

Citation:

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with the relation given by DEBIJE for sufficiently low temperatures :

$$C_v = 77,94 + 3 R \left(\frac{T}{\theta} \right)^3 \dots \dots \dots (7)$$

The column headed θ contains the values of θ calculated according to formula (7) from the individual measurements.

From these measurements the conclusion can be drawn, that in the temperature range from 15 to 22° K. the specific heat of copper follows DEBIJE's T^3 law within 2 %¹⁾.

Anatomy. — “*A case of occlusion of the arteria cerebelli posterior inferior.*” By Prof. C. WINKLER.

(Communicated in the meeting of November 28, 1914).

J. P., aged 58, artisan-painter, has never before shown any other irregularities but palpitations after physical exertion before the beginning of his illness on October 20th 1912.

At the age of twelve he became an apprentice painter, and always afterwards kept to this handicraft. As a young man he used to smoke much, and also drank much beer, but he firmly denies any sort of venereal infection, though he underwent a treatment for strictura urethrae at the age of 45. His father died of consumption, his mother of jaundice. The eldest *sister* died of apoplexy. The patient is the sixth among nine children. He married young and has five healthy children.

At eight o'clock in the morning of the 20th October he *suddenly complained of dizziness* and was obliged to sit down on a chair. He *did not lose consciousness*, but could no longer walk because his *right leg* had become *lax*. He could neither *speak* nor *swallow*, and suffered of double vision.

Before the beginning of this attack he had walked for a quarter of an hour over hilly ground, and for the rest had even kept himself unusually quiet.

For this attack of vertigo he was treated in the hospital at Pretoria. *After a fortnight* he was *again able to speak in so far* as to make himself intelligible, although he never completely recovered his voice; *swallowing* too was *performed normally again* at this time.

After *two months* he began to walk about again with the aid of a stick. Since the attack however his sense of taste had suffered much. After *three months* the *double vision* had disappeared too.

He did not suffer from *headache* either before or during the attack of vertigo. Neither had there been *any vomiting*, nor *singultus*.

It left however some lasting symptoms, to wit:

1. formications (needle-prickings), in the right half of the body and in the left half of the face.
2. his right eye seemed to him to be covered by a film.
3. he (is) was unable to distinguish between cold and heat with his right hand.

¹⁾ Later, more accurate measurements, which however have not yet been completely finished, seem to show that in this region a small deviation from the T^3 -law exists which slightly surpasses the amount mentioned above. [Added in the translation].

4. he is unable to walk without a stick, because he often feels suddenly dizzy.
 5. he cannot look quickly sideways, without losing his equilibrium.
 6. when looking suddenly sideways (especially to the right), he cannot recognize the objects standing beside him, at least not immediately.
- For the rest the patient declares that his hearing was bad since long. Eating, drinking and sleeping are all right. No disturbances in the deposition of the urine or in defecation.

Status praesens. A strongly built man, average height, good nutrition, well fed. Colouring of the skin and mucous membranes healthy.

The left *arteria temporalis* is visibly crumpled, its wall has surely doubly the thickness of that on the right. To the touch it seems to be tense.

The tongue is moist, not coated. Nowhere any swelling of glands.

Pulse 90 per minute, regular and equal

Breathing abdominal, 24 per minute, regular.

Heart under percussion normal, under auscultation a slightly accentuated diastolic sound in the aorta. Lungs normal both under percussion and auscultation. No irregularities are to be stated in the abdomen. Urine: acid reaction - no albumen, no glucose.

The local sense of J. P. is good, he knows that he is in the Binnengasthuis, is aware too of the right date. His surroundings do not however interest him much.

His memory is good. A number of six figures is correctly reproduced after a lapse of five minutes. Simple and even somewhat more complicated arithmetical questions are correctly solved mentally, e. g. $13 \times 14 = 182$.

The internal speech is unimpaired.

The external speech is rather monotonous, lacking articulation.

The voice is hoarse.

Reading presents no difficulties, neither does writing, which is done in a very neat hand.

The hair-covering of the head is normal, as are likewise the boundaries of the hair-growth. *The head is ever kept turned somewhat to the right.* The face is asymmetrical. The *left cheek* is thicker than the right one, it *feels hotter to the touch and is injected.* The left regio temporalis is salient. The *left orbital fissure* is narrower than that to the right. The *left bulb* is slightly directed upward.

The circumference of the head is 59 cm.

Not unfrequently an *involuntary movement* may be observed, by which *the head* is thrown to the right. The eyes then are turning first to the left and afterwards follow slowly the movement of the head to the right.

The nerves of the brain:

I. *Olfactorius.* The patient states that his sense of smelling was enfeebled long before his illness. To the left he recognizes neither Eau de cologne nor anisseed-oil.

II. *Opticus.* Visus (after correction of the hypermetropia + 3 D) on both sides I. The fundus is normal on both sides, as is likewise the field of vision.

III, IV, V. Movements of the eye. *The pupil* on the left side is somewhat narrower than that on the right, the latter is of normal width. On both sides the pupils are reacting on light and on convergency. *The orbital fissure to the left is narrower than that to the right. The left bulb is slightly protruding.* The position of the bulbi is somewhat diverging. When in rest, sometimes *nystagmoid movements* appear, usually to the left and in horizontal direction.

They disappear when the patient regards fixedly. *In darkness nystagmus to the left.*

The *convergency is normal*, the right bulbus however deviates soon towards the left. *No double vision*

The *moving of the two bulbi* is normal to the right, to the left it is accompanied by *nystagmus*, which however soon ceases afterwards, the moving of the *two bulbi upward and downward* is likewise complicated by *nystagmus*.

Besides this there is no paralysis of the muscles of the eye.

When the patient is looking straight forward, and is summoned to regard fixedly *anybody standing on the right of him*, he does so in the following manner: He turns his head to the right; *both eyes remain behind* in this movement, *they are even drawn towards the left* for one moment, it is only after this that *they are following slowly the movement of the head*, and that the patient looks fixedly into the desired direction.

V. The N. trigeminus. All motor functions of mastication etc. are undisturbed. Sensibility on the contrary has suffered.

The *tactile sense* is unimpaired on both sides. Every contact, however slight, with a hair-pencil or a small plug of cottonwool, is instantly perceived.

On the other hand the *perception of pain* is destroyed *over the whole of the trigeminus area on the left side*. The difference between the head and the point of a pin is not distinguished. Nowhere at any point within this area is a painful contact perceived. To the right the sensibility to pain is intact.

The *perception of temperature*, intact to the right, is likewise disturbed to the left. On this side melting ice is still recognized to be cold, but as being less cold than to the right. With regard to the perception of heat, there is always a difference disfavoured to the left side. The boundary-line of the left analgesy (conf. the scheme) is distinctly defined against the median line, it then passes over the top of the head and returns behind the ear (which is included in the analgesia) along the chin to the median line, where it meets the analgetic right half of the body (conf. later on).

The left half of the mucous membrane of the cavity of the mouth is likewise analgetic, the boundary-line passing over the median line of the tongue and \pm over the middle of the palatum. The latter is swollen (conf. later on).

A deep impression is correctly perceived both to the right and to the left within the trigeminus-area. The two points of the compass of WEBER are well distinguished on both sides at a distance of ± 20 cm. (vertically). The sense of localisation is intact on both sides.

The cornea is normally sensible to the right. To the left both the pain-sensibility and the tactile sense have completely disappeared in it, and a piece of melting ice on the left cornea is not felt to be cold. The cornea-reflex is failing.

The left facial half is hyperaemic and swollen, it feels hotter to the touch, but there is no trophical abnormality.

VII. The N. facialis is intact on both sides. All mimical and voluntary innervation of the face is performed on both sides in the same manner.

VIIIa. The Nervus cochlearis. The tympanic membrane (observation of Dr. VAN GILSE) is normal to the right, and to the left it becomes normal too after the removal of a plug of cerumen.

The patient has not heard well to the right since long (before the attack of vertigo).

To the right upper limit of hearing by bone conduction (monochord STRUYCKEN) $15\frac{1}{2}$ (norm. 13—14).

Upper limit of hearing by air-conduction idem 31 (norm. 14).
 To the left " " " " " bone-conduction idem $15\frac{1}{2}$.
 " " " " " air-conduction idem 31.

Whispering voice. To the right ± 8 cm.
 To the left low zone ± 3 cm.
 high zone ± 5 cm.

To the right the patient does hear:

SCHWABACH shortened. WEBER not lateralized. RINNE to the left +, to the right —.
 VIIIb. *The nervus vestibularis*. Injection of cold water.

On the right side it distinctly produces nystagmus to the left. Afterwards there is \pm no deviation to be found in both arms in pointing at a fixed object.

On the left side there is as distinctly produced nystagmus to the right. The pointing experiment made after this shows no deviation for the right arm, but it does so for the left arm that is deviating to the right.

IX, X, XI. The taste has not suffered either to the left or to the right. Subjectively the patient declares that his sense of taste has diminished on the tip of the tongue.

The uvula is swollen clubshaped at its end, on its right upperside there is a scar. It is deviating towards the right.

The arcus palatini to the right are placed lower than those to the left. On innervation both arches are lifted slightly (a result of the swollen uvula). Insignificant Rhinolalia aperta.

Laryngoscopically (Dr. VAN GILSE). Epiglottis abnormally small. *During phonation the right vocal cord is passing far over the median line.* Of the left vocal cord only a small margin is visible, half concealed under the swollen false vocal cord *The left vocal cord is entirely motionless*, there are neither abductor nor adductor motions.

The motions of the right vocal cord are normal.

To the left there is tumefaction in the region of the arythenoid-cartilage and in the sinus piriformis.

A complete paralysis of the left N. accessorius of the oblongata is assumed to exist.

The shoulders are lifted without any difficulty. M. trapezoides and M. sterno-cleido-mastoidens are not atrophic.

Swallowing presents difficulties, because according to patient, there is an impediment to the left.

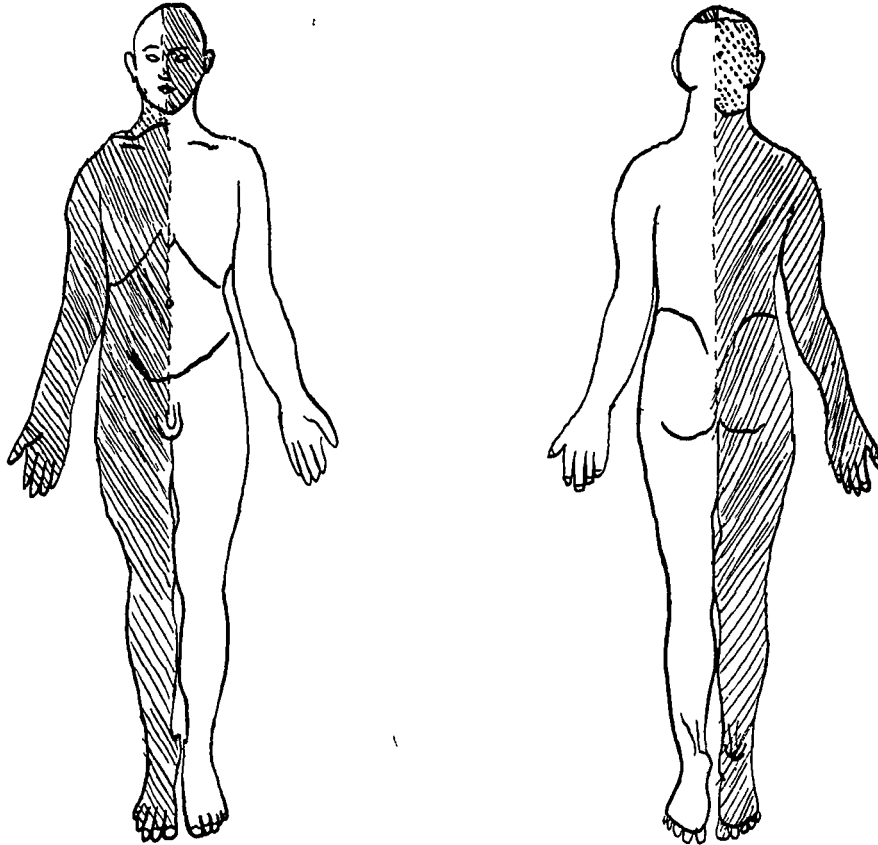
XII. *The N. hypoglossus*. When in repose the tongue is normal, when put out it is stretched straightforward. Strong tremor, especially at the tip. Movements can be made in all directions. The innervation of the bottom of the month is equal on both sides.

Neck and trunk. The attitude of the head is always turned to the right. For the rest no irregularities in the movements of neck and trunk. The vertebral column is nowhere painful. The patient is able to raise himself from a declining posture to a sitting one without the aid of his arms.

Sensibility. The tactile sense is undisturbed both to the right and to the left, even the slightest contact with a plug of cottonwool or a hair-pencil is instantly perceived.

On the contrary the *pain-sensibility is entirely destroyed* on the right side with distinct boundary-lines at the mid-ventral and mid-dorsal lines. Diminished in the region of the neck and at the right side of the occiput (see the dotted lines in the scheme), this incomplete disturbance is distinctly separate both from the complete analgesia of the trunk and from the normally sensible region of the trigeminus to the left.

The sense for temperature has likewise completely disappeared on the right side. No difference is felt between melting ice and hot water. A tube containing cold or hot water is called alternately cold and hot.



J. P. Aged 59. ///// Complete Thermo-anaesthesia and Analgesia.
Incomplete Thermo-anaesthesia and Hypalgesia.
November 1914.

As soon however as the patient is touched *on the right side* with a hot object, he feels a *peculiar pricking sensation* at the *left exterior corner of the eye and at the left nostril*.

Further the reflex-actions of the abdomen and the cremaster exist on both sides.

Arms. On inspection no abnormality, well developed muscular system, normal tonus on both sides. All movements are performed powerfully with strength. The dynamometre points 85 on the Right, 65 on the Left. No ataxy when pointing with the index to the tip of the nose, or when the two indices are brought together. Normal diadokynesis. The reflex-actions are high on both sides.

The tactile sense is undisturbed on both sides.

The perceptions of pain and of temperature are completely destroyed to the right (conf. the schema), to the right they are undisturbed.

The nerve trunks remain painless under pressure.

The perception of active and passive movements is particularly good. On both sides localisation is normal. The two points of the compass of WEBER are recognized and distinguished within the appointed scale. On both sides stereognosia is perfectly normal.

Legs. On inspection no irregularities, powerful muscular development with normal tonus. Neither tremor nor accessory movements.

All movements are executed on both sides powerfully and with equal strength. No ataxy of movement when the knee-heel experiment is made or when describing a small circle.

During repose however there is a *slight static ataxy*. When standing with both feet closely joined, the patient totters and threatens to fall, usually to the left. This becomes rather worse when his eyes are closed. The patient walks with legs wide apart, and generally deviates towards the left of his course. It is impossible for him to stand on one leg either on the left or on the right, and likewise to halt.

When walking, the trunk is borne somewhat stiffly.

The reflex-actions of the knee and of the tendo Achillis are normal on both sides.

Reflex-action of the plant of the foot to the right: plantar-flexion of all toes with averting movement.

To the left plantar-flexion of the little toes after irritation of the planta pedis and when the tibia is stroked.

The *tactile sense* is undisturbed on both sides. Even the slightest contact is perceived.

Pain-sensibility. Normal to the left. On this side a frightened reaction, accompanied by a deep inhalation, repeatedly follows on a pin-prick, as if there existed a strong hyperaesthesia.

Nowhere on the right is pain perceived. Although sometimes by an effort the patient is able to distinguish between the contact with the head or with the point of a pin, still this distinction is not founded on any perception of the sensation of pain.

The exterior genitals are analgetic to the right, though the boundarylines do not follow strictly the median line, but deviates somewhat towards the right.

The perception of heat and cold is intact on the left, it has disappeared on the right.

On both sides *passive and active movements* are perceived with absolute correctness. The *sense of space* is undisturbed on both sides. Localisation, though with a rather large declination, is good on both sides.

The state of the patient remained unchanged during the months of October and November. The reaction of WASSERMANN was found to be negative in the blood. Lumbar puncture was not performed.

Summing up, we may state the case as follows:

On the 20th of October 1912, at eight o'clock in the morning, accompanied by violent vertigo, but without loss of consciousness, a complex of symptoms presented itself, fitting into the general view of the so-called per-acute bulbar paralysis. Part of these symptoms

— the disturbances of speech, the difficulty in swallowing, the laxity of the right leg — have been soon meliorated or cured. Another part of them however have become lasting.

The most important of these residue symptoms are:

a. Complete analgesia and thermanaesthesia in those regions of skin and mucous membrane that are controlled by *the left N. trigeminus*, — the tactile sense, localisation and motor-power having been preserved in the trigeminus-muscles.

The reflex-action of the cornea no longer exists.

This analgesia alternates with:

b. Complete analgesia and thermanaesthesia in the right half of the body. Within the region of the upper cervical roots on the right this disturbance is incomplete. The tactile sense, the deep sensibility, the sense of space, localisation and stereognosy are undisturbed and have not suffered in the right half of the body. There is not one single symptom of hemiplegia.

c. Complete paralysis of the larynx to the left. Incomplete paralysis of the swallowing-muscles on that side.

d. A peculiar involuntary attitude of the head, turned towards the right, together with a dissociation of the conjugate movement of the eyes and the head turning to that side. When this movement is made, the eyes cannot follow it. They first turn towards the left, afterwards slowly following the movement of the head towards the right, the patient being consequently unable to recognize instantly the objects placed beside him, on account of the defective stand of the eyes.

e. A slight degree of static ataxy.

Without any doubt this disturbance is caused by an occlusion in the arteria cerebelli posterior inferior and a softening (eventually a cyst) in the latero-dorsal portion of the left half of the medulla oblongata.

This morbid affection has been first described and appreciated by SENATOR¹⁾, subsequently it has been carefully analysed by WALLEMBERG²⁾ and MARBURG³⁾, who have done most meritorious

¹⁾ H. SENATOR. Zur Diagnostik der Nervenkrankungen in der Brücke und in dem verlängerten Mark. Arch. f. Psych. Bd. 14. 1883. p. 643 ff.

²⁾ ADOLF WALLEMBERG. Acute Bulbar-affection (Embolie der arteria Cerebellaris posterior inferior sinistra). Arch. f. Psych. Bd. 27. 1895 p. 504 ff. and:

WALLEMBERG. Anatomischer Befund in einem als Embolie der art. cerebellaris posterior inf. sinistra beschriebenen Falle. Arch. f. Ps. Bd. 34. 1901. S. 923

³⁾ R. BREUER und OTTO MARBURG. Zur Klinik und Pathologie der apoplectiformen Bulbarparalyse. Arbeiten aus dem neurologischen Institut der Wiener Universität (OBERSTEINER) Bd. IX. 1902. p. 181.

work for the pathology of the medulla oblongata. RUDOLF BRUN¹⁾ has given a nearly complete summary of the literature on this subject, into which I will not enter here.

The foregoing case has been communicated, because in a clinical sense it is a peculiarly well-defined case.

A few remarks I may be allowed to add still about it. Before the arteria vertebralis has united with the contra-lateral one to form the arteria basilaris, it supplies the medulla oblongata with several small branches. Among these branches the art. spinalis dorsalis

Scheme of the Nutrient bloodvessels of the medulla oblongata after DURET.

(Archives de Physiologie. 1873. Tome V. Planche VIII).

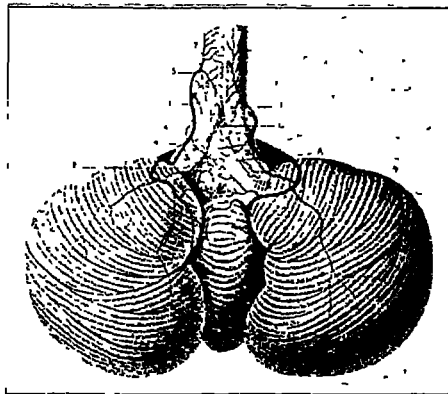
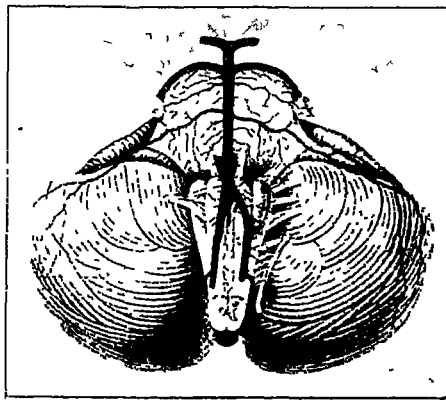


Fig. I. A. Art. cerebellaris posterior (inferior).

B. Art. cerebellaris media (inferior anterior).

C. Art. cerebellaris superior.

D. Art. cerebellaris posterior.

1. Art. radicularis (N. accessorii spinalis).

2. Art. spinalis anterior.

3. Art. radicularis (N. X et N. IX).

4. Art. auditiva spinalis (N. VII et N. VIII).

5. Art. radicularis N. VI.

6—7. Arteriae fossae supra-olivaris.

8. Arteria auditiva interna (from B).

9. Art. N. V.

10. Art. radicularis N. XII.

Fig. II. A. Plexus chorioideus.

B. Tela chorioidea.

C. Foramen Morgagni.

D. Clavus.

1. Arteria cerebelli posterior inferior.

2—4. Small branches of this artery.

5. Arteria spinalis posterior.

6—8. Small branches of this artery.

¹⁾ RUDOLF BRUN. Ein-Fall von doppelseitigen symmetrischen Erweichungssystem im verlängerten Mark.

Arbeiten aus dem hirnanatomischen Institute der Universität in Zürich. Bd. VI. 1912. S. 270—400.

and the art. cerebelli posterior inferior are of especial interest to us. They originate on both sides from a joint small branch of the art. vertebralis on the anterior side of the oblongata. The art. spinalis dorsalis then descends along the lateral surface of the oblongata and provides for the caudal portion of the medulla oblongata. The art. cerebelli ascends between the corp. restiformis and the oliva inferior, it provides for the laterodorsal portion of the m. oblongata in its proximal part by means of small branches originating from it in perpendicular direction, and then leaves the corpus restiforme to supply further with blood the distal half of the basal cerebellum-laminae.

The area of irrigation of the art. cerebelli inferior posterior is accordingly situated within the latero-dorsal portion of the med. oblongata proximally to that of the art. spinalis dorsalis.

The N. octavus is lying proximal to this irrigation-zone.

The boundary line between pons and oblongata forms the proximal demarcation of this region, about there where the distal part of the nucleus N. VI is to be found. Caudally it is confined by the N. ambiguus, the caudal extremity of which is provided for by the art. spinalis dorsalis. The ventral boundary is indicated approximatively by the Oliva-nucleus; the dorsal one by the basal nuclei that have their own supply of arteries, the medial boundary by the nucleus and the roots of the N. XII.

Surveying a topographical map of the medulla oblongata, we may see that within the irrigation zone of the art. cerebelli posterior inferior are found:

Fig. III. Scheme of the area of irrigation of the art. cerebelli inferior hit by a frontal section.



a. That part of the tractus spinalis N. V, that is going in a caudal

direction opposite to the upper half of the oliva inferior. The sensible nucleus of this nerve and its motor nucleus are not included.

b. The so-called "aberrirendes Seitenstrangfeld", in which are found the spino-thalamic (EDINGER's) tract, the rubro-spinal (MONAKOW's) tract, and the ventral spino-cerebellar (GOWER's) tract.

c. The proximal part of the N. ambiguus, i. e. the ventral nucleus of the N. IX, X, and partly too of the N. XI, besides the forth-coming roots of these nerves.

d. The interior portion of the Corpus restiforme (MONAKOW's I. A. K.) with the descending root of the N. VIII that is found within it.

Besides, in the immediate vicinity of this region is lying the Nucleus dorsalis N. X, especially the tractus solitarius with its nuclei, and if medialward this region extends really so far as the radices N. XII demarcate the formatio reticularis grisea, then the tractus vestibulo-spinalis belongs likewise to it.

Moreover the caudal basal portion of the cerebellum must be also reckoned to belong to this irrigation zone.

According to the symptoms this dorso-lateral portion of the oblongata is destroyed on the left side.

As the most prominent disturbance there was found:

I. *Alternating paralysis of the sensibility for pain and for thermal stimuli, to the left in the region controlled by the N. V, to the right over the whole half of the body, with the exception of the Trigemini-area.*

The tactile sense, localisation and the sense of space, perception of passive and active movements, stereognosia, are all preserved in the normal way.

The dissociation in these perceptions — and the literature proves that it has been observed more than once — is most remarkable. It shows that the conduction of pain- and heat-sensation within the entire region of the trigemini ought necessarily to be sought for in the tractus spinalis of this nerve, which has been interrupted in the proximal oblongata. The tactile impressions may still find their way along the nucleus sensibilis N. V, which remains unimpaired (as are likewise the N. motorius and its radix mesencephalicus). It is interesting that the reflex-action of the cornea has disappeared and that the cornea no longer perceives anything. Probably the cornea — without tactile corpuscles and without hairs — does not possess any contrivance for the tactile sense.

The interruption of the spino-thalamic tract on the left side is assumed to be responsible for the defective conduction of the thermal and pain-stimuli in the right half of the body.

The lemniscus medialis, is not attained by the lesion — the long

posterior root-fibres end in the nuclei of GOLL and BURDACH, and the fibres originating in these nuclei have continued their course therein through the decussatio lemnisci — from this is determined the intactness of deep sensibility (stereognosia, sense of space, perception of passive and active motion of the right half of the body).

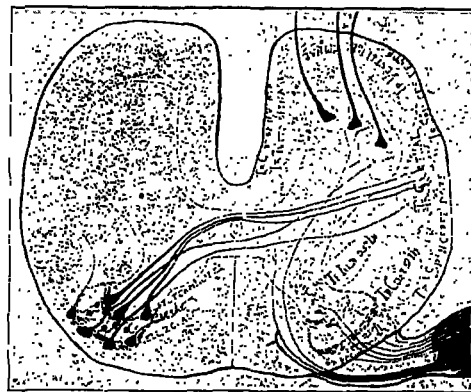
It is generally taken for granted that the thin fibres in the marginal zone of LISSAUER conduct their impulses into the fibres of the spongiosa of the formatio ROLANDO, and after passing through the substantia gelatinosa and the cells of GIERKE are absorbed by the *terminal* cells, adjacent to the substantia gelatinosa.

The axones of the cells are then thought to cross one another in the anterior (and posterior) commissure, and to continue their course as tractus spino-thalamicus in the lateral column of the medulla.

It is just because of experiences similar to the case here described that the tractus spinothalamicus has been assumed to be invested with the function of conducting the thermal and pain-impulses.

It is different for the tactile sense. Tactile impulses enter likewise into the thin fibres of the zone of LISSAUER, but they may pass thence immediately into the marginal cells of the spongiosa of the formatio ROLANDO, — the zonal cells. Their axones may, ascend as well through the posterior as through the lateral cords of the unilateral and the contralateral side, it is even, most probable that these prolongations are so diffused in the tegmentum of the spinal cord, that the conduct of these impulses remains possible as long as even a small part of it has been preserved. In the left half of the

Fig. IV. Scheme of the LISSAUER marginal zone and of the substantia ROLANDO with the origin of the tractus spino-thalamicus.



oblongata there is a sufficient number of fibres, both in the lemniscus medialis and in the median portions of the formatio reticularis grisea

to bring about the conduct of the tactile impressions from the right half of the body. The tactile sense of the right side remains therefore undisturbed.

II. The paralysis of the swallowing muscles to the left (that has been much meliorated) and the lasting paralysis of the muscles of the larynx on that side are symptoms following almost necessarily from the former. The ventral (motor) nucleus of the IXth, Xth and XIth nerve has been destroyed by the lesion.

Whether the dorsal vagus nucleus has been injured, forms an independent question. For the moment the sense of taste to the left has suffered only very slightly. Those who believe the tractus solitarius to be a continuation of centripetal glosso-pharyngeus-fibres — as it doubtlessly is in part — and who consider it as a tract conducting taste-impulses, will be rather inclined to think it has not been injured.

On the other hand the analgesia transgresses into the zone of the N. trigéminus in the region of the ear, whilst pain- and heat-sensation are disturbed in the dermal branch dependent on the N. X, a fact easily to be understood, considering the destroying of the forthcoming roots of this nerve.

III. The dissociation of the conjugate movement of the eyes and the head towards the right.

I believe this symptom to be a consequence of the portio interna corporis restiformis to the left. Within this portion is contained the radix descendens N. VIII. It contains the descending root-fibres of the N. vestibularis, which enter into it on a higher plane than that where is situated the focus of disease. The N. vestibularis herefore has been destroyed partially, not completely — the coldwater-reaction of BARANY proves that vestibularis-impulses still act upon the double-eye.

The influence of the one-sided destruction of the vestibular tonus on the double-eye is well-known. Both in man and in animals the uni-lateral eye is turned downward and inward, the contro-lateral one upward and outward. They deviate therefore in a direction opposite to the lesion.

In the present case however that involuntary stand of the eyes has found compensations, amongst others the oblique attitude of the head. The motor mechanism for the double eye is consequently brought into another state of equilibrium than the normal one. It undergoes an innervation tendency to direct both eyes more than is usual towards the left side.

This mechanism has been disposed in that way by means of reflex-actions through the exercise that has led to compensation.

As soon as a voluntary act does make use of the motor mechanism of the double eye which is connected indissolubly with the turning of the head towards the right, there will necessarily be made an endeavour to employ another mechanism than that existing in the norma.

The prevailing innervation-tendency for turning the eyes towards the left is now in conflict with the impulse of turning towards the right. As a result of it, first the turning of both eyes towards the left may be observed, whilst it is only after this that the position of extreme turning towards the right is attained.

As a consequence of this the fixation of the eyes on objects standing to the right is not synchronic with the turning of the head. Therefore these objects are not instantly recognized, as long as the settling of the eyes remains defective.

The same case does present itself if the head is turned towards the left, with this difference that no turning of the double eye towards the left then precedes. In this latter case the voluntary and the reflective movements are added up together, the eyes are moving too quickly, with the result that objects standing on the right are again not instantly well-recognized, though the irregularity is redressed much sooner than when looking towards the right. As fourth and last symptom we find the static ataxy shown by the patient, a symptom that may depend either on an interruption of rubro-spinal or vestibulo-spinal tracts, or on the softening that probably exists at the base of the cerebellum, or on both.

All symptoms taken together however indicate a sudden inefficacy of the nerve-area, irrigated by the arteria cerebelli posterior inferior.

Chemistry. — *“The metastability of the Metals in consequence of Allotropy and its significance for Chemistry, Physics and Technics. III.”* By Prof. ERNST COHEN and G. DE BRUIN.

‘The specific Heat of the Metals 2.

1. In the first paper on this subject¹⁾ it was pointed out that the existing data on the physical and mechanical constants of metals known up to the present are to be considered as entirely fortuitous values, since they refer to the indefinite metastable systems which are produced when metals pass from the molten to the solid state. In other words: all physical and mechanical constants of the metals are functions of the previous thermal history of the specimen experimented with.

¹⁾ Proc. 16, 632 (1913).