On October 2nd he discussed a letter and afterwards copied correctly a reply.

On October 4th he wrote a short letter, well worded, correctly punctuated and spelt, in his usually good business hand, with only one error in spelling. He could understand speech well without pantomime, and talk intelligibly, only substituting words occasionally, then saying "Am I talking nonsense?" He however complained frequently of "crashing noises" in his head, which were also excited by rattling of knives, etc.

About two hours after writing this last letter, he had at 10 P.M. a somewhat violent convulsive attack; falling unconscious, he remained so for about thirty-six hours (his friends thought the convulsions bilateral, but there is some doubt). After this attack, though too weak to attempt to write, he regained his speech to a greater extent than before the attack.

On October 12th, about 8 P.M. (having been comatose since the second attack), he suddenly pressed his hand, it is said, over the region of his left kidney, with a cry as of acute pain, and became quickly comatose; convulsions followed, and lasted more or less all night, but were not violent as before. He remained comatose till death, about 8 P.M. on October 14th.

There was no *post-mortem* examination, but I am inclined to think the symptoms were due to hæmorrhage from or about the posterior terminal branches of the middle cerebral artery supplying the superior temporo-sphenoidal and superior marginal convolutions. (A somewhat similar case is reported in Suckling's *Diagnosis of Diseases of the Brain*, but due to embolism.) That it was hæmorrhage is almost certain from the previous tendency to bleeding, from the tense rapid pulse, the absence of heart disease other than hypertrophy consequent upon chronic kidney disease, and the immediately preceding mental strain, excitement, and bodily over-exertion; added to which is the fact that, though the onset was sudden, yet the first symptoms appear to have been faulty word memory, indicating a small lesion affecting the superior temporo-sphenoidal convolution; and as the mischief spread, the symptoms became noticeably more, till at last he could neither speak, recognise spoken or musical sounds, read or write to dictation, recognise familiar objects, or copy writing—though it is possible he may have retained the ability to sign his name.

Regarding the reading, in his case the difficulty was twofold, for the peculiar sounds uttered seem to be diagnostic of word deafness, while that he was certainly word-blind also is shown by his inability to recognise pictures or written directions, and the fact that when getting better he still had to learn to spell out advertisements by means of capital letters chiefly. Dr. Broadbent records an interesting case in which a word-deaf patient read aloud: "So sur wisjee coz wenement apripsy fro freuz fenement wiza seconce coz foz no sophias a the freckled pothy conollied." Dr. Ross, on the other hand, reports a case of a word-blind patient, who for "Dear Sir, I shall be much obliged if you will let me know whether or not you consider it likely A. B. will recover," read as follows: "Dear Sir, you are requested to bring this note with you next time you come to the infirmary."

An additional argument in favour of hæmorrhage exists in the fact that after lying down for some time a subconjunctival hæmorrhage appeared, as if from soaking of the fluid blood along the course of the middle cerebral artery, and thence into the connective tissue of the orbit on the side of the lesion. That it was a cortical lesion is probable from the local pain, the vomiting, the absence of unconsciousness, the absence of any definite motor paralysis, except perhaps some paresis of the muscles of the tongue interfering with whistling, though the chief interference was due to inability to interpret the sounds correctly; the centre for this organ is in close proximity to both the centres for hearing and for sight, since some authorities still hold that the centres in the occipital lobes are not the only visual centres, but also those originally mapped out by Ferrier in the supramarginal and angular convolutions. Professor Ranney, of New York, gives a diagram in his work on nervous diseases showing associating fibres between the speech centre and those of hearing and those of sight (occipital lobes), and between the speech centre and the medulla, and also between the hearing and sight centres; now as these apparently, and the second or speech tract certainly, pass antero-posteriorly close to the surface of the hemisphere (Wernicke), one is tempted to think that pressure on and consequent irritation of these would account for symptoms of word blindness, even supposing the supramarginal sight centres to be only motor. If, then, a small artery supplying the hearing centres ruptured, there seems to me every reasonable chance of the effused blood interfering either with the ad-

jacent sight centres in the supramarginal convolution or with those associating fibres, or possibly both.

THE STAINING OF THE FLAGELLA OF BACTERIA.

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To present to our view all the morphological features of a micro-organism it is necessary to determine the form of the cell body of the micro-organism and especially in the motile species to determine also the presence or absence of flagella. In the ordinary methods of staining bacteria the cell body alone is shown. Several methods have been formulated by which the presence and character of flagella may be demonstrated. The principle underlying all these methods is the same, namely, to act upon the substance of the flagella by means of a mordant, so that these may take up a staining material which when used by the ordinary methods fails to stain them. Methods have been formulated by Koch,¹ Künstler,² Neuhaus,³ Trenkmann,⁴ Loeffler,⁵ Lubsch,⁶ Van Ermengen,⁷ Rémy and E. Sugg,⁸ Klein,⁹ and Nicolle and Morax.¹⁰ The method of the last-named observers is a rapid and effective means of staining flagella. The difficulty to overcome is the precipitation by the mordanting process of foreign substances, which, taking on the stain, obscure the stained flagella. This precipitation they seek to obviate by the following method:—

They rub in a watchglassful of ordinary tapwater a paticle of a recent agar culture of the micro-organism, so that no large particles remain. By means of a pipette, a thin film of this mixture is made on a coverglass held in a Cornet's forceps, and previously strongly heated and allowed to cool. The film is protected from contamination and allowed to dry at the ordinary temperature. A few drops of the mordant are then placed on this film. The mordant is composed of 10 c.c. of 20 per cent. solution of the purest tannin; 5 c.c. of cold saturated solution of ferrous sulphate; 1 c.c. saturated solution of fuchsin in alcohol. The cover glass is then warmed over a flame for twelve seconds, so that the liquid just steams, and it is very important not to heat too strongly or too long. The coverglass is then washed gently but well in a stream of ordinary water. The points of the forceps and the upper surface of the coverglass are then well dried, and the mordant used twice or thrice again in exactly the same way. Too little mordanting shows the bacteria without flagella, too much mordanting precipitates foreign matters and obscures the flagella. Generally three mordantings enable the flagella to take on the stain better than the background. The staining proper may be effected by creasoted or anilin fuchsin, anilin gentian violet or gentian violet. They use Ziehl's phenol-fuchsin. A few drops of the stain are heated on the coverglass in the flame as before for fifteen seconds, and then washed as before. They repeat the staining if they suspect "undermordanting." Then the coverglass may be examined when dry.

By following the clear instructions of these observers and staining with Ziehl's reagent, I obtained good staining of the flagella in the cases of the spirillum Finkleri, sp. Deneke, sp. Metchnikovi, sp. cholera Asiaticæ (one from Koch's laboratory and three isolated by Professor Delépine¹¹ from Manchester cases), a spirillum somewhat like Finkler's isolated recently from Manchester sewage, the bacillus of typhoid, and B. coli communis. Well stained flagella of the last-mentioned spirillum, of the sp. Deneke, and of B. coli communis were obtained by diffusing in tap water a twelve hours' drop culture in bouillon, and this method may prove useful if the bacteria do not readily separate from each other when agar cultures are used. The results are not uniform over the whole of the specimen; the ground is, as a rule, very darkly stained, but here and there the bacteria stand out well stained on a clear background.

The method may not be so suitable for photomicrographic purposes as Loeffler's and Van Ermengen's, but for rapid work this is the best method hitherto described. In the spirilla mentioned above the separate segments had each one flagellum situated at one end. Occasionally strings of spirillar segments were seen, the cells being apparently joined by means of their flagella. This recalls the appearance seen in drop cultures of these organisms, in which a single segment follows at a short interval all the slow movements of a spirillum across the field of view, the segment having apparently some attachment to the spirillum, whilst surrounding free segments have a rapid darting motion.

These observations agree with those of Nicolle and Morax

and other observers. By the differences in the character of their flagella Nicolle and Morax divide the spirillum of cholera and its allies into three types:

Type I. A non-motile Indian spirillum from Koch's laboratory not having flagella.

II. Motile spirilla having flagella.

Type A. Having one flagellum at one end or two flagella one at each end. (Sources—Shanghai, Hamburg, Courbevoix, Seine water, and sp. Deneke.) Loeffler, Trencmann, Neuhaus, and Straus had already noticed this.

Type B. Having four flagella two at each end, or three at one end and one at the other, or having four at one end. (Sources—Massowah, Calcutta, Paris, 1884.)

They never found more than four flagella, and the flagella were often incomplete, being very fragile. They found the character of the flagella to be constant through successive cultures, after passing through animals and man and in the attenuation cultures described by Hueppe as resistant forms. They consider this constancy in the character of the flagella of some value as being the only means of differentiation of spirilla which are isolated from cases of cholera in different places, and analogous in their cultural and pathogenic properties. In *B. coli communis* they found a maximum of from eight to ten flagella, and these were much more fragile than those of the typhoid bacillus, which were ten to twelve in number. Lubsch⁶ says that *B. coli communis* has only one to three flagella, and the typhoid bacillus eight to twelve. My observations agree with those of the former observers, but possibly the organisms are different from those of Lubsch. At present therefore the character of the flagella does not afford a means of diagnosis between *B. coli communis* and the bacillus of typhoid.

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A MODIFIED GOLGI'S METHOD FOR THE STUDY OF THE HUMAN BRAIN.

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GOLGI's¹ original and later² methods give good results with young and embryonic animal brains, but not with adult or human brains. The following method, gradually evolved during the course of a systematic research with various modifications, has given in my hands good results, which are almost constant for the human brain. It is as follows:—

(a) Thin slices (2 to 4 mm. in diameter) of brain, with the pia-arachnoid intact, are suspended by a thread or a glass (or platinum) hook, in K. bichromate 2 p. c. — 95 cc., to which, after 10 to 15 minutes, add 5 c.c. of 1 p. c. osmic acid, keep in the dark for 24 hours, (b) then change into K. bichromate 2½ p. c. — 90 c.c., osmic acid 1 p. c. — 10 c.c., in which keep specimen (suspended) for 2 days; (c) finally change into Golgi's mixture of K. bichromate 3 p. c. — 80 c.c., osmic acid 1 p. c. — 20. The total fixation and hardening of 3½ days shows nerve cells and the two types of glia cells (fibre cells and protoplasmic cells) well; 4½ days show more nerve cells, especially cell bodies; 6 days are needed to show axis cylinders, nerve fibres, and collaterals. On an average it is well to have two specimens, hardened 3½ and 4½ days respectively; (d) rinse in distilled water for 1 or 2 seconds, and plunge into AgNO₃ solution (½ p. c.) in the dark for 5 to 15 minutes, (e) then change into 100 to 120 c.c. of AgNO₃ solution, to which 1 drop, not more, of formic acid has been added, and (f) place in incubator, in the dark, at T. of 25 to 27° C., changing it for fresh silver solution after 24 hours; (g) the total staining in the silver solution should be 3½ days or 4½ days respectively, often 3 days suffice; (h) rinse in methylated spirit and fix in wax, or spirit 15 min. followed by absolute alcohol 15 min, thin celloidin ½ hour, and fix on

cork; (i) cut under spirit; (k) pick out the best sections and place in large quantity of distilled water till nearly freed from spirit, about 5 minutes, (l) then place sections in ½ p. c. solution of AgNO₃ for ½ to 1 hour; (m) dehydrate in spirit, then in xylol-piridine, equal parts; (n) clear in xylol (twice), and mount, after blotting, in xylol dammar, without a cover-glass, hastening the process of drying by placing the slides in the incubator at T. of 37 to 40° C. for 1 day or a little longer. This procedure (n) is necessary, otherwise, even after months, the specimens may begin to spoil.

Successful preparations show the nerve cells and their processes down to their finest ramifications and endings, and the same holds with regard to the glia cells, both protoplasmic and fibre cells, and all these cell elements are sharply differentiated from one another and from the clear ground substance. Axis cylinders and collaterals are seen, somewhat abundantly, also nerve fibres ascending and ending freely by branching fibrils in the cortex. The method is applicable to brains provided *post-mortem* changes are not too advanced, or the tissue disintegrated or softened. Results obtained from human and animal brains have been noted in two previous papers, namely, *BRITISH MEDICAL JOURNAL*, July 29th, 1893, and *Internat. Monats. f. Anat. u. Physiol.*, 1893, Bd. 10, Heft. 11; in the latter of which the author gives special details for the study of the perivascular neuroglia in the human brain.

THE USE OF A COMBINATION OF CARBOLIC ACID AND CHLOROFORM IN ENTERIC FEVER.

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In the early part of last year there appeared in the *BRITISH MEDICAL JOURNAL* two very interesting communications by Drs. Charteris and Wiglesworth, on the effect of the internal administration of carbolic acid in zymotic diseases. As bearing on the same subject, I venture to hope that the following remarks will be of interest to the readers of the *JOURNAL*.

In the year 1892, 24 cases of enteric fever were treated in the Station Hospital, Kirkee (India), with 9 deaths, that is, the high mortality of 37.5 per cent. In the year 1893, 18 cases of this fever were treated in the same hospital, with only 2 deaths, that is, a mortality of 9 per cent. Of these 18 cases, the last two were under my care from first to last. All recovered perfectly without complication of any kind, or occasion for anything beyond a minimum of anxiety.

None of these cases were diagnosed as examples of enteric fever without a consensus of opinion among the medical officers serving with me as to the unmistakable nature of the fever. All twelve cases had practically the same treatment. This communication being principally concerned with the medicinal treatment of enteric fever, I will not take up space with any remarks regarding the important details of diet and nursing, beyond saying that the greatest care was taken as to the suitability of the former and the efficiency of the latter. On admission, if the fever was within the first week, 3 grains of calomel was ordered at bedtime, and this dose was twice subsequently repeated at a few days' interval. The following combination of pure carbolic acid and chloroform was at the same time prescribed, and administered according to the following directions:

Five doses of the mixture to be given every second hour on the first day. Seven doses on the second day. Ten doses on the third and following days, until a distinct improvement is observed in the general condition of the patient, with a fall of temperature. The doses then to be gradually reduced to seven, five, and three in the twenty-four hours, until the medicine is finally abandoned.

It is important to continue giving the mixture in from three to five doses daily for at least a week after the temperature has fallen to normal; doing so renders the patient less liable to a relapse. The combination I advocate is composed as follows:

R. Acid. carbol. pur. (Calvert's) mxxxvi; spt. chloroformi 3ij; tr. cardamom. co. 3ij; syrup. hemidesmi 3ij; aquæ chloroformi ad 3xii. M. Ft. mistura. Sig. The carbolic mixture one ounce, with an equal quantity of iced water, every two hours as directed.

In past years carbolic acid has been more than once recommended as an intestinal antiseptic in enteric fever, but has been never generally adopted. I believe that this neg-

¹ Golgi, *Sulla fina anatomia degli organi centrali del sistema nervoso*, 1885-6.

² Sala, in *Zeitsch. für Wissensch. Zool.*, 1891.