

Map scheme of the sensory distribution of the fifth nerve (trigeminus) with its ganglia and connections [with text] / L. Hemington Pegler.

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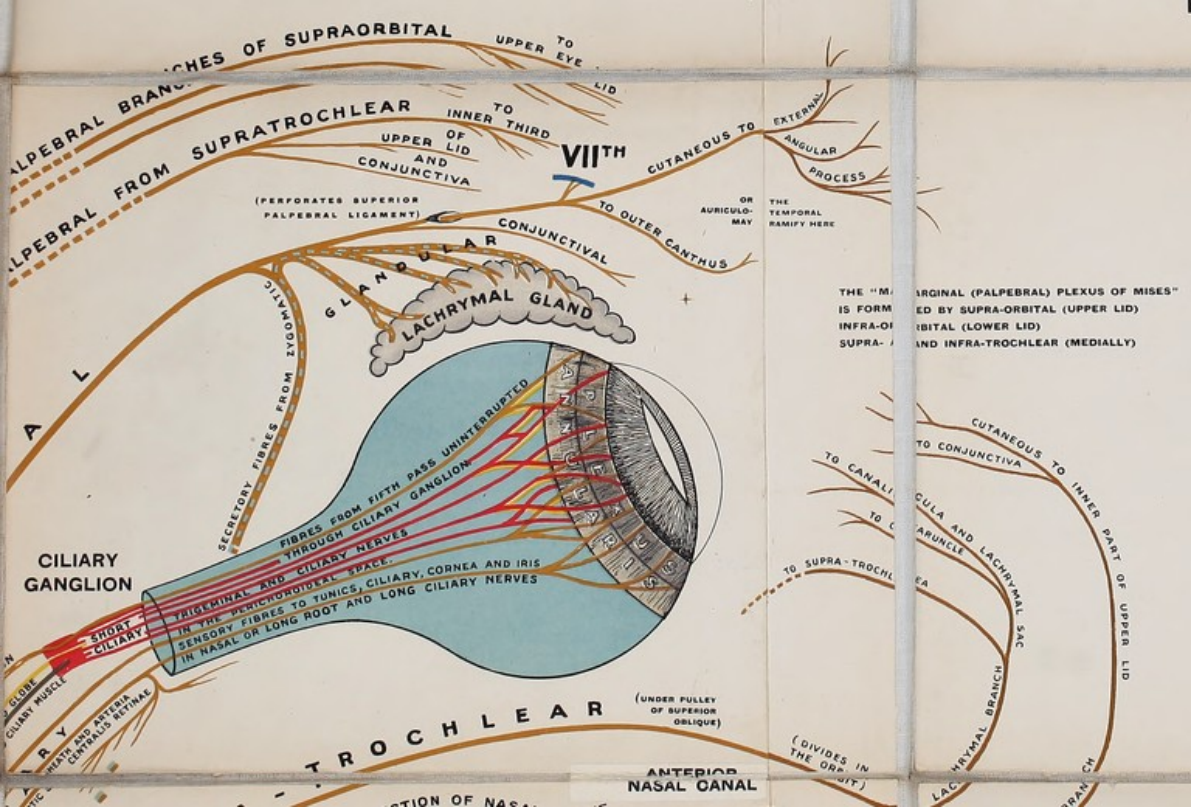
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MAP SCHEME
OF THE
SENSORY DISTRIBUTION
OF THE
FIFTH NERVE (TRIGEMINUS)
WITH ITS
GANGLIA AND CONNECTIONS
BY
L. HEMINGTON PEGLER.



MAP-SCHEME OF THE NERVE DISTRIBUTION OF THE FIFTH NERVE (TRIGEMINUS) WITH ITS BRANCHES AND CONNECTIONS

L. HE MINGTON PEGLER, M.D.
 FECIT.

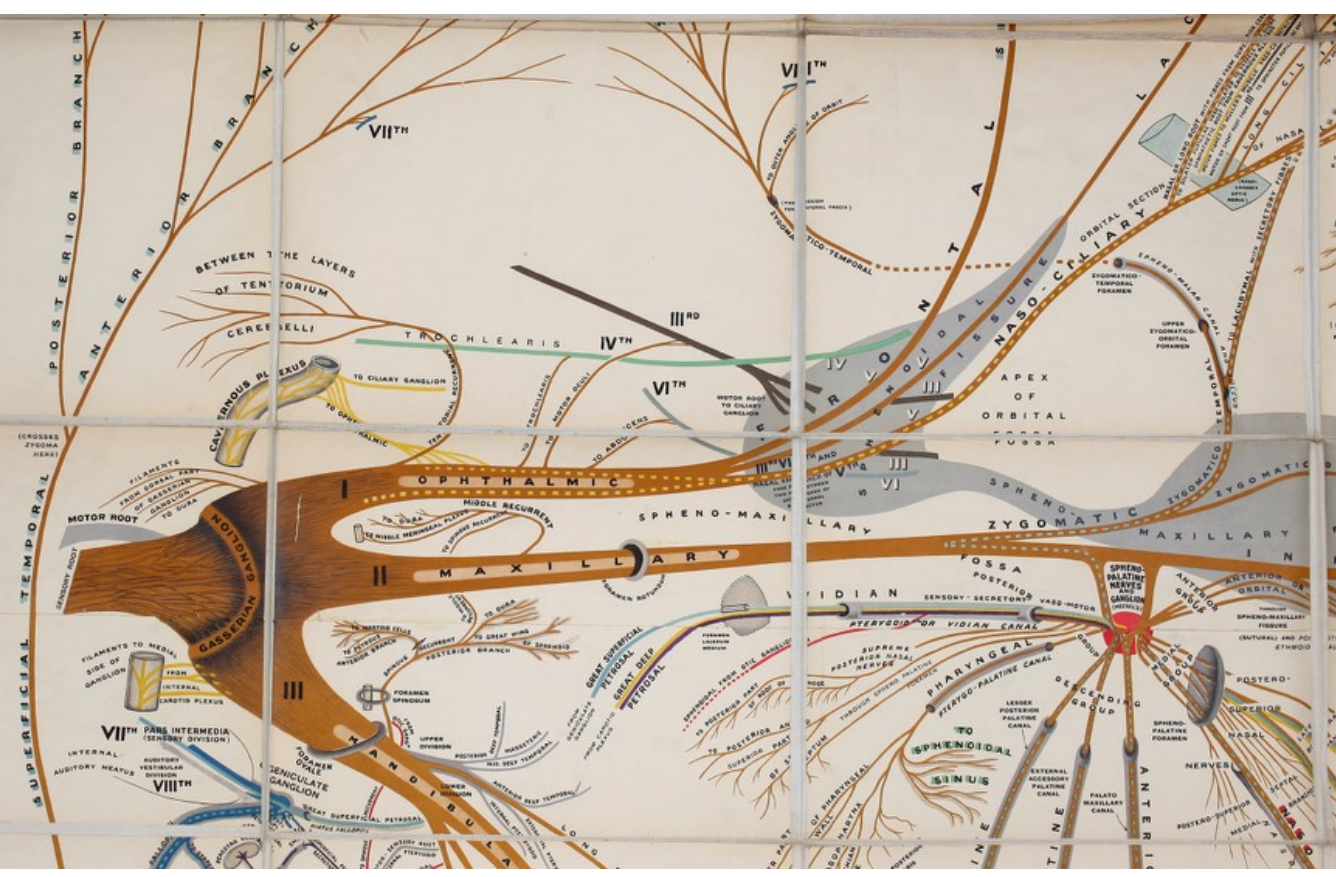


THE "MARGINAL (PALPEBRAL) PLEXUS OF MISES" IS FORMED BY SUPRA-ORBITAL (UPPER LID) INFRA-ORBITAL (LOWER LID) SUPRA- AND INFRA-TROCHLEAR (MEDIALLY)

(SEE ALSO INFERIOR PALPEBRAL OF INFRA-ORBITAL)

COLOUR SCHEME

- NERVE
- IIIRD MOTOR OCULI SEPIA
 - IVTH TROCHLEARIS SAGE GREEN
 - VTH TRIGEMINUS YELLOW OCHRE
 - VTH MOTOR BRANCHES ASH GREY
 - VITH ABDUCENS BLUE GREY
 - VIITH FACIAL MOTOR DARK BLUE
 - VIITH PARS INTERMEDIA LIGHT BLUE
 - VIIITH AUDITORY LIGHT PURPLE



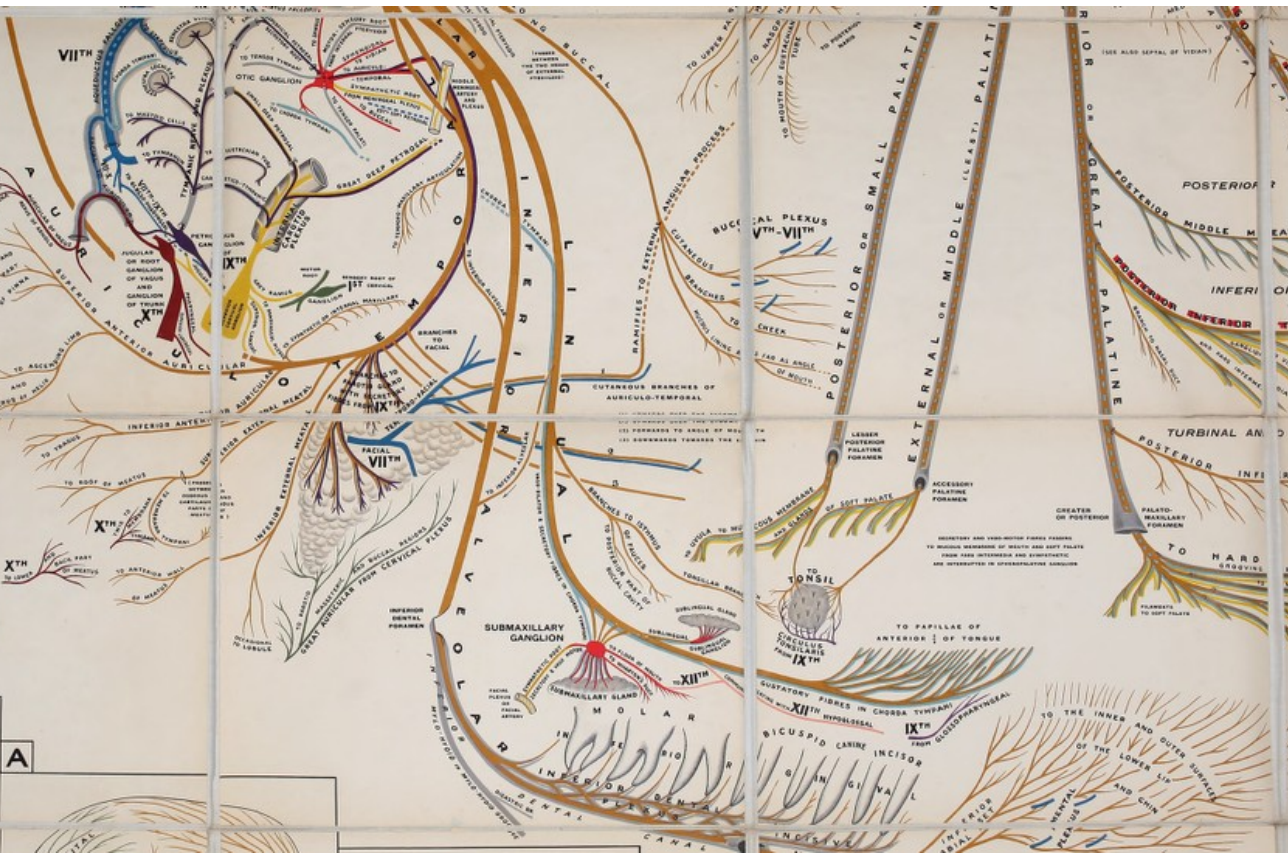
- VIIITH AUDITORY LIGHT PURPLE
- IXTH GLOSSOPHARYNGEAL PURPLE
- XTH VAGUS BRICK RED
- XIITH HYPOGLOSSAL PALE PINK
- CERVICAL NERVES DARK GREEN
- GANGLIA OF FIFTH VERMILION
- SYMPHATIC YELLOW
- VIITH AND PARS INTERMEDIA
- VTH AND PARS INTERMEDIA
- VTH AND IXTH
- VTH AND SYMPHATIC

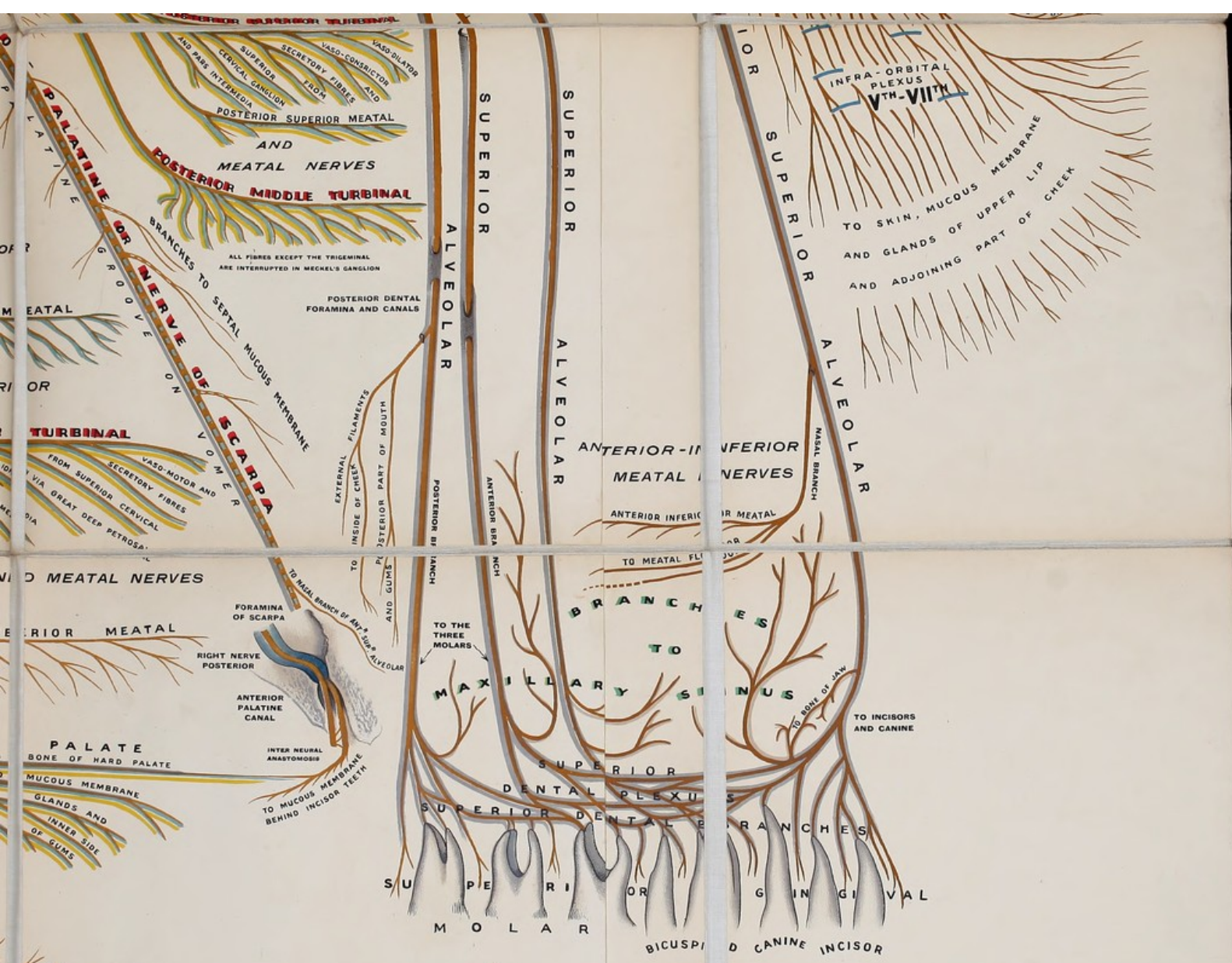


SENSORY ROOT OF FIFTH NERVE

THIS DRAWING IS AN EPITOME OF THE LARGE MAP AND ALSO REPRESENTS THE SENSORY DISTRIBUTION OF THE OCCIPITAL NERVES WHICH, WITH THE FIFTH AND THE AURICULAR BRANCHES OF THE CERVICAL PLEXUS AND VAGUS COMPLETE THE INNERVATION OF THE SCALP.

TO ILLUSTRATE THE THEORY OF REFERRED PAIN, IT TRACES BACK THE SENSORY ROOT OF THE FIFTH NERVE TO ITS POINT OF ORIGIN IN THE PONS VAROLII AND MEDULLA OBLONGATA. THIS SENSORY NUCLEUS EXTENDS FROM THE KNEE-SHAPED





B

CUTANEOUS NERVE AREAS OF HEAD AND NECK

CERVICAL NERVES

TRIGEMINAL

CERVICAL NERVES

POSTERIOR PRIMARY DIVISIONS

(DEMARCATED BY THICK BROKEN LINE)

II. CERVICAL
GREAT OCCIPITAL

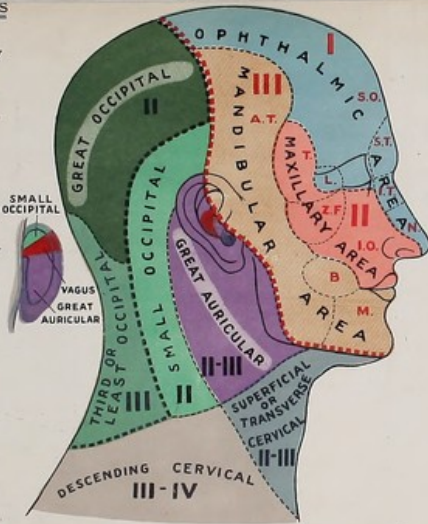
III. CERVICAL
THIRD OCCIPITAL

ANTERIOR PRIMARY DIVISIONS (CERVICAL PLEXUS)

II. CERVICAL
SMALL OCCIPITAL

II. AND III. CERVICAL
GREAT AURICULAR
TRANSVERSE CERVICAL

III. AND IV. CERVICAL
DESCENDING CERVICAL



TRIGEMINAL NERVE

(DEMARCATED BY DOTTED RED LINE)

- SUPRA-ORBITAL
- AURICULO-TEMPORAL
- SUPRA-TROCHLEAR
- TEMPORAL
- LACHRYMAL
- INFRA-TROCHLEAR
- ZYGOMATICOFACIAL (MAXILLARY)
- NASAL
- INFRA-ORBITAL
- BUCCAL
- MENTAL

ADAPTED FROM MORRIS "TREATISE ON ANATOMY," FOURTH EDITION

ANALYTICAL TABLES
OF THE
ANATOMY AND PHYSIOLOGY
OF THE
FIFTH CRANIAL OR TRIGEMINAL NERVE
AND OF ITS
GANGLIA AND CONNECTIONS

BEING A COMPENDIUM OF THE MAP-SCHEME OF THIS NERVE

BY

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1913

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PREFACE

THIS Map-Scheme of the Fifth Cranial Nerve and its connections was originally designed to illustrate a lecture given by the writer in London upon referred pains in the head. It has since been much altered and enlarged, two insets have been added, and explanatory notes have been affixed. The functions of the nerves are indicated in the map in respect of all the more important branches to the nose, eye, tongue, palate, and secreting glands, such paths having been selected as have been most successfully investigated. The statements thus embodied are also tabulated in the analyses included herewith. To the student this graphic presentation of the complex trigeminal system is intended to be useful in the course of his reading and dissections. To the clinician it should furnish the clues required for following up the tracks along which pain excited in one part of the head may be referred to a distant part. It should also aid him in understanding how, through their mutual nervous connections, disease in one organ such as the nose or ear may produce symptoms which seriously affect another, as, for instance, the eye or the teeth.

The writer hopes that by rendering a study of this important nerve more easy or attractive, the map-scheme will enable many practitioners to attain a closer acquaintance with its anatomy and physiology, the surest road to success in the treatment of its morbid states.

Finally, he has a pleasing duty to perform in expressing his indebtedness to those gentlemen who have placed him under obligation in the progress of his work. Professor Thane, of University College, Dr. David Waterston, Professor of Anatomy at King's College, and Dr. John Cameron, Lecturer on Anatomy at Middlesex Hospital Medical School, have rendered him kindly assistance on difficult points; Dr. Waterston insuring the accuracy of the tables by passing them carefully under review, and Dr. Cameron giving him access to recent dissections of the fifth nerve. To Dr. Gordon Holmes the author feels himself most deeply indebted for information and advice in many directions, but especially with reference to the physiological part, and to the drawing and description of the Inset A (Roots of the Fifth Nerve), which is such an important addition to the scheme.

An inset for skin areas was inserted under the suggestion of Dr. James Mackenzie, who, as well as Professors Arthur Keith, Johnson Symington, and other experts, examined the map when it was approaching completion. In January, 1913, it was exhibited before the Anatomical Society of Great Britain.

L. H. P.

HARLEY STREET, W.,
July, 1913.

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INTRODUCTORY NOTE UPON THE NOMENCLATURE ADOPTED IN THE MAP CONCERNING THE NASAL NERVES

THE *General Nomenclature* of the map has been kept as much as possible in line with the latest edition of Quain's 'Elements,' edition 1909, and the changes suggested in the B.N.A. (Basle Anatomical Nomenclature) have been largely utilized. A departure has been made only in the instance of the nasal nerves, the naming of which has been deemed either not complete enough or in other respects not to be fulfilling modern requirements. This remark applies especially to the nasal branch of the Ophthalmic, which in the B.N.A. is called 'Naso-ciliary' up to the point in the orbit of its giving off the Infratrochlear, but which Quain, Gray, Cunningham, and others, have so designated in its entirety as a synonym for the 'Nasal nerve.' There has, however, always been a disposition on the part of some anatomists to describe this nerve as splitting up into branches after its descent through the anterior nasal canal and on this and other points referring to it authors vary considerably.

The map attempts, therefore, to give a clearer conception of the nerve by regarding it as one main stem with branches, from its commencement to its termination, as has already been done, but marked out by natural landmarks into four stages or sections as follows:

1. An 'Orbital' section, extending from immediately behind the sphenoidal fissure to the orbital aperture of the anterior ethmoidal canal: this part corresponds as nearly as may be to the naso-ciliary nerve of the B.N.A., and its situation in the orbit is the origin of its suggested title; it now possesses surgical interest.

2. A 'Cranio-ethmoidal' section, reaching from the anterior ethmoidal foramen to the anterior nasal canal.¹ This stage corresponds practically to the Anterior Ethmoidal nerve of the B.N.A., and the name suggested for it indicates its situation in the cranium, with relations to the ethmoid bone upon which it rests.

3. An 'Intranasal' section, extending from the nasal aperture of the anterior nasal canal to the junction between the nasal bone and the superior lateral cartilage. This stage is included within the part entitled 'Anterior Ethmoidal' nerve in the

¹ The term 'anterior nasal canal' is here employed to signify the passage through which the Nasal nerve issues from the Cranial cavity to the roof of the Cavum nasi, and which is lateral to the nasal slit or Ethmoidal fissure often mentioned in the textbooks in this connection (consult Quain, vol. iii., part ii., p. 16, and Gray, p. 239).

B.N.A., and in Cunningham's 'Manual,' 1912, edited by Robinson, but it is the 'External branch' of Cunningham's textbook, 1909, and also of Morris's 'Treatise,' edition 1907, in which the B.N.A. is more closely followed. The name 'external branch' has also been retained for this part of the nerve by Gray's editors ever since the first edition in 1858. There are, however, yet other ways of naming it, and the title 'external branch' is applied by some authors to a lateral offset arising from the parent stem as it enters the nasal groove. There seems to be required, therefore, some designation for this stage that will convey the fact of the nerve, now in the nasal fossa, having thus become actually a nasal nerve in accordance with its original title.

4. The fourth and last is the 'Cutaneous section,' extending from the point of escape of the nerve between the bone and cartilage to its ultimate termination on or near the point of the nose.

This continuation of the nasal nerve on the face is still the 'External nasal ramus' of the B.N.A. and in Cunningham's 'Manual,' and the 'Anterior or Superficial' branch of Quain's 'Elements,' as well as of Gerrish's 'Anatomy' (1899); but in the latter the term 'Anterior or Superficial' branch is applied to the nerve higher up—*i.e.*, at the commencement of the previous stage. The simple designation 'cutaneous' for this superficial part is at least expressive of its destination—the skin.

The foregoing arrangement of the Nasal nerve into sections aims at simplification, and sufficiently serves the purpose of the map. The student will therein find the title 'Naso-ciliary' placed under 'Orbital section,' and 'Anterior Ethmoidal' under 'Craneo-ethmoidal section,' thus indicating the equivalents of the sectional titles in the most recent nomenclature; but owing to the greater lack of uniformity in the terminology of the more distal part of the nerve, it has been thought preferable to leave the 'intranasal' and 'cutaneous' sections with no other designations beneath them.

The reader may here be reminded that the B.N.A. authorities consider the nerve they have termed 'naso-ciliary' to divide anteriorly in the orbit into two parts, one constituting the Infratrochlear, and the other the Anterior Ethmoidal. This latter designation, agreeing with that of the canal and companion artery, has not been much adopted; perhaps its popularity would have been more universal had the small 'Posterior Ethmoidal' branch been more constant. It is stated in 'Poirier and Charpy' that Delber found this nerve only twice in six subjects. Readers wishing to consult the 'Traité' by these authors will find the following note upon the French nomenclature useful.

They divide the Frontal into an External Frontal (supra-orbital) and Internal Frontal, which corresponds to the 'Frontal proper' of some of our authors (see Morris's 'Treatise,' 4th ed., p. 964). To the Supratrochlear, which they describe as terminating by anastomosing with the Infratrochlear, they attach the name of Arnold. The Nasal nerve they also divide into two branches (in the orbit)—the External Nasal or Infratrochlear, and Internal Nasal or Ethmoidal, and this divides into an internal branch to the Septum and an external or 'naso-lobar,' their usual designation for the remainder of the nerve.

All further suggestions for a more complete nomenclature of the nasal nerves will be clearly discerned in the map, where they are indicated by italic capitals.

The Superficial nerves of the nose arrange themselves naturally into the following three sets: 'Superior lateral,' 'Inferior lateral' (including vestibular) and 'Anterior or Dorsal cutaneous nasal nerves,' the last-named comprising the cutaneous section and branches of the Nasal nerve just considered.

Turning to the interior or Cavum, the posterior slope of the *roof* at the level of the rostrum of the sphenoid is supplied by a few of the lateral posterior superior nasal nerves which pass *posteriorly* in the muco-periosteum, avoiding the sphenopalatine foramen;¹ the map gives them as from the Vidian, to which alone some authors assign their origin. As these filaments are neither precisely septal, pharyngeal, nor lateral nasal, they are labelled in the map-scheme 'Supreme posterior nasal,' by way of distinction, and owing to their position in the inspiratory breathway, they are probably of considerable importance. The *floor* of the Cavum, and neighbouring wall, receive a nasal branch of the Anterior superior alveolar, its fibres of distribution being labelled 'Anterior inferior meatal nerves.' They are clinically interesting through referring sensory impressions to the canine and incisor teeth. To the anterior part of the *Septum* are distributed the medial branches of the intranasal section of the Nasal nerve, and these are marked 'Anterior Septal Nerves.' The supply for the posterior part of the septum is more complex, the Vidian and medial branches of the Posterior superior nasal furnishing the nerves to the upper and back part, whilst further forward the offsets of the naso-palatine distribute fibrils along the course of the groove on the vomer. The title given to the whole of this group is 'Posterior superior septal nerves.' The *anterior slope* of the roof and the adjoining outer wall of the Cavum nasi are innervated by the lateral branches of the intranasal section of the Nasal nerve, some of which terminate in small filaments for the anterior ends of the middle and inferior turbinates and meatuses; these figure as the 'Anterior Turbinal and Meatal nerves.'

The posterior aspect of the outer wall, as of the corresponding part of the Septum, is supplied from the Maxillary Division, and the nerves range themselves into two groups—a 'Superior' and an 'Inferior' 'Posterior Turbinal and Meatal.' The former group includes the Superior Turbinal and Superior Meatal nerves and the Posterior Middle Turbinal nerve derived from the Sphenopalatine ganglion or from the Vidian; in the map they appear as lateral posterior superior branches of the ganglion. Some writers make no mention of any nasal branches from the Vidian, but it is stated by Robinson² that both it and the ganglion contribute to the superior nasal group. The 'Posterior Middle Turbinal' nerve is generally recognized as a constant branch from the lateral set of the posterior superior nasal nerves.

The Inferior group includes the 'Posterior Middle' and 'Posterior Inferior Meatal' and the 'Posterior Inferior Turbinal' nerves; all are branches of the Anterior Palatine.

¹ See Cunningham's 'Manual,' revised by Robinson, fifth edition, 1912.

² *Ibid.*

According to the carefully revised Manual already quoted, which, unfortunately, did not come into the writer's hand until the map was completed, the middle turbinate gets a supply from one of the inferior nasal branches of the Anterior Palatine, as well as from the Lateral posterior superior nasal nerves, and the Inferior Turbinate receives two branches from the Anterior Palatine—viz., part of the superior and the whole of the inferior nasal branch.

These posterior turbinal nerves, owing to the larger area over which they are distributed compared with the anterior, and hence to the greater liability to pathological changes or adverse conditions to which they are subject, may be thought of as the turbinal nerves, so that the prefix ' posterior ' is not very essential.

In the following tables and schedules the material dealt with in this Introduction is schematically arranged.

TABLES OF THE ANATOMY AND PHYSIOLOGY OF THE FIFTH NERVE AND ITS CONNECTIONS, CRANIAL AND SYMPATHETIC, WITH INDEX

[APPENDED WILL BE FOUND A TOPOGRAPHICAL SYNOPSIS OF NERVES DISTRIBUTED TO THE NOSE AND
ACCESSORY SINUSES AND EXTERNAL AND MIDDLE EAR]

THESE tables, which are an indispensable accompaniment to the map, contain upwards of 315 named nerves and branches, and are numbered for reference from 1 to 64.

A small figure placed after a component member indicates that such member is further analyzed below.

The general order is that adopted in Quain's 'Elements,' and an asterisk (*) indicates that the branch is omitted or regarded only as a variant in that work or by other authorities.

Thick type indicates that the nerve is a continuation rather than an offset; terminal branches are similarly distinguished. *Italic capitals*, confined to certain of the nasal nerves, distinguish the extended forms of nomenclature devised by the author for this map. Other details are referred to in the footnotes.

1. Gasserian ganglion	...	...	<ul style="list-style-type: none"> Communicating with carotid plexus (58). To dura. Ophthalmic (2). Maxillary (11). Mandibular (35).
2. Ophthalmic	...	...	<ul style="list-style-type: none"> Tentorial recurrent (between the layers of the tentorium cerebelli). Communicating with cavernous plexus (59). *To third nerve. To fourth nerve. *To sixth nerve. Frontal { <i>Supra-orbital</i> (4). { <i>Supratrochlear</i> (5). Lachrymal (3). Nasal, or Naso-ciliary (6).

3. Lachrymal ... { Communicating with zygomatic.¹
Communicating with facial (50).
Glandular to lachrymal gland.
Conjunctival.
To outer canthus.
*Cutaneous to region of external angular process.
4. Supra-orbital ... { Outer or lateral division { Palpebral to upper lid.
Communicating with facial.
Branches to diploë.
To frontal sinus.
Branches to pericranium.
Cutaneous to fore and upper part of scalp.
Cutaneous to parietal region and vertex, nearly to lambdoid suture.
Inner or medial division { Palpebral to upper lid.
Communicating with facial.
Branches to pericranium.
Cutaneous to forehead and parietal region.
5. Supratrochlear ... { Palpebral, to inner third of upper lid.
Conjunctival.
Communicating with infratrochlear.
*Cutaneous to root of nose.
Cutaneous branches to lower and middle frontal region.
6. Naso-ciliary (orbital section of Nasal nerve)... { Nasal or long root to ciliary ganglion.
Long ciliary nerves (two) to ciliary body, cornea, and iris.
Infratrochlear (9).
Posterior.² or spheno-ethmoidal³ to posterior ethmoidal cells and sphenoidal sinus.
Anterior ethmoidal (cranio-ethmoidal section of nasal) { Branch⁴ to anterior ethmoidal cells and frontal sinus (in anterior ethmoidal canal).
Intranasal section of nasal (7).
7. Intranasal section of Nasal nerve ... { Lateral branches (turbinal, etc.) { To anterior end of middle turbinate and meatus ... } *Anterior turbinal and meatal nerves.*
To anterior end of inferior turbinate and meatus ... }
Medial branches (septal) { To fore and outer part of wall of fossa.
To anterior part of septum, reaching to vestibule ... } *Anterior septal nerves.*
Continues as Cutaneous section of nasal.
8. Cutaneous section of Nasal nerve ... { Cutaneous to anterior and lower part of nose ... } { *Anterior or dorsal cutaneous nasal nerves.*

¹ Correctly regarded as a branch of the zygomatic, conveying secretory fibres to lachrymal gland. ² Krause. ³ Luschka. ⁴ Meckel and Langenbeck.

9. Infratrochlear ...	<ul style="list-style-type: none"> ... { Superior palpebral branch { To inner canthus. To inner third of upper lid and conjunctiva. To canaliculi and caruncle. To lachrymal sac. Communicating with supratrochlear. ... { Inferior palpebral branch { Cutaneous to root of nose ... } <i>Upper lateral cutaneous nasal nerves.</i> Cutaneous to upper part of side of nose ... } Communicating with infra-orbital.
10. Ciliary ganglion ¹ ...	<ul style="list-style-type: none"> ... { Roots { Sensory (and sympathetic), nasal or long, from naso-ciliary. Motor or short, from third nerve. Sympathetic, from cavernous plexus. ... { Branches { Short ciliary nerves { 1. To tunics of globe. 2. To ciliary body, iris, and cornea. [The short unite with the long ciliary nerves to form the plexus annularis previous to distribution to the last-named organs.]
11. Maxillary nerve ...	<ul style="list-style-type: none"> ... { Middle meningeal recurrent (12). ... { Zygomatic { Zygomatico-temporal (13). Zygomatico-facial (14). ... { Spheno-palatine (two) to spheno-palatine ganglion (23). ... { Infra-orbital (15).
12. Middle meningeal recurrent	<ul style="list-style-type: none"> { To dura. { To plexus on middle meningeal artery. { Communicating with spinous recurrent.
13. Zygomatico-temporal	<ul style="list-style-type: none"> { Communicating with lachrymal (secretory). { Communicating with auriculo-temporal. { Cutaneous to anterior temporal region and towards orbit. { Communicating with facial.
14. Zygomatico-facial ...	<ul style="list-style-type: none"> { Cutaneous to inferior palpebral region. { Cutaneous to prominence of cheek. { Communicating with facial.
15. Infra-orbital ...	<ul style="list-style-type: none"> { Postero-superior alveolar (usually two) (16). { Middle superior alveolar (17). { Antero-superior alveolar (18). { Facial branches { Inferior palpebral (20). Cutaneous nasal (21). Superior labial (22).

¹ See also 'Ciliary Ganglion,' in Physiological Analyses.

16. Postero-superior alveolar ... { External branch ... To gums, periosteum, and adjacent lining of cheek.
To superior dental plexus { To maxillary sinus.¹
To the molar teeth.
Superior gingival.
17. Middle superior alveolar ... { To maxillary sinus.¹
Superior gingival.
To superior dental plexus and the bicuspid teeth.
18. Antero-superior alveolar ... { Nasal branch (19).
Dental branch { To superior dental plexus, and to the plexus of the opposite side.
To canine.
To incisors.
Superior gingival.
To maxillary sinus.¹
19. Nasal branch of Antero- { To anterior part of inferior meatus, including the floor of the } Antero-inferior meatal nerves.
superior alveolar ... { nasal fossa ... Communicating with naso-palatine.
20. Inferior palpebral ... { To skin and conjunctiva of lower eyelid.
To infra-orbital plexus with facial.
21. Cutaneous nasal ... { To skin of posterior and lower part of side of nose ... } Lower lateral cutaneous nasal nerves.
Vestibular branch to ala and lining of vestibule ... }
22. Superior labial ... { To skin, mucous membrane, and glands of upper lip and cheek.
To infra-orbital plexus with facial.
23. Spheno-palatine ganglion ... { Roots { Spheno-palatine nerves (sensory).
Vidian, sensory, secretory,² and sympathetic.³
Branches (in groups) { Anterior or orbital (24).
Medial or nasal⁴ (25).
Descending or palatine (26).
Posterior (27).
24. Anterior (ascending) or orbital { To periosteum of orbit.
group ... { To sphenoidal sinus.
To posterior ethmoidal cells.
25. Nasal or medial group ... Postero-superior nasal nerves (28).

¹ It is probable that all the alveolar nerves contribute to the supply of the sinus, and that fibres also arise from the superior dental plexus.

² See Tables II, and III., p. 19.

³ See Table IV, p. 20.

⁴ Part of these pass posteriorly, and correctly belong to the posterior group (Robinson).

26. Descending or palatine group { Anterior or great palatine (30).
Middle palatine (31).
Posterior palatine (32).
27. Posterior group ... { Branches to muco-periosteum of posterior part of roof of nose
and septum, from Vidian or from lateral set of posterior
superior nasal nerves.¹ ... } *Supreme posterior nasal nerves.*
Pharyngeal or pterygo-palatine (34).
28. Postero-superior nasal nerves { Lateral set { Ethmoidal To posterior ethmoidal cells.
Turbinal { Superior turbinal ... } *Postero-superior turbinal and meatal
nerves.*
Superior meatal ... }
Posterior middle turbinal ... }
Medial set { Branches to upper and posterior part of septum ... } *Postero-superior septal nerves.*
Naso-palatine (29) ... }
29. Naso-palatine nerve { Filaments to septal mucous membrane.
To mucous membrane behind incisor teeth.
Communicating with opposite nerve in Scarpa's canal.
Communicating with anterior superior alveolar.
30. Anterior palatine ... { Inferior nasal branches { Posterior middle meatal²... } *Postero-inferior turbinal and meatal
nerves.*
Posterior inferior turbinal ... }
Posterior inferior meatal ... }
To inner side of gum, glands, and mucous membrane of hard palate.
Communicating with naso-palatine.
31. Middle palatine ... { To tonsil.
To glands and mucous membrane of soft palate.
32. Posterior palatine ... { To tonsil.
To glands and mucous membrane of soft palate.
To uvula.
33. Vidian ... { **Great superficial petrosal** from geniculate ganglion (51).
Great deep petrosal from internal carotid plexus (conveying fibres from glosso-pharyngeal)³ (58).
Sphenoidal branch communicating with otic ganglion.
Trigeminal fibres to upper and back part of roof and septum of nose, superior turbinate, and
meatus.

¹ See Cunningham's 'Manual,' revised by Robinson, fifth edition, 1912. These small nerves vary, and are difficult to demonstrate.

² *Ibid.* Henle and Robinson describe a slightly different arrangement. See Introductory Note.

³ See Professor Thane's figure in Quain, edition 1909, vol. iii.

34. Pharyngeal ... { To pharyngeal end of Eustachian tube.
To upper part of pharyngeal wall.
To naso-pharynx.
To posterior nares.
To sphenoidal sinus.
Internal Pterygoid.
35. Mandibular nerve ... { Spinous recurrent (36).
Upper division (motor, except long buccal) (37).
Lower division (sensory, except mylo-hyoid) (39).
36. Spinous recurrent ... { Communicating with otic ganglion.
Anterior branch { To petrous bone and mastoid cells.
Communicating with middle recurrent.
Posterior branch { To great wing of sphenoid.
* To dura.
37. Upper division of mandibular { Anterior deep temporal.
Middle deep temporal.
Posterior deep temporal.
Masseteric.
External pterygoid.
Long buccal (purely sensory) (38).
38. Long buccal ... { Branches to buccal plexus with facial.
Cutaneous to surface of cheek.
To mucous lining of cheek.
39. Lower division of mandibular { Auriculo-temporal (40).
Lingual (46).
Inferior alveolar (44).
40. Auriculo-temporal ... { Communicating with otic ganglion (two) (secretory) (49).
Articular to temporo-maxillary joint.
Communicating with temporo-facial branch of facial { Cutaneous over zygoma.¹
Cutaneous towards angle of mouth.
Cutaneous towards chin.
External auditory meatal (two, superior and inferior) (42).
Anterior auricular (two, superior and inferior) (43).
To parotid gland.
To sympathetic on maxillary artery.
Communicating with inferior alveolar.
Superficial temporal, with anterior and posterior branches (39).

¹ Here given as described by Frohse (see Quain, edition 1909).

41. Superficial temporal ... { **To temporal region, nearly to vertex.**
Communicating with facial.
Communicating with zygomatico-temporal.
42. External auditory meatal (two) { Superior external auditory meatal ... { To roof of auditory meatus.
Inferior external auditory meatal ... { To membrana tympani.
To anterior wall of auditory meatus.
*To lobule of pinna.
43. Anterior auricular (two) ... { Superior anterior auricular ... { To ascending limb and crus of helix.
Inferior anterior auricular ... { To upper part of auricle.
To tragus.
44. Inferior alveolar ... { Motor nerve to mylo-hyoid and anterior belly of digastric.
Dental branches and plexus { Inferior gingival.
To molar teeth.
To bicuspid teeth.
To canine tooth.
Incisive ... { To incisor teeth
Inferior gingival.
Mental (45).
45. Mental ... { Labial branches { Cutaneous to lower lip.
To mucous membrane of lower lip.
To mental plexus with facial.
Mental branches { Cutaneous to region of chin.
To mental plexus with facial.
46. Lingual ... { Communicating with inferior alveolar.
Communicating with facial (pars intermedia) (chorda tympani).
Branches to the isthmus of the fauces, to tonsil and lining of mouth cavity.
Communicating with hypoglossal.
Branches to submaxillary ganglion (47).
Branches to sublingual ganglion (48).
To papillæ of the anterior two-thirds of the tongue.
47. Submaxillary ganglion ... { Roots { From lingual (chorda tympani) (sensory and secretory).
From plexus on external maxillary (facial) artery (sympathetic).
Branches { To floor of mouth and Wharton's duct.
To submaxillary gland.
*Communicating with hypoglossal.
Communicating branches with lingual.
48. *Sublingual ganglion ... { Roots ... From lingual (secretory).
Branches ... To sublingual gland.

49. Otic ganglion	<table border="0"> <tr> <td style="vertical-align: middle;">Roots</td> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Sympathetic from middle meningeal plexus. Motor (and sensory?) from nerve to internal pterygoid. Secretory from small superficial petrosal.</td> </tr> <tr> <td style="vertical-align: middle;">Branches</td> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;"> <table border="0"> <tr> <td style="vertical-align: middle;">Secretory</td> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">To auriculo-temporal (two). *To long buccal.</td> </tr> <tr> <td style="vertical-align: middle;">Communicating</td> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">With Vidian by sphenoidal branch.¹ " nerve to internal pterygoid. " chorda tympani. " spinous recurrent. " nerve to tensor tympani. " nerve to tensor palati.²</td> </tr> </table> </td> </tr> </table>	Roots	{	Sympathetic from middle meningeal plexus. Motor (and sensory?) from nerve to internal pterygoid. Secretory from small superficial petrosal.	Branches	{	<table border="0"> <tr> <td style="vertical-align: middle;">Secretory</td> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">To auriculo-temporal (two). *To long buccal.</td> </tr> <tr> <td style="vertical-align: middle;">Communicating</td> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">With Vidian by sphenoidal branch.¹ " nerve to internal pterygoid. " chorda tympani. " spinous recurrent. " nerve to tensor tympani. " nerve to tensor palati.²</td> </tr> </table>	Secretory	{	To auriculo-temporal (two). *To long buccal.	Communicating	{	With Vidian by sphenoidal branch. ¹ " nerve to internal pterygoid. " chorda tympani. " spinous recurrent. " nerve to tensor tympani. " nerve to tensor palati. ²
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Conclusion of Fifth Nerve and its Ganglia.

Tables 50 to 64 refer to the VIIth, IXth, Xth, Sympathetic and Cervical nerves. These Tables are complete in themselves, but some of the branches in brackets [] are necessarily not included in the map scheme.

50. Facial nerve	<table border="0"> <tr> <td style="vertical-align: middle;">In internal auditory meatus</td> <td style="vertical-align: middle;">...</td> <td style="vertical-align: middle;">* Communicating with auditory nerve.</td> </tr> <tr> <td style="vertical-align: middle;">At the geniculate ganglion</td> <td style="vertical-align: middle;">...</td> <td style="vertical-align: middle;"> <table border="0"> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Communicating with spheno-palatine ganglion by great superficial petrosal.</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Communicating with Otic ganglion by branch to join small superficial petrosal.³</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Communicating with Sympathetic on middle meningeal by external superficial petrosal.</td> </tr> </table> </td> </tr> <tr> <td style="vertical-align: middle;">In aqueduct of Fallopius</td> <td style="vertical-align: middle;">...</td> <td style="vertical-align: middle;"> <table border="0"> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Nerve to stapedius.</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Chorda tympani (sensory and secretory, from pars intermedia).</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Communicating with auricular of vagus (55).</td> </tr> </table> </td> </tr> <tr> <td style="vertical-align: middle;">At exit from stylo-mastoid foramen</td> <td style="vertical-align: middle;">...</td> <td style="vertical-align: middle;"> <table border="0"> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Posterior auricular, with communicating branches to auricular of vagus and superficial cervical nerves.</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Digastric, with communicating branch to glosso-pharyngeal.</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">[* Communicating with petrous ganglion of IXth.]⁴</td> </tr> </table> </td> </tr> <tr> <td style="vertical-align: middle;">Terminal divisions</td> <td style="vertical-align: middle;">...</td> <td style="vertical-align: middle;"> <table border="0"> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Temporo-facial.</td> </tr> <tr> <td style="vertical-align: middle;">{</td> <td style="vertical-align: middle;">Cervico-facial.</td> </tr> </table> </td> </tr> </table>	In internal auditory meatus	...	* Communicating with auditory nerve.	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¹ According to Rauber's figure, the sphenoidal branch may be a root.

² Some authorities believe the motor fibres from the internal pterygoid pass uninterrupted through the otic ganglion to these muscles.

³ Ramus anastomoticus cum plexu tympanico (B.N.A.).

⁴ Attributed to Garibaldi in Landois and Stirling's 'Physiology,' edit. iv., p. 736.

- | | | | |
|--|---|---|--------------------|
| 52. Tympanic nerve ... | { | To Eustachian tube.
To fenestra cochleæ.
To fenestra vestibuli.
To mastoid cells.
To tympanum.
Carotico-tympanic ¹
Small deep petrosal. ¹
Small superficial petrosal. | } Tympanic plexus. |
| 53. Ganglion of root of vagus
(ganglion jugulare) ... | { | *Communicating with petrous ganglion of glosso-pharyngeal (51).
[With superior cervical ganglion] (57).
[With spinal accessory nerve.]
Auricular branch (of Arnold) (55).
Continued inferiorly to ganglion of trunk (55). | |
| 54. Auricular branch of vagus ... | { | Communicating with petrous ganglion.
Communicating with facial.
To membrana tympani.
To lower and back part of auditory meatus.
Communicating with posterior auricular.
Cutaneous to upper and back part of pinna, and external auditory meatus. | |
| 55. Ganglion of trunk of vagus
(ganglion nodosum) ... | { | Pharyngeal branch (to pharyngeal plexus).
[Communicating with hypoglossal.]
[Communicating with loop between first two cervical.]
Superior laryngeal. | |
| 56. Auditory nerve (vestibular
division) ... | { | *Communicating with facial and pars intermedia in internal auditory meatus | |

SYMPATHETIC SYSTEM

- | | | |
|------------------------------------|---|---|
| 57. Superior cervical ganglion ... | { | Carotid or ascending { External division ... Internal carotid plexus (58).
{ Internal division ... Cavernous plexus (59).
[Grey rami communicating with first four cervical.]
[To ganglion of trunk of vagus] ...
[To hyperglossal (XIIth)] ...
Jugular { To petrous ganglion (IXth) ...
{ To ganglion of root of vagus (Xth) ... } Cranial connections.
To pharyngeal plexus.
[Vascular rami to external carotid, etc.]
Superior cervical cardiac.
[Continued below into middle cervical ganglion.] |
|------------------------------------|---|---|

¹ Named in the B.N.A. as superior and inferior carotico-tympanic respectively.

- | | | |
|-----------------------------|-----|--|
| 58. Internal carotid plexus | ... | { To internal carotid artery.
[Communicating with sixth nerve.]
Communicating with Gasserian ganglion.
Carotico-tympanic, ¹ to tympanic plexus.
Small deep petrosal (to tympanic plexus).
Great deep petrosal (to join great superficial petrosal).
[To cavernous plexus.] ² |
| 59. Cavernous plexus | ... | { To internal carotid artery.
[Communicating with third nerve.]
[Communicating with fourth.]
Communicating with ophthalmic of fifth.
Sympathetic root of ciliary ganglion.
[Filaments to pituitary body.] |

CERVICAL NERVES

CUTANEOUS BRANCHES OF POSTERIOR PRIMARY DIVISIONS FORMING PART OF THE 'POSTERIOR CERVICAL PLEXUS'

- | | | |
|--|-----|---|
| 60. Great occipital (from second cervical) | ... | { To scalp of back of head as far forward as vertex.
Communicating with small and third occipital. |
| 61. Third occipital (from third cervical) | ... | { To scalp of back of head.
Communicating with great occipital. |

ANTERIOR PRIMARY DIVISIONS

CUTANEOUS BRANCHES FORMING THE 'SUPERFICIAL ASCENDING BRANCHES OF THE CERVICAL PLEXUS'

- | | | |
|---|-----|--|
| 62. Small occipital (from second cervical) | ... | { Auricular branch To skin of upper part of dorsum (medial surface) of pinna.
Mastoid branch To skin over mastoid region, communicating with facial.
Occipital branch To skin of occipital region. |
| 63. Great auricular (from second and third cervical) | ... | { Facial branch ³ ... To skin over parotid, masseteric, and buccal regions, and to parotid gland.
Auricular branch { To skin of lower third of back of pinna.
Communicating with facial and vagus nerves.
Mastoid branch { To skin of front of lobule and helix.
To skin over the mastoid region.
Communicating with facial. |
| 64. Superficial cervical (from second and third cervical) | ... | { Ascending branch To upper part of front of neck, reaching to mandible.
Descending branch To lower part of front of neck, reaching to sternum. |

¹ Often described as arising from the external division of the carotid nerve.² Quain's editors describe the communication as between the external and internal divisions of the carotid branch.³ The examinee is often asked to put his finger over the part of his face which is not supplied by the fifth nerve—*i.e.*, the parotid region.

INDEX OF TABLES

(The order of the nerves is that followed in Quain, edition of 1909.)

1. Gasserian ganglion.
2. Ophthalmic nerve.
3. Lachrymal nerve.
4. Supra-orbital nerve.
5. Supratrochlear nerve.
6. Naso-ciliary nerve.
7. Intranasal section of nasal.
8. Cutaneous section of nasal.
9. Infratrochlear nerve.
10. Ciliary ganglion.
11. Maxillary nerve.
12. Middle meningeal recurrent nerve.
13. Zygomatico-temporal nerve.
14. Zygomatico-facial nerve.
15. Infra-orbital nerve.
16. Postero-superior alveolar nerve.
17. Middle superior alveolar nerve.
18. Antero-superior alveolar nerve.
19. Nasal branch of anterior superior alveolar.
20. Inferior palpebral branch of infra-orbital.
21. Cutaneous nasal branch of infra-orbital.
22. Superior labial branch of infra-orbital.
23. Spheno-palatine ganglion.
24. Anterior (ascending) or orbital group.
25. Medial or nasal group.
26. Descending or palatine group.
27. Posterior group.
28. Postero-superior nasal nerves.
29. Naso-palatine nerve.
30. Anterior palatine nerve.
31. Middle palatine nerve.
32. Posterior palatine nerve.
33. Vidian nerve.
34. Pharyngeal nerve.
35. Mandibular nerve.
36. Spinous recurrent nerve.
37. Upper division of mandibular.
38. Long buccal nerve.
39. Lower division of mandibular.
40. Auriculo-temporal nerve.
41. Superficial temporal.
42. External auditory meatal nerves.
43. Anterior auricular nerves.
44. Inferior alveolar nerve.
45. Mental nerve.
46. Lingual nerve.
47. Submaxillary ganglion.
48. Sublingual ganglion.
49. Otic ganglion.
50. Facial nerve.
51. Petrous ganglion of glosso-pharyngeal.
52. Tympanic nerve.
53. Ganglion of root of vagus.
54. Auricular branch of vagus.
55. Ganglion of trunk of vagus.
56. Auditory nerve (vestibular division).
57. Superior cervical ganglion.
58. Internal carotid plexus.
59. Cavernous plexus.
60. Great occipital nerve.
61. Third occipital nerve.
62. Small occipital nerve.
63. Great auricular nerve.
64. Superficial or transverse cervical nerve.

PHYSIOLOGICAL ANALYSES

I. CILIARY GANGLION

TABLE OF DISTRIBUTION AND FUNCTIONS OF THE LONG AND SHORT CILIARY NERVES

- | | |
|---|--|
| 1. Trigeminal fibres in nasal root,
and long ciliary nerves ... | } Sensory to tunics of globe, ciliary body, cornea, and iris. |
| 2. Sympathetic fibres from
cavernous plexus conveyed
by ophthalmic, and nasal root | } Dilator fibres to pupil.
Vaso-dilator fibres to vessels of globe. |
| 3. Sympathetic fibres passing to
the globe from cavernous
plexus directly ... | } Motor fibres to Müller's muscle (non-striated fibres of levator palpebræ).
Vaso-constrictor fibres to vessels of globe. |
| 4. Fibres of third nerve passing
directly to the ciliary gan-
glion, but interrupted in it ¹ | } Motor fibres to sphincters of pupil and ciliary muscle. |

II. ANALYSIS OF THE CONNECTIONS OF THE FIFTH NERVE WITH THE PARS INTERMEDIA
(SENSORY PART OF THE FACIAL)

NOTE.—The map shows that the pars intermedia gains access to the ophthalmic nerve through one connection only—viz., the loop of anastomosis between the lachrymal and zygomatic nerves, the fibres being conveyed by the great superficial petrosal to the sphenopalatine ganglion.

The first division of the fifth is thus supplied through the second, the current ascending by the sphenopalatine nerves, and taking a reflected course to reach the maxillary nerve and its zygomatic branch.

The third, or mandibular division is connected with the pars intermedia through the chorda tympani—first, by a filament from the chorda to the otic ganglion, and secondly, by direct fusion with the lingual.

¹ The fibres in Nos. 1, 2, and 3 are believed to pass uninterrupted through the ciliary ganglion.

IV. CONNECTIONS BETWEEN THE FIFTH NERVE AND THE SYMPATHETIC SYSTEM

NOTE.—No pre-Gasserian connection is represented between the sympathetic and the fifth nerve. The prime source figured in the map is the superior cervical ganglion; anastomosis between the carotid plexus and the basal surface of the ganglion is presumed to exist, but is not universally recognized. (See Quain's 'Elements,' vol. iii., part ii., p. 154.)

Sympathetic fibres enter the ophthalmic nerve previous to its subdivision, directly from the cavernous plexus, and the ciliary ganglion is usually joined from the same source by a separate root, though the nasal root of the fifth, or the motor root of the third, may take its place. The lachrymal secretion is said to be influenced by the sympathetic; if so, it is either through the ophthalmic, or the vascular plexuses.

To the second division the sympathetic is conveyed directly by the great deep petrosal from the carotid plexus. Arriving with the Vidian at the sphenopalatine ganglion, the path is interrupted, and fresh neurones carry the impulses to their destination *via* the nasal and palatine nerves.

Between the third division of the fifth and the sympathetic there is no direct anastomosis, and the otic and submaxillary ganglia are supplied through the plexuses on the middle meningeal and facial arteries respectively.

Superior cervical ganglion	...	{	From cavernous plexus ...	{	To the ophthalmic ...	{	Vaso-constrictor and secretory fibres to lachrymal gland.
					To the ciliary ganglion ...	{	Vaso-motor to the globe of the eye.
			From carotid plexus ...	{	Through great deep petrosal by Vidian to sphenopalatine ganglion ...	{	Vaso-motor fibres to nasal vascular sinuses, controlling erectile tumefaction of Schneiderian membrane.
						{	Secretory to nasal mucous glands and to glands of soft palate.
			From middle meningeal plexus ...	{	To otic ganglion ...	{	Vaso-constrictor and secretory to glands of buccal region.
			From facial plexus ...	{	To parotid gland, submaxillary and sublingual ganglia	{	Vaso-constrictor and secretory to parotid, submaxillary, and sublingual glands.

SYNOPSIS OF TRIGEMINAL BRANCHES DISTRIBUTED TO THE NOSE AND
ACCESSORY SINUSES

THE NOSE

N.B.—The region is given in left-hand column.

The nerves supplying the region, indicating when possible the terminology of the B.N.A., appear in the centre.

Extended titles for nasal nerves or groups suggested by the author are given in the right-hand column.

I. NASAL CUTANEOUS BRANCHES

1. Root and upper part of side of nose	*1. Supratrochlear	...	...	...	} <i>Upper lateral cutaneous nasal nerves.</i>
...	2. Inferior palpebral branch of infratrochlear	...	...	...
2. Posterior and lower part of side of nose, including the vestibule	Internal nasal, from facial branches of infra-orbital	...	...	...	} <i>Lower lateral cutaneous nasal (and vestibular) nerves.</i>
...		
3. Dorsum and point of nose	External nasal ramus of anterior ethmoidal	...	...	...	} <i>Anterior or dorsal cutaneous nasal nerves.</i>

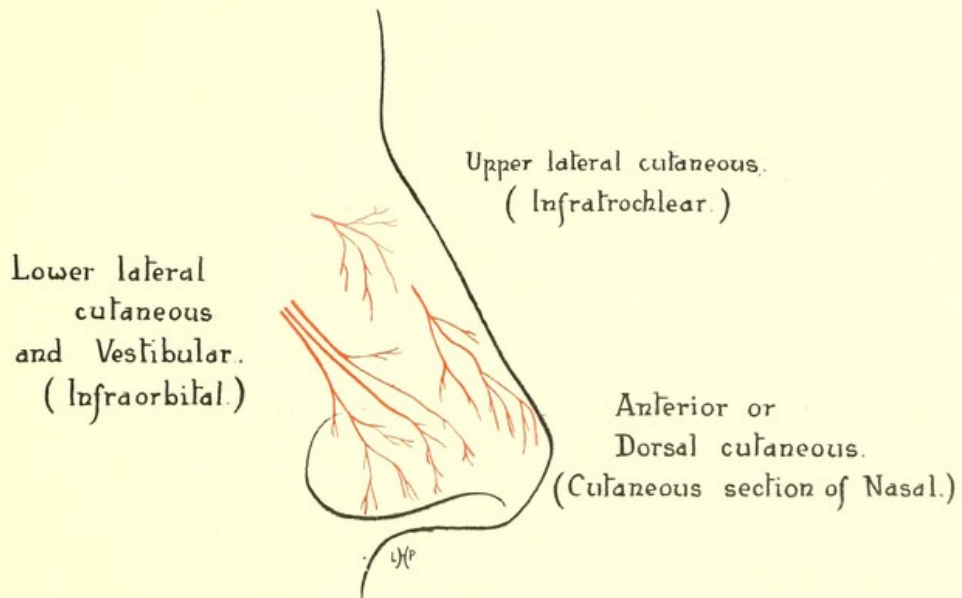


FIG. 1.—CUTANEOUS NERVES OF THE NOSE.

II. SEPTUM NASI

1. Upper and anterior aspect of septum, reaching as far down as vestibule ... } Medial branches of anterior ethmoidal ... } *Anterior septal nerves.*
2. The highest part of the septum posteriorly, and adjacent part of the roof, are supplied by the Vidian and some lateral branches of the posterior superior nasal that do not pass through the sphenopalatine foramen ... } *Supreme posterior nasal nerves.*
3. Posterior and upper part of septum and region of the groove ... } Medial branches of posterior superior nasal nerves from sphenopalatine ganglion and Vidian, and septal offsets of nasopalatine ... } *Postero-superior septal nerves.*

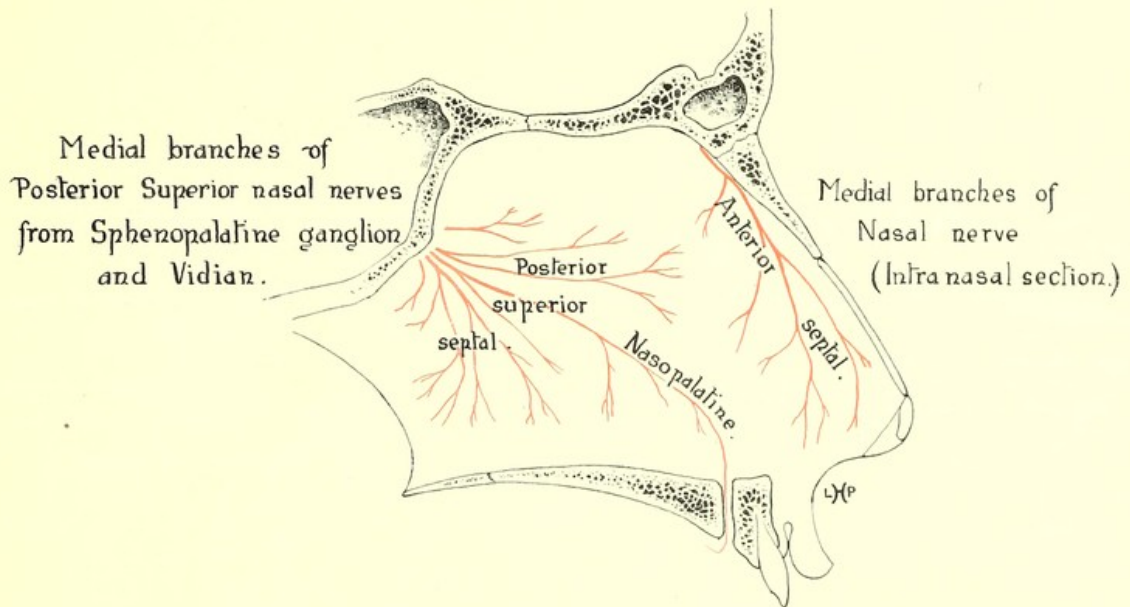


FIG. 2.—TRIGEMINAL NERVES OF SEPTAL WALL.

III. TURBINATE BODIES

- | | | | |
|---|--|---|---|
| 1. Superior turbinate and posterior two-thirds of middle turbinate | Lateral branches of postero-superior nasal nerves from sphenopalatine ganglion and Vidian | <i>Superior turbinal nerve</i>
<i>Posterior middle turbinal nerve</i> | <i>Postero-superior turbinal and meatal nerves.</i> |
| 2. Posterior two-thirds of inferior turbinate | Lateral posterior inferior nasal branch of anterior palatine | <i>Posterior inferior turbinal nerve</i> | <i>Inferior turbinal and meatal nerves.</i> |
| 3. Anterior extremity of middle and inferior turbinates (including adjacent outer wall of fossa) | Lateral branches of anterior ethmoidal ... .. | ... .. | <i>Anterior turbinal and meatal nerves.</i> |

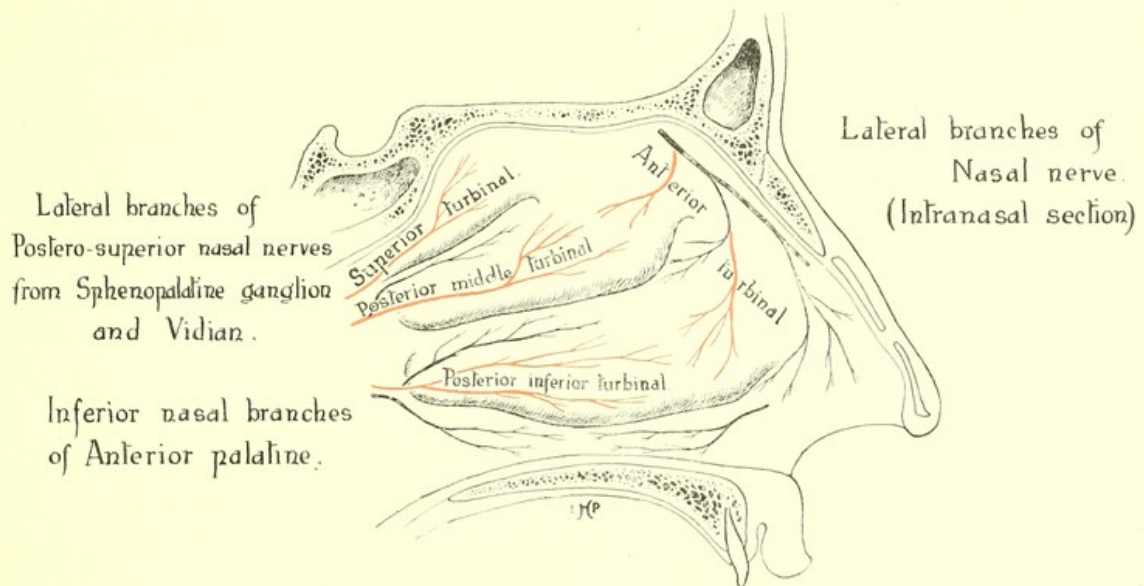


FIG. 3.—TRIGEMINAL NERVES OF LATERAL NASAL WALL. (*Diagrammatic*) TURBINATE NERVES. The turbinate branches are printed red, the meatal, black.

IV. NASAL MEATUSES

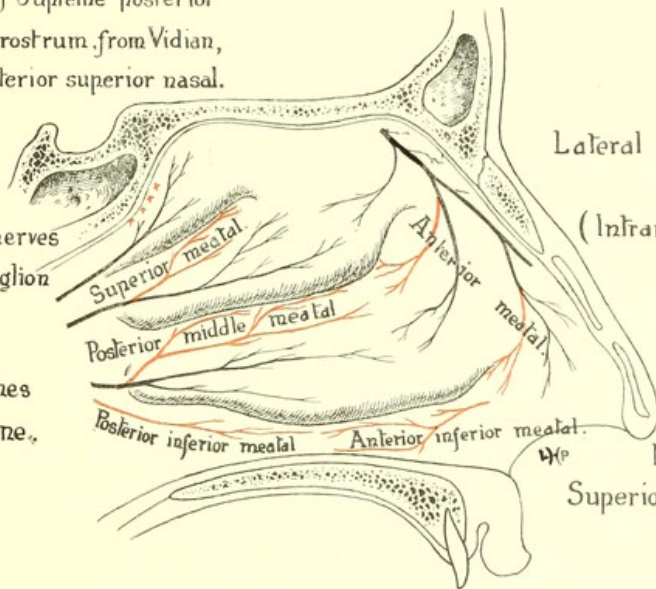
1. Posterior part of middle and inferior meatuses... } Lateral posterior inferior nasal branches of anterior palatine¹ ... { *Posterior middle and postero-inferior meatal nerves.*
2. Anterior part of inferior meatus and floor of fossa ... } Nasal branch of anterior superior alveolar ... } *Anterior meatal and antero-inferior meatal nerves.*
... } Lateral branch of anterior ethmoidal nerve ... }
3. Superior meatus ... } Lateral posterior superior nasal branches from spheno-palatine ganglion and Vidian ... } *Posterior superior turbinal and meatal nerves.*

¹ See footnote at bottom of p. 11.

Indicate position of Supreme posterior nasal in region of rostrum from Vidian, or from Lateral posterior superior nasal.

Lateral branches of Posterior superior nasal nerves from Sphenopalatine ganglion and Vidian.

Inferior nasal branches of Anterior palatine.



Lateral branches of Nasal nerve. (Intranasal section.)

Nasal branch of Superior anterior alveolar.

FIG. 4.—TRIGEMINAL NERVES OF LATERAL NASAL WALL AND ROOF. (Diagrammatic) MEATAL NERVES.

The meatal branches are printed red, the turbinate, black.

THE ACCESSORY SINUSES

- | | | | |
|------------------------------|-----|-----|---|
| 1. Frontal sinus | ... | ... | { Frontal sinus branch of supra-orbital.
Occasional branch from anterior ethmoidal in passing through anterior ethmoidal canal. |
| 2. Posterior ethmoidal cells | ... | ... | { Ethmoidal nerves from orbital branches of sphenopalatine ganglion.
Ethmoidal branches of posterior superior nasal nerves from sphenopalatine ganglion.
Occasional branch from anterior ethmoidal in anterior ethmoidal canal.
Occasional 'posterior ethmoidal' nerve, a branch of nasociliary; (passes through posterior ethmoidal canal). |
| 3. Sphenoidal sinus | ... | ... | { Sphenoidal nerves from orbital branches of sphenopalatine ganglion.
Sphenoidal nerves from pharyngeal of sphenopalatine ganglion.
Sphenoidal nerves from 'posterior' or 'sphenoidal' branch of nasociliary. |
| 4. Maxillary sinus | ... | ... | { Maxillary sinus branches of anterior, middle, and posterior alveolar nerves from superior maxillary.
Branches from superior dental plexus of superior maxillary. |

SENSORY NERVES DISTRIBUTED TO THE EXTERNAL EAR

I. LATERAL OR EXTERNAL SURFACE OF AURICLE

1. To the upper, anterior, and lesser part of auricle ; to crus and ascending limb of helix } Superior anterior auricular branch of auriculo-temporal.
2. To tragus } Inferior anterior auricular branch of auriculo-temporal.
3. To lower, posterior, and greater part of auricle, behind a line from upper part of helix to centre of fissura intertragica } Auricular branch of great auricular from cervical plexus.
4. To part of hollow of concha ... } Terminal branch of auricular branch of vagus.

II. MEDIAL OR CRANIAL SURFACE OF AURICLE

1. To upper third or fourth of medial surface } Auricular branch of small occipital from cervical plexus (superiorly).
Cutaneous termination of auricular branch of vagus (inferiorly).
2. Lower three-fourths of medial surface } Auricular branch of great auricular from cervical plexus.

III. EXTERNAL AUDITORY MEATUS

1. Roof of meatus } Superior external auditory meatal branch of auriculo-temporal.
2. Anterior part of meatus ... } Inferior external auditory meatal branch of auriculo-temporal.
3. Lower posterior part of meatus } Auricular branch of vagus.

IV. MOTOR AND SENSORY NERVES TO MIDDLE EAR

1. To membrana tympani ... { Auricular branch of vagus.
Superior external auditory meatal branch of auriculo-temporal.
2. To tympanic mucous mem-
brane; to fenestra cochleæ
and fenestra vestibuli ... } Tympanic nerve (Jacobson's) from glosso-pharyngeal.
3. To Eustachian tube ... { Filament from tympanic nerve.
Filament from pharyngeal branch of spheno-palatine ganglion.
Branch from trigeminal fibres, conveyed by Vidian from spheno-palatine ganglion.
4. To tensor tympani muscle ... Branch from nerve to internal pterygoid of Vth through otic ganglion.
5. To stapedius ... Branch from facial in aqueduct of Fallopius.
6. To mastoid cells ... { Branch from tympanic nerve (IXth).
Filaments from anterior branch of spinous recurrent (Vth).

