been recognized. It has even been suggested that counter-irritants, from the seton and cautery to the poultice and blister, owe their accredited effect to such non-specific action, and that irradiation by sunlight and other rays, the injection of colloidal metals, and certain drugs (iodides, for instance), act in the same way.

This form of therapy has now been extensively exploited, and the clinical data do not always supply the most convincing proofs. On the experimental side proof of non-specific immunization might be based on immunity reactions, or protection experiments in animals. An apparently non-specific reaction demonstrable by antibody effects has been exemplified in persons vaccinated with typhoid vaccine and subsequently developing another infection at a time when the "post-vaccine" agglutinins have almost disappeared from the blood. The second infection leads to a renewed production of the typhoid agglutinin. Thus heterologous stimuli may increase the output of antibodies once the tissues have been sensitized by the specific stimulus. The reappearance of latent antibodies has also been demonstrated in animals as the result of injection of a heterologous bacterium or even non-bacterial proteins—that is, the types of substances used for non-specific therapy. The heterophil antibodies already referred to also exemplify non-specific immunization.

By protection experiments on animals it has been shown that increased resistance may be produced non-specifically. Thus Harvey and Iyengar found that in pigeons a relative immunity to *B. avisepticus* resulted from the injection of *B. coli* vaccine, though quantitatively inferior to that produced by a specific vaccine. In experiments of my own, evidence has been elicited that the resistance of guinea-pigs to experimental infection by *B. diphtheriae* could be increased by the injection of normal serum from various animals and even from other individuals of the same species, though also inferior to the protection conferred by a specific antitoxin.

Non-specific therapy, therefore, is not without some support on the laboratory side, and the further exploration of this field in the treatment of infective disease seems justified.

HOW INTERFERENCE IN LABOUR MAY BE LESSENED BY EXAMINATION DURING PREGNANCY.*

BY

JOHN S. FAIRBAIRN, B.M.Oxon., F.R.C.P.,

F.R.C.S.,

OBSTETRIC PHYSICIAN, ST. THOMAS'S HOSPITAL, LONDON.

My purpose is to draw attention to the application of the methods of modern medicine to the particular problems of midwifery practice. These methods may be stated shortly as, first, the effort to maintain normal functioning by removing any known cause of its disturbance, and, secondly, detecting the earliest sign of disordered function with a view to immediate treatment and cure. If this is our attitude of mind towards the digestive, cardiac, and other functions it must equally be so in regard to the whole reproductive function, including that of parturition.

An anticipatory vision in the management of labour is the most striking development of this attitude of mind applied to the practice of obstetrics. Its relation to the old practice may be aptly compared to the difference between an army commander relying on his tactical skill in emergency to repel surprise attacks, and one who, with all modern means of discovering his enemies' intentions, breaks up threatening concentrations before the attacks mature. Indeed, the prematernity supervision may be termed the intelligence branch in the war against mortality and disability in childbirth.

Ante-natal supervision is as yet in its infancy, and much

* Address delivered to a meeting of the Swansea Division of the British Medical Association.

still remains to be done to improve its methods of investigation. Some enthusiasts have run the new thing to death, and their methods have tended to make the pregnant mother consider her condition as pathological rather than physiological. This danger must be kept in mind and the purpose of the supervision and examination explained to the woman. So far as possible, investigation of suspected abnormalities should be made as little obvious as can be. The chief aims of the supervision may be stated as:

1. Maintaining health of body and mind in the pregnant woman.
2. Preserving the pregnancy to full time.
3. Foreseeing and avoiding preventable difficulties in labour.
4. Preparing the mother for the nursing and care of her child and generally educating her in regard to her own health and that of her family.

If these aims are successfully carried out their effect on maternal and infantile mortality and disability is too obvious to require mention. Reproduction, though physiological, puts a severe strain on the efficiency of every system of the body, and, like passing recruits for active service and "vetting" the crews in a boat race, the thorough investigation of the state of health of the woman early in her pregnancy and further observation to see how she is standing the test, seem but reasonable precautions. Quite apart from those who have some organic weakness and who may break down under the strain, there are special illnesses, such as the toxæmias of pregnancy, that may arise, even in those in the best physical condition. Putting on one side the loss of prospective life, miscarriage is a prolific cause of operative interference during or after its occurrence, often as an emergency and in unfavourable surroundings, and of subsequent disability. Stillbirths and early infantile mortality for the most part result from toxic states of the mother (for example, syphilis and albuminuria), prematurity, and birth injuries. The good health of the mother throughout child-bearing means not only that her resistance to infection and disease is increased, but also her efficiency in looking after her family when they are most in need of her care.

Though the health of the mother will be the primary consideration throughout pregnancy, it will be noticed that there is a difference between the objective in the early and in the later months—say, after the viability of the foetus. In the first three months or so the preservation of the pregnancy is the chief matter; in the last two months the purpose of the investigation will chiefly be towards foreseeing and preventing difficulty and complications in labour.

The ante-natal supervision should be directed to the maintenance of the general health at its best and to the removal of all possible septic foci and the discomforts and troubles connected with the pregnancy; but it is impossible to go into so large a problem, and I will select two types for detailed consideration, as illustrative of the methods employed: first, the woman with albuminuria, and, secondly, the cases of possible difficulty in labour from malpresentation and misfit.

ALBUMINURIA.

In regard to the first, I do not wish it to be thought of solely in terms of eclamptic convulsions and possible complications in labour, for there is a far commoner possible result, and that is permanent renal damage. As the testing of the urine is the first sieve to strain out cases for further investigation, the next point is to determine the meaning of the albuminuria, and for that it is necessary that a catheter specimen should be obtained, so as to make sure that the albuminuria is not due to contamination after the urine has left the bladder; and then a further chemical and bacteriological examination may be necessary to exclude those cases due to pyelitis or cystitis—that is, those in which the albuminuria has arisen after excretion from the kidneys. The next point to determine is how far the renal function is affected, for albuminuria by itself is not proof positive of its disturbance. Diminished secretion, the presence of casts, oedema, and raised blood pressure would indicate renal damage, and to determine its degree the urea concentration test should be carried out. As soon as any impairment of renal function is discovered the essential matter is to keep the patient strictly to bed, and observe what rest with a restricted protein intake will do. In most cases the effect of the diminished metabolism is the rapid

recovery of the renal function and the disappearance of the albuminuria. In the more severe cases, however, improvement may be slow or may not occur. If, after a couple of weeks, no improvement results, and still more if the continuance of headache and sickness, increased oedema, and persistent high blood pressure show that the condition is both serious and resistant to treatment, the pregnancy must be terminated, for fear of progressive and permanent renal damage, or, more rarely, eclamptic convulsions. Improvement, even if slow, will justify further observation. One of the most obvious clinical signs for the termination of the pregnancy is a rising or persistently high blood pressure, as it is a warning of the onset of eclampsia. Dimness of vision with oedema of the retina and exudate is another indication for the immediate termination of the pregnancy, because of the risk of permanent damage to the eyesight. The same principle holds good in other disorders of pregnancy, and that is to determine how far conditions will yield to treatment, and, only in those cases in which other measures have failed, to resort to the induction of abortion or premature labour.

MALPRESENTATION AND DISPROPORTION.

I intend to confine my remarks this evening chiefly to the examination necessary to discover the position and presentation of the foetus, the pelvic capacity, and, so far as possible, to detect any factors likely to complicate the labour. This part of the examination is not begun till the last two months of pregnancy—that is, about the thirty-fourth week—as before then it is rarely possible to discover with accuracy the presentation, and, even if it were, a completely different state of affairs may be present a few weeks later. Before the thirty-fourth week induction of labour is rarely worth while, as the chances of survival of the child are too slender.

The general physical development of the woman should be noted, both in the erect position and when lying down. A height under 5 feet, narrowness across the hips, spinal curvature or other deformity, lameness due to disease of the hip-joint or to infantile palsy, should always suggest the need for special care. Bone or joint disease or other condition that has necessitated a long period of lying on the back during childhood may have checked the full development of the pelvic girdle. The appearance of the abdomen should be carefully observed, both when standing up and recumbent, and the size, shape, and position of the uterus noted. The pendulous abdomen of the multiparous woman is easily recognized and is especially marked when standing up; it is liable to be accompanied by late engagement of the head and malpresentation, and requires support during the later months of pregnancy. The history of the previous labours may indicate whether there has been difficulty before, but even if there has been none it must not be forgotten that the deviation of the uterine axis may cause malpresentation at the beginning of labour, thus calling for careful observation as soon as labour has started, and that other factors may be present that were not previously. In a first pregnancy, on the other hand, unusual forward projection of the uterus, especially if persistent even in the dorsal position, indicates deficient space in the abdominal or pelvic cavity. The common causes are overdistension of the uterus, small abdominal capacity, as in short stumpy women or those with spinal deformity (for example, kyphosis), bringing the ribs close down to the iliac crest, or pelvic contraction preventing the descent of the head into the pelvis so that the foetus is entirely abdominal. Decided forward projection of the uterus in a first pregnancy should always attract attention, but the cause is usually readily determined, and all cases in which it is due to non-descent of the presenting part should raise the suspicion of some misfit between the head and pelvis.

The diagnosis of presentation and position is carried out by the ordinary obstetrical examination, and should be confirmed again later. Rectification of a breech presentation is most easily effected about three weeks before term, and though rectification of the foetal lie and the uterine obliquity by padding and a binder may be tried in shoulder presentations, the more favourable time, owing to the tendency to recurrence, is as a rule at the commencement of labour. In any case in which external version has been

done further examination is necessary to see that there has not been a reversion to the original presentation. Face and brow presentations are rarely recognized at the ante-natal examination, and, if recognized, are not readily converted to, or maintained as, a vertex. For the most part they arise at the onset of labour, and, as in oblique lies, reliance must chiefly be placed on discovering the high position of the head and the conditions liable to give rise to them, and trust to rectification at the onset of labour. Occipito-posterior positions are likewise best treated either just before or immediately at the onset of labour by a pad and binder, after the method of Buist.

The other important part of the obstetrical examination is that of the pelvic capacity, which is carried out by two different methods—one pelvimetry, and the other the estimation of the fit of the head into the brim. The two methods are complementary, and although formerly the measurements were thought to be all-important, wider experience has led to their being looked upon rather as a rough guide and so relegated to a secondary place, the fit of the head in the brim being taken as the deciding factor in determining treatment.

The abdominal examination is especially important as the simplest method of picking out those cases requiring further investigation. The head high up and floating above the brim is easily accessible to palpation. If it has descended into the pelvic cavity the fingers must be sunk into the pelvis in order to recognize the hard and immovable mass filling up the sacral hollow. A high position of the head in a primigravida during the later weeks of pregnancy must always be taken as a warning of possible trouble. The head is commonly found in the cavity during the last month or six weeks of pregnancy, and a high position in the last two weeks must always call for full investigation. In multiparae, especially those with a lax abdominal wall, there is neither the same tension within the abdomen to drive the head downwards nor does the uterine axis lie directly in that of the inlet to facilitate descent, and hence a high position of the head has not the same significance. The history of previous labours in these cases, however, will generally serve to decide whether there is a diminished pelvic capacity, but the possibility of undue size of the head must be borne in mind.

A rough test can be made of the relation between the size of the head and pelvis by pressing the head downwards from the abdomen. If the two poles of the head, the forehead and hind-head, can be felt very distinctly a transverse position of the head with some degree of extension is probable, indicating some flattening of the brim. If in addition the biparietal prominence is easily recognizable, and still more if on pressing down the head it bulges over the pubes, there is definite evidence of misfit. Willett emphasizes the important evidence that can be obtained by laying the flat of one hand on the suprapubic region while the head is pressed down between the fingers and thumb of the other hand, when the parietal eminence, if felt, must be taken as a warning during pregnancy and a danger signal in labour. He also holds that if the palm of the hand is placed on the parietal eminence, it may be found that when the patient sits up and leans forward the parietal eminence sinks below the pubes, showing that the head will pass the brim. By pressing the head into the brim with the patient in the dorsal position an impression can thus be obtained of the amount of room and of the ease with which the head will enter, and those cases in which difficulty is suspected should then be reserved for further examination by the bimanual method. The treatment of the minor degrees of misfit between the head and the pelvis is by the induction of labour before the child is large enough to cause difficulty, and yet not too small to give trouble in rearing.

The cases of high position of the head with difficulty in making it enter the pelvis, picked out by the rough abdominal examination, are now examined bimanually—that is, with two fingers of one hand in the vagina, whilst the other hand on the abdomen presses the head down into the pelvic cavity. This method is more accurate because the internal fingers can be placed fairly accurately in the centre of the pelvis and the pressure of the head directed on to

them—that is, nearly in the proper axis—thus obviating a difficulty in the abdominal method, where pressure is liable to be made either too much backwards on to the sacral promontory or too much forwards on to the pubes. The fingers in the vagina also estimate the degree of descent of the head, how far it can be made to slide down behind the symphysis, and how tightly it fills the inlet and cavity, or whether it merely sits on the brim and bulges over the pubes. As soon as the bimanual examination shows a tight fit, the examination is repeated under anaesthesia and the final decision made as to whether to proceed at once to induction or postpone it for a week or two.

If the patient is examined at the thirty-fourth week, and it is then discovered that disparity between the head and the pelvis is such that even at this early stage natural delivery is unlikely owing to a serious degree of pelvic deformity, Caesarean section at term would be selected. These cases are, however, very rare, and in the lesser degrees of deformity the woman would be seen every fortnight. The fit of the head would be judged by rough estimation until difficulty in pressing down the head was detected, when the bimanual examination under anaesthesia would be made in order to decide the most suitable time to induce. Except in the extreme degrees of pelvic deformity, in which delivery of a living child by the natural passages is clearly impossible, the tendency will be to prefer induction in a young woman so as to have accurate knowledge of what is possible by the natural powers. Nothing is learnt from Caesarean section, and the scars in the uterus and abdominal wall are a source of weakness and a cause of anxiety in all future pregnancies and labours. For a time the more dramatic Caesarean section was overdone, largely because a short-sighted view, limited to the one pregnancy, was taken instead of a wide vision over the future reproductive life of the woman. In a young woman with the whole of her reproductive life in front of her an early induction should be preferred, even if it offers but a slender chance of the child being reared. A natural labour carefully observed and conducted will teach us much more than we can learn from the most thorough examination, and in a young woman with twenty years of reproductive life in front of her it is much better for her future to make a trial trip of her first pregnancy and know by experience what the natural powers can do. Usually they will do better than we expect. On the other hand, in a woman who has had previous labours in which induction has failed to give a living child, or in a woman in her first pregnancy towards the end of her reproductive life, Caesarean section would clearly be the preferable method of delivery, as securing her a living child in what might be her only pregnancy.

OTHER CAUSES OF INTERFERENCE.

These examples will suffice to indicate how complications in childbed from malpresentation and misfits may be eliminated by anticipation, investigation, and treatment during pregnancy. There remain, however, the haemorrhages and convulsions, to which passing reference must be made, as both are considerable items in making up the mortality in child-bearing. We know so little as to the causation of ante-partum haemorrhage that our endeavour must be to take the first occurrence of bleeding as a warning of possible further trouble to come. Except that accidental haemorrhage occurs more frequently in women suffering from albuminuria and the intoxications of pregnancy, we know nothing of the causes of separation or abnormal implantation of the placenta. As the causes are unknown, the second best must be done by considering the occurrence of any bleeding of moment as a warning of the possibility of more serious trouble ahead, and therefore keeping the patient at rest and under observation and being prepared to take immediate action if the need arises. If placenta praevia can be definitely diagnosed, it is unsafe to temporize. Eclamptic convulsions rarely occur without albuminuria or other warning signs, and thus their unexpected onset is greatly limited by proper ante-natal supervision; they may, however, occur occasionally in patients under observation and treatment for albuminuria, when they are not usually serious, or may develop suddenly with little warning.

I have tried to show how far the complications due to malpresentations and misfits, to ante-partum haemorrhage and convulsions, with consequent interference in labour, may be greatly lessened. Errors due to miscalculations will be with us so long as we remain erring mortals, but as we become more experienced they will become fewer. There will, however, be left over four-fifths of the interference in labour—the low forceps delivery, the “shoe-horn” operation of easing the head over the perineum because of failure of the forces of labour to overcome the final obstacle of the resistance of the levator ani muscles. Happily this procedure is a minor one, but even it calls for a fresh attitude of mind in regard to it, though that is another story which I cannot begin to-night. The forceps must be regarded as our second line of defence after our first line has given way, and we must try to strengthen the first line, which is to seek out the causes of the ineffectiveness of the powers and remove them—of which fatigue, long-continued pain, anxiety, and dread of the ordeal are the most prominent.

Lectures

ON

THE SYMPATHETIC INNERVATION OF STRIATED MUSCLE.*

BY

THE LATE JOHN IRVINE HUNTER, M.D., CH.M.,
CHALLIS PROFESSOR OF ANATOMY IN THE UNIVERSITY OF SYDNEY.

LECTURE II.—PART II.

THE FUNCTIONS OF THE TWO GROUPS OF MUSCLE FIBRES:

EXPERIMENTAL EVIDENCE (Continued).

EXPERIMENTS ON BIRDS.

THE folded attitude of the wings of birds when standing or walking affords an excellent example of what Sherrington has called an “active posture”—namely, the maintenance of position against the action of gravity by means of the activity of contractile tissues. I thought a study of the mechanism concerned in the production and maintenance of this posture would throw light on the postural activity of voluntary muscle generally, and provide a means of determining the exact part played by the dual nerve supply—somatic and sympathetic—of such muscle in the production and maintenance of posture.

The effect of gravity, which would be freely acting under normal conditions in some birds, would tend to cause drooping and falling outwards of one wing, if the mechanism for the maintenance of its posture were interfered with, and by comparison with the position of the normal wing of the opposite side the degree of interference is readily measurable. The wing offers advantages for study over the limbs of the cat, dog, and goat, in which the normal attitude is extension, for compensatory efforts are necessary in order to retain this position in the interests of maintaining the erect attitude. This tends to mask the effects of injury reducing the efficiency of the postural mechanism. Variations in the position of the wing may also be studied more easily than alterations in the degrees of flexion of the hind limbs of the frog after sympathetic ramisection, as suspension of the frog (which is necessary to allow the normal side and the injured side to be compared) introduces rotatory reflexes. This circumstance renders a careful analysis necessary in order to dissociate the effects of labyrinthine impulses from the proprioceptive effects produced in the musculature of the limb itself¹⁵ (cf. Langelaan, *Brain*, 1915 and 1922).

In his memoir, “The Postural Activity of Muscle and Nerve,”¹⁶ Sherrington says:

“Section of the afferent roots of the wing affects little, if at all, the folded posture maintained by the wing when not in flight, i.e., during standing or walking. Nor has the source of the postural

contraction of the flexors of the wing been found. Here, as in the case of the iris, the postural contraction, if, as is presumable, reflex, lies in receptors not those of the contracting muscle themselves—is, in short, alienogenous not autogenous.”

In view of our experiments on goats it appeared to me that a possible explanation for the failure to alter materially the folded position of the wing, by severing the posterior nerve roots corresponding to the origin of the brachial plexus, was due to the fact that in such an experiment the sympathetic innervation of the voluntary muscle of the wing was left intact. In previous papers (see, for example, *Surgery, Gynecology and Obstetrics*, December, 1924) I have argued that the function of the sympathetic nerve supply of skeletal muscle is the maintenance of posture once the position is attained—in other words, that it is responsible for the property of plastic tone. It appeared desirable, therefore, to ascertain the effect of removal of the influence of the sympathetic nerve supply of the muscle of the wing by section of the cervical sympathetic. The result of the first experiment of this kind has already been recorded.¹⁷ The wing was markedly drooped compared with the normal side when the body of the fowl was supported in the hand during recovery from the anaesthetic. Later the droop of this wing was definitely noticeable but not so marked, its tip being 1.5 cm. lower than the tip of the intact wing. The wing also was less firmly folded to the side of the body. This condition was still noticeable when the fowl was kept at rest for some minutes up to the time of being killed seventy-four days later. A *post-mortem* examination revealed that the vertebral sympathetic cord had been cut below (or behind) the upper two roots of the brachial plexus only, so that the effect was incomplete. Subsequent operations of a more complete character, in which the sympathetic was approached by dissection of the intertransverse spaces from behind, instead of from the front as in the first experiment, gave similar results.

Anatomical Features of the Cervical Sympathetic Trunk of Birds.

The vertebral sympathetic plexus or cord, which contains the fibres that interest us in these experiments, passes through the foramina of the transverse processes along the vertebral vessels on a plane ventral to the roots of the brachial plexus. On approaching the ribs the cord usually splits into dorsal and ventral trunks, which pass respectively dorsal and ventral to the neck of the rib. The operation usually performed on the fowls was to divide these trunks above the first true rib (at C in Fig. 7)—that is, caudal to the last large nerve (the last cervical) which contributes towards the formation of the brachial plexus. In sea-gulls I invariably cut the dorsal and ventral trunks immediately behind (or below) the penultimate cervical nerve as well.

This section produced a more marked effect on the eyelids than the more caudal section. Langley has shown that the last cervical nerve is the first nerve through which pre-ganglionic fibres of the sympathetic nervous system emerge from the spinal cord. He records that the criterion of movement of the feathers following stimulation shows that these fibres are distributed to the upper part of the neck and the head. It may be distributed to the anterior part of the wing, but the effect is only slight when it occurs there. Therefore the more caudal section of the sympathetic

FIG. 7.—Diagram of the fowl's brachial plexus. C, The spot where the whole sympathetic connexions of the wing can be severed. D, The line along which either the posterior or the anterior somatic roots or both can be cut.

* Delivered by Professor Elliot Smith at University College, January 26th, 1925.