difficult part of the proceeding; and when all was well cleared and dried the vagina was plugged with sublimated compresses and iodoform dusted over it. I saw also an ovariectomy, the same precautions being used as in the former case. The tumour was a firm, very fixed mass, as large as a child's head, which Signor Carle thought it probable he would not be able to remove; but he deemed it best to operate, as it was a source of much trouble and pain. A free incision into the abdominal cavity, extending above the umbilicus, disclosed a thick-walled cyst extensively adherent in the pelvis. It was accordingly punctured, and, the fluid having been withdrawn, was freely laid open, and some papillomatous matter in the interior removed. The peritoneal surfaces of the sac and the abdominal walls were united by continuous suture, the edges of the sac and the skin united by sutures passed through the thick wall of the sac and the abdominal wall, the abdominal cavity carefully cleared by sublimated sponges held in long-bladed locked forceps, the sac plugged with iodoform compresses, iodoform sprinkled all over, and the whole covered with cotton-wool and bandages. Two days afterwards the woman was doing well.

In the Ospedale S. Giovanni, which contains 600 beds in the large long cruciform wards, with an altar at the intersecting point, and tiled floor, common on the Continent, I accompanied Signor Caponotto in his morning round, which occupies him commonly from 7 A.M. till 12, 1, or even 2 P.M., and saw cases recovering from ovariectomy (two); removal of tongue (submental); Dupuytren's operation for artificial anus (two); laparotomy for abdominal obstruction; trephining of mastoid process of temporal bone (two); urethrotomy for traumatic stricture; divers amputations, &c. He usually operates at 10 A.M. He did an osteotomy for ill-set fracture of the leg in a man, similar precautions as regards washings of hands and of the patient's limb and use of the sublimate in cleaning the wound and the dressings being adopted as at the Mauriziano. Chloroform is always given in Turin in preference to ether. Signor Caponotto told me that although it was administered several times daily in that hospital, and although no particular precautions were used—indeed it was often administered by students,—a fatal result had occurred only once. In somewhat extensive observation of European hospitals, I do not know that I have ever seen better surgery, more care in antiseptic precautions, more general attention in dressing &c., or better results, than in the hospitals of Turin, or that I have met men more equal to the various requirements of operative surgery than Signori Carle and Caponotto, and who give more time to their work. The latter informed me that he has no remuneration; the former receives 1000 francs per annum. The clinical instruction is given in the S. Giovanni by the professors. Professor Bruno lectured at length on each of two cases, a simple fracture of the leg and a common hydrocele, the greater number of the crowd of students neither seeing nor hearing anything. One could not but feel that some of them would have been better occupied in accompanying Carle or Caponotto, who were attended only by their assistants, and that this sort of division of labour was not quite satisfactory as regards teaching.

In the Ospedale Ottalmico, which is furnished with laboratory, museum, and all appropriate appliances, I saw extraction of cataract without previous iridectomy (a good circular pupil remaining), iridectomy, and other operations performed by Signor Raymond as well as I have seen them at Moorfields or elsewhere. Antiseptic precautions are here also used, the carbolic spray being employed. The hands of the operator and assistants were scrupulously washed, the sublimate water was poured over the eye, the instruments, chiefly purchased in London, were in antiseptic fluid, and iodoform, fine and carefully prepared, was dusted upon the eye after the extraction of the cataract and after some other operations.

I came to the conclusion that some of our students, after obtaining their diplomas (it is, I am sure, best to remain at the British schools till that has been done), might very advantageously spend a short time in the clear, bright, healthy, happy town of Turin, where they will have the opportunity of seeing quietly and well a greater variety of cases well treated by individual surgeons than in the more reputed and more crowded hospitals of Vienna, Berlin, or Paris. By so doing, in this and some of the other large continental towns, they might also obtain and communicate to us in England better information respecting details and general

treatment and results than it was possible for me to do in my short visit this spring. Such information would be of more value than that gained at the International Congresses; at any rate, it would be a highly important supplement to them. Cambridge.

CRANIO-CEREBRAL TOPOGRAPHY.

BY WILLIAM ANDERSON, F.R.C.S.,

AND

G. H. MAKINS, F.R.C.S.

THE earliest of the serious attempts to demonstrate the relation of the brain convolutions to the cranium was that of Broca,¹ and his researches have been followed by those of Bischoff,² Turner,³ Féré,⁴ Pozzi,⁵ Giacomini,⁶ Ecker,⁷ Heffler,⁸ Hare,⁹ R. W. Reid,¹⁰ Horsley,¹¹ and Cunningham.¹² The experiments of these observers may be classified into three principal groups. In the first, led by Broca, the cranial sutures were exposed, punctures were drilled at certain points in their course, and pegs or pins of wood or metal were introduced into the brain through the apertures; the more important relations of the convolutions to their bony case were thus laid down in a manner that involved no material source of fallacy beyond the variability of position of the sutures themselves in their relation to the cranium as a whole. In the second group various parts of the brain were exposed by removal of its investments, the organ having in some cases been prepared for the experiment either by injection of its vessels (Heffler) or by freezing (Féré). Thus Turner, having removed portions of the frontal, parietal, occipital, temporal, and sphenoid bones, left a number of regions (occipital or post-lambdoid, frontal or pre-coronal, antero-parietal or post-coronal, post-parietal or pre-lambdoid, and squamoso-sphenoidal) bounded either by sutures or by arbitrary lines, and each containing certain convolutions or portions of convolutions. Heffler prepared a series of casts of different segments of the head (anterior, superior, and posterior), then of the corresponding portions of the bony cranium and of the brain. Lastly, Cunningham, having prepared the brain by a special process in such a manner that when exposed *in situ* it would remain absolutely unaltered for at least twenty-four hours, removed portions of the bone on one side, leaving narrow bars of the cranial wall in the lines of the sutures and temporal ridge. Moulds were taken, and from these were prepared the valuable series of models recently exhibited at the Royal Academy of Medicine in Ireland, and at the Anatomical Society of Great Britain. The third group, the most important for the surgeon, includes the various endeavours to localise the principal brain fissures by means of certain lines and admeasurements marked upon the shaven scalp. In these researches it was of course necessary that certain recognisable starting points for the lines or measurements in question should be defined upon the surface of the cranium and all parts of the skull that could be made available for the purpose—the glabella, the external occipital protuberance, the external angular process, the zygoma, the mastoid process, the frontal and parietal eminences, the temporal ridges, the external auditory meatus, the borders of the orbit, and the coronal and lambdoid sutures—have been utilised in one or other of the three chief systems—that of the French school (Championnière and others), of Reid, and of Hare,—to which surgeons already owe a debt of gratitude.¹³

There is no doubt that by any of these carefully elaborated methods the brain points sought for could be exposed in the greater number of cases by a trephine of an inch in diameter, but there will be found in each plan certain disadvantages which render it occasionally untrustworthy.

¹ Bulletins de la Société Anatomique, 1861.

² Die Grosshirnwindungen des Menschen. München, 1868.

³ Journal of Anatomy and Physiology, vol. viii., pp. 142-369.

⁴ Bulletins de la Société Anatomique, 1875; and Archives de Physiologie, 1876. ⁵ Archives Générales de Médecine, 1877.

⁶ Topografia della Scissura di Rolando. Torino, 1878.

⁷ Archiv für Anthropologie, vol. x., 1876-78. ⁸ Ibid. p. 243.

⁹ Journal of Anatomy and Physiology, Jan. 1884, p. 175.

¹⁰ THE LANCET, Sept. 27th, 1884.

¹¹ American Journal of the Medical Sciences, 1887.

¹² THE LANCET, May 26th, 1888.

¹³ Reid's diagram will be found in THE LANCET, vol. ii. 1884, p. 539; that of Hare in vol. i. 1888, p. 409.

Thus, in the French system, the bregma is adopted as the fixed point by which the upper extremity of the fissure of Rolando (carried as far as the middle line) is to be discovered; but the coronal suture is variable in its relations to the rest of the cranial walls within limits which, though small ($\frac{3}{8}$ in.), are sufficient to introduce an undesirable source of error, and in a certain number of heads, perhaps one in every five or six, the ridge or depression commonly present at this spot is not perceptible through the scalp. The indications for the inferior extremity of the same sulcus, again, are inelastic, and, although probably accurate for crania of a certain type, would be more or less incorrect in other cases. The same may be said for the points indicating the fissure of Sylvius. In the systems of Reid and Hare the indications for the localisation of the different parts of the fissure of Sylvius present material differences, and in both the parietal eminence is adopted as a landmark for the termination of the sulcus (Reid $\frac{3}{8}$ in. below, Hare at the most prominent point), although the most central point of the boss is often hard to define, and in any case its position is subject to a variation of an inch in the horizontal and nearly half an inch in the vertical direction.¹⁴ The fissure of Rolando in Reid's method is found by two lines running perpendicularly upwards from a base line (which passes through the lower margin of the orbit and the external meatus) at points corresponding to the pre-auricular depression and the posterior border of the mastoid process; but, apart from the practical difficulty of erecting perpendicular lines upon a curved surface, it may be noticed that the posterior border of the mastoid process is seldom well defined, and that the breadth of the process varies to the extent of $\frac{3}{8}$ in., and under conditions which bear no reference to cerebral development. In Hare's system, the upper extremity of the fissure is found by a plan almost identical with that previously formulated in the last edition of Quain's Anatomy, and against which no objection can be raised, since it adjusts itself well to the varying size of the brain case. From this point the course of the sulcus is found by a line forming an angle of 67° with the sagittal line, and running downwards and forwards for a distance of $3\frac{3}{4}$ in.;¹⁵ but it is not very easy to measure angles upon an irregularly curved surface, and the plan is, moreover, open to objection on the score of inelasticity. The external parieto-occipital fissure is placed by most observers beneath or near the apex of the lambdoid suture; but it may be shown that this, as an external landmark, has the same defects as the bregma. Mr. Reid, however, while recognising the relation of the sulcus to the suture, prefers to discover the position of the former by prolonging the Sylvian line to the sagittal line—a procedure which necessarily includes any defects that may belong to his method of tracing the fissure of Sylvius. A few other points for criticism might be raised, but the following tabulated list of indications given by different authorities for the position of the principal fissures will, perhaps, lay the matter before the reader in the shortest and most comprehensive manner.

1. FISSURE OF SYLVIVS.

(a) "Commencement":

Champonnière: 3 cm. behind external angular process, and 5 cm. above zygomatic arch.

Hare: In the course of a line from external angular process to occipital protuberance, and $1\frac{1}{8}$ in. behind the process. Deviation in 17 heads, $\frac{1}{8}$ in.

Reid: $1\frac{1}{4}$ in. behind external angular process.

(b) Point of bifurcation:

Thane and Godlee (Quain's Anatomy): $1\frac{1}{4}$ in. behind and $\frac{1}{4}$ in. above external angular process.

Hefttler: 1.3 cm. behind coronal suture and opposite speno-squamosal suture.

Ecker: Corresponds to coronal suture, or not more than a few millimetres behind.

Reid: 2 in. behind and slightly above external angular process.

Merkel: 5 cm. to $4\frac{1}{2}$ cm. perpendicularly above middle of zygoma.

Hare: The ascending limb is described as corresponding to the squamoso-sphenoidal suture, but its point of commencement is not localised.

Horsley: 1 to 2 millimetres anterior to speno-squamous suture, midway between stephanion and zygoma.

(γ) Course of posterior limb:

Broca: Opposite level of squamo-parietal suture, and hence about 5 cm. above zygomatic arch.

Reid: A line commencing 2 in. behind and a little above external angular process, and extending to a point $\frac{1}{2}$ in. below centre of parietal eminence.

Seguin: Along line from external angular process to tip of lambda (corresponding closely to Reid's line).

Hare: A line from commencement of fissure (see above) to centre of parietal eminence.

Horsley: Commencing midway between stephanion and zygoma, extends along squamo-parietal suture nearly up to parietal eminence. The squamo-parietal suture lies at junction of middle and superior thirds of line from temporal ridge to zygoma, just anterior to temporo-maxillary articulation.

2. FISSURE OF ROLANDO.

(a) Upper extremity:

Broca, Championnière, Féré, and others: $4\frac{1}{2}$ cm. to 5 cm. behind bregma. Distance never exceeds 5.7 cm., but there is great variation in pathological conditions.

Thane and Godlee: $\frac{1}{2}$ in. behind middle of a line drawn from the root of the nose to the external occipital protuberance.

Hare: 55.7 per cent. of distance between glabella and external occipital protuberance.

Reid: Touched by the upper end of a line drawn from the posterior border of the mastoid process perpendicularly to a base line extending from the lower border of the orbit through the middle of the external auditory meatus.

Merkel: Touched by the upper end of a line drawn in a direction perpendicular to the zygoma from the posterior border of the mastoid process.

Seguin: A line corresponding closely to that of Reid and Merkel, but drawn perpendicular to a base line extending from the cusps of the upper teeth to the tip of the mastoid process. (A modification of Féré's alveolo-condylar plane.)

(b) Lower extremity:

Féré: $2\frac{1}{2}$ cm. to 3 cm. behind lower extremity of coronal suture, which lies 15 mm. to 20 mm. behind external angular process at the level of the super-ciliary ridge.

Championnière: A point 7 cm. behind and 3 cm. above external angular process.

Thane and Godlee: About 1 in. behind bifurcation of fissure of Sylvius (see above).

Reid: Touched by a line carried at right angles to the base line (see above) from the pre-auricular depression.

Seguin: Touched by a line drawn perpendicular to the alveolo-condylar plane through the middle of the external auditory meatus. This line reaches the bregma above (auriculo-bregmatic line).

Merkel: Touched by a line drawn perpendicular to the zygoma through the temporo-maxillary articulation.

(γ) Direction of fissure of Rolando:

Giacomini: A line drawn at right angles to the sagittal line from the greatest transverse diameter of the head (measured with calipers) cuts the fissure of Rolando nearly in the middle, and the decussation lies exactly midway between the sagittal line and the point of the greatest transverse diameter. The fissure forms an angle of 115° to 125° with the vertical line (or 55° to 65° with the sagittal line). Crania examined were all of strongly brachycephalic type.

Hare: Course of fissure indicated by a line passing from its upper extremity (see above) downwards and forwards at an angle of from 60° to 73° (average 67°) with the sagittal line.

3. EXTERNAL PARIETO-OCCIPITAL FISSURE.

Féré: Summit of lambdoid suture: exactly in 35 cases, 1 to 4 mm. anterior in 17 cases, and 2 to 3 mm. behind in 2 cases. (Subjects examined all women, mostly over sixty, and forming part of the clinique of M. Charcot.)

Hefttler: usually opposite to summit of lambdoid suture.

¹⁴ See table in Journal of Anatomy and Physiology, 1889, p. 465.

¹⁵ This angle was first estimated by Giacomini, who found it to range between 55° and 65° (115° - 125° in the vertical line).

Hare: $1\frac{1}{2}$ in. to $2\frac{1}{4}$ in. (average $1\frac{1}{2}$ in.) from upper extremity of fissure of Rolando, $\frac{5}{8}$ in. anterior to lambda.

Thane and Godlee: Summit of lambdoid suture, 2 in. to 3 in. from external occipital protuberance.

Reid: Posterior extremity of line continued from fissure of Sylvius to sagittal line.

Merkel: Beneath or a few millimetres behind summit of lambdoid suture (about 6 cm. above external occipital protuberance).

Horsley: 2 mm. to 3 mm. anterior to apex of lambdoid suture.

The details of the system we venture to propose will be found in the current issue of the *Journal of Anatomy and Physiology*. It will be sufficient here to state that the principal researches were carried out by means of experimental punctures made at certain points previously marked upon the scalp, and that the subjects were twenty in number—fourteen men, three women, and three children (aged two and a half, eight, and fourteen),—but, as both hemispheres were examined in each case, the total observations for each fissure may be taken as forty. Broca's method was adopted in preference to any other, because in this the relations between brain and cranial wall are in no way disturbed, and if the point of perforation be carefully fixed there is no reasonable probability of errors of observation. A supplementary set of examinations dealt with the relation of certain of the cranial sutures, eminences, &c., to the skull as a whole, with a view to determine the range of variation of the landmarks hitherto employed in cerebral localisation. The main general deductions from the experiments were: firstly, that the normal variability of the fissures is very considerable in different subjects, and even on the two sides of the same brain, and it is only by finding the mean of the variations that the best position for the application of the trephine can be calculated; and secondly, that the positions of the various sutures, eminences, and ridges are not entirely or equally trustworthy as indications of the localities of the cerebral convolutions, as the former may vary under conditions that have no influence upon the latter. This being stated, it is only necessary to refer to the diagrams showing the plan of construction of our cranial chart, and the relations to it of the more important cerebral sulci. (See Figs. 1, 2.)

FIG. 1.

Cranio-cerebral guiding lines, traced upon a cast of Professor Cunningham's (from a photograph). GP, Glabellar point; glabella opposite superior border of orbit. IP, Inial point, at external occipital protuberance. MSP, Mid-sagittal point; midway between GP and IP. Ang.P, Angular point; external angular process opposite upper border of orbit. Sq.P, Squamosal point; intersection of oblique and frontal lines at junction of middle and lower thirds of latter. PP, Parietal point; termination of oblique line, equidistant with FS² from squamosal point. Aur.P, Pre-audicular point; depression in front of tragus, at level of upper border of external auditory meatus. FS¹, "Commencement" of fissure of Sylvius, $\frac{1}{2}$ ths of distance from Ang.P. to Sq.P. FS², Bifurcation of fissure of Sylvius, $\frac{1}{2}$ ths of distance from Ang.P. to Sq.P. FS³, Termination of fissure of Sylvius, $\frac{1}{2}$ an inch above PP, in a direction parallel to frontal line. FR¹, Upper extremity of fissure of Rolando carried to sagittal line in direction of fissure, $\frac{2}{3}$ ths of an inch behind mid-sagittal point. FR², Lower extremity of fissure of Rolando carried to oblique line in direction of fissure, $\frac{2}{3}$ ths of an inch in front of squamosal point. PO, External parieto-occipital fissure, carried to sagittal line in direction of fissure, $\frac{1}{2}$ ths of distance from MSP to OP.

FIG. 2.

Outline traced from a photograph of a cast of Professor Cunningham's. For references see Fig. 1.

It will be noticed that the standard points are few, and are liable only to a very small degree of variation in different subjects; that the frontal and oblique lines by which the course of the fissures of Rolando and Sylvius are mainly indicated undergo changes of length and direction in association with variations in the size and form of the skull, and are hence applicable for heads of all dimensions and types, and appear to be adaptable for children as well as adults; and that the test points in the course of the different fissures are measured as far as possible in fractions of the length of the lines, and not in inches and centimetres, in order to secure a similar adaptation to crania of all dimensions. This rule is departed from only in the case of the two extremities of the fissure of Rolando, where the necessary adaptive changes are sufficiently secured by the shifting of the frontal line.

The following indications may now be quoted from our paper in the *Journal of Anatomy and Physiology*:

1. *Fissure of Rolando*.—The upper extremity, carried for convenience of admeasurement as far as the longitudinal fissure (in line of the sulcus), was found to lie in all cases between the mid-sagittal point and a point three-quarters of an inch behind it. Its distance behind the mid-sagittal point, however, bore no constant relation to the length of the sagittal line, and hence the central spot for the application of the trephine may be most safely fixed at three-eighths of an inch behind the mid-sagittal point. The superior connecting gyrus between the pre-central and post-central (ascending frontal and parietal) convolutions occasionally appears only on the mesial surface of the hemisphere—in this case the fissure of Rolando actually reaches the longitudinal fissure. The lower end of the sulcus, carried into the fissure of Sylvius, lies in the squamosal line between the junction of this line with the frontal line (squamosal point), and three-fourths of an inch in front of this. The centre of the trephine may hence be applied, in the squamosal line, three-eighths of an inch in front of the squamosal point. In four instances the sulcus really joined the horizontal limb of the Sylvian fissure. The angle formed, with the upper border of the hemisphere, by a line connecting the two extremities of the fissure of Rolando, in eight cases was found to range between 55° and 70° ; in twelve out of the sixteen fissures falling between 60° and 65° . The course of the fissure is extremely capricious, and tracings taken from opposite hemispheres often differ considerably from each other. (See illustration in *Journal of Anatomy and Physiology*.) A strong curve with a backward convexity is not unfrequently met with in the upper third, and a second smaller curve in the opposite direction may sometimes be found near the lower extremity of the sulcus.

2. *Fissure of Sylvius*.—The place at which the frontal and temporo-sphenoidal lobes appear to separate when seen from the lateral aspect of the brain—the so-called "commencement of the fissure of Sylvius"—can scarcely, from its very nature, be fixed with complete exactness, but it may be computed with sufficient accuracy for all practical purposes. It was found to lie in the squamosal line between $1\frac{1}{2}$ in. and

$1\frac{1}{2}$ in. behind the external angular processes, or about $\frac{5}{12}$ ths of the distance between the point and the frontal line. The bifurcation of the fissure lies in the squamosal line at a point from $1\frac{1}{2}$ in. to 2 in. behind the external angular process, or at $\frac{7}{12}$ ths between this process and the frontal line.¹⁶ The course of the horizontal limb from the bifurcation to the frontal line corresponds closely to the squamosal line and a continuation of this backwards for an equal distance behind the frontal line (to parietal point in diagram), it then turns upwards for about half an inch in a direction parallel to the frontal line. The mode of termination of the fissure is, however, so uncertain, that a circle of an inch in diameter failed to cover all the variations in the twenty subjects examined by us. The parietal eminence is nearly always closely related to the point in question.

3. The *external parieto-occipital fissure* joins the longitudinal fissure at a point averaging $\frac{1}{2}$ ths of the distance measured from the mid-sagittal point to the external occipital protuberance, and lies near to the apex of the lambdoid suture. In operations in the neighbourhood of the longitudinal fissure, it is of course necessary to take into consideration the width of the superior longitudinal sinus and its frequent deviation towards the right side in the posterior half of its course. An endeavour was made to ascertain the average positions of the superior and inferior frontal fissures, but these were found to be so irregular in their course as to baffle all attempts to secure indications of any value.

As a practical point it should be mentioned that the mobility of the integumental structures covering the cranium may lead to a misplacement of the trephine aperture, and to obviate this source of error it is desirable to pierce with a strong needle or pin the soft parts at the centre of the spot marked for investigation, and fix the point of the instrument in the bone before making the incision for the exposure of the required portion of the skull cap. The small depression in the outer table will then serve for the application of the pin of the trephine.

A CASE OF

RAYNAUD'S SYMMETRICAL GANGRENE IN A PATIENT SUFFERING FROM CON- STITUTIONAL SYPHILIS.

WITH SOME REMARKS ON THE HISTORY, NATURE, AND
MANIFESTATIONS OF THE DISEASE.

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(Continued from page 11.)

In studying the history of symmetrical gangrene, and in endeavouring to investigate its etiology, I have been struck with the comparative rarity of the affection. In the excellent library of the Manchester Medical Society, containing about 30,000 volumes, a library rich alike in English, American, and foreign medical literature, I have not been able to discover more than ninety-three examples of this disease. Indeed, many experienced hospital physicians have never seen a well-marked case of symmetrical gangrene. How is the rare occurrence of so characteristic a disorder to be explained? Some light may, I believe, be thrown on this difficult subject by a consideration of the sort of abnormal relationship which in certain curiously constituted individuals seems to exist between the cerebro-spinal and sympathetic systems, between the voluntary and involuntary nerves. The most remarkable example of such an abnormality is probably the well-known case of Colonel Townsend, who by the exercise of his will was able to stay the movements of his heart and of his lungs, and to simulate death with such completeness that experienced medical witnesses believed in the reality of his dissolution. His case is reported by Dr. Cheyne in a quaint old work entitled "The English Malady," published in 1733. I find also in the fifth volume of the *American Medical Record* a case recorded by Dr. Meredith

Clymer, where the patient by the force of his will could produce at pleasure a blanching of the entire cutaneous surface (*cutis anserina*), with loss of heat. Again, Dr. Druitt¹ maintains that psychical disturbances are at times sufficient to induce attacks in a sensitive person, where such attacks are usually induced by cold. Dr. Colcott Fox also refers to a woman who frequently experienced paroxysms of local asphyxia. In reference to her case, it is stated that her extremities "go blue" in a second if she is startled by a sudden knock at the door or any unusual occurrence. Raynaud too refers to a case recorded by Lamotte. A billiard marker received a blow from a stick on the outer part of his right arm. There was severe pain; the hand became cold, pale, and insensible. The morning after, Lamotte made many cuts with the lancet without the patient perceiving it; he even cut across the hand without a drop of blood escaping. His hand remained in the same state during ten days. At the end of that time a little heat returned, then the arterial pulsations, which had been suppressed, reappeared, and the functions of the part were gradually re-established. Raynaud further refers to Volvius, who reports a case in which a similar state appeared following a violent fit of passion, and lasting eight or ten days. In two of the instances I have here adduced, the circulation in the extremities was to a considerable extent influenced by the will. This subjection of the vaso-motor nerves to the higher cerebral centres is extraordinarily rare, and very few examples of it are to be found in medical literature. In three of the other cases the spasmodic contraction of the arterioles was found to depend on strong emotional influences—in one case the emotion of passion, and in the other two the emotion of fear, inducing a closure of the vessels. Anomalous cases such as these teach us that there are constitutional peculiarities in certain individuals which render them abnormally susceptible to impressions which in the vast majority of persons would pass wholly unheeded. A very large proportion of those who have suffered from Raynaud's disease are described as emotional and excitable—men and women in whom the neurotic element is in the ascendant. A study of the cases which have been recorded points to this unstable equilibrium of the nervous system as a potent predisposing factor in the pathogenesis of the disease. Still, I am disposed to believe that vascular spasm, even though maintained for a considerable time, is not by itself alone sufficient to induce gangrenous destruction in the extremities. It may, no doubt, and in countless instances does, induce local syncope, and far more rarely local asphyxia, but not gangrene. In the two cases to which I have just referred, the one recorded by Lamotte and the other by Volvius, the circulation in the affected parts was apparently totally suspended for eight or ten days, and yet there was no appearance of gangrene or mortification. This destructive change seems to require for its production another factor—namely, a degraded vitality in the cell structures affected—a retrograde change in the tissues. But how is this change brought about? To my mind, certainly what we see here lends weight to the opinion of those who believe in the existence of trophic nerves—nerves which directly control the nutrition of the part to which they are distributed; when their functions are suspended, thereupon destructive changes are liable to occur. Possibly, however, the experiments of Boas² throw some light on these and similar cases. On ligaturing the finger and placing it in ice-cold water, he observed certain changes in the blood-corpuscles in a patient who was subject to hæmoglobinuria (a disease closely allied to symmetrical gangrene). The hæmoglobin was, in fact, found dissolved in the serum, while the changes in the blood discs corresponded with those which have been described by Ponfick; consequently the corpuscles were less resistant to cold than in the normal state. This change in the blood was not observed in a healthy person.

An attentive consideration of the phenomena which accompany an attack of symmetrical gangrene, supply to us much valuable information regarding the circulation of the blood, as it is distributed to the extremities. In numerous instances we observe, perhaps, a more or less generally diffused discolouration of these parts, while within this discoloured area may be seen little black islets consisting of gangrenous patches. These islets do not gradually merge into the surrounding parts, but their outline is clear and distinct. Thus in one of Raynaud's cases he remarks: "In the middle of the most diseased parts

¹⁶ The division of the oblique and sagittal lines into twelfths is readily calculated by employing a measure graduated in lines.

¹ Medical Times and Gazette, vol. i., p. 408.

² Deutsch. Archiv f. Klin. Medicin, 1883.