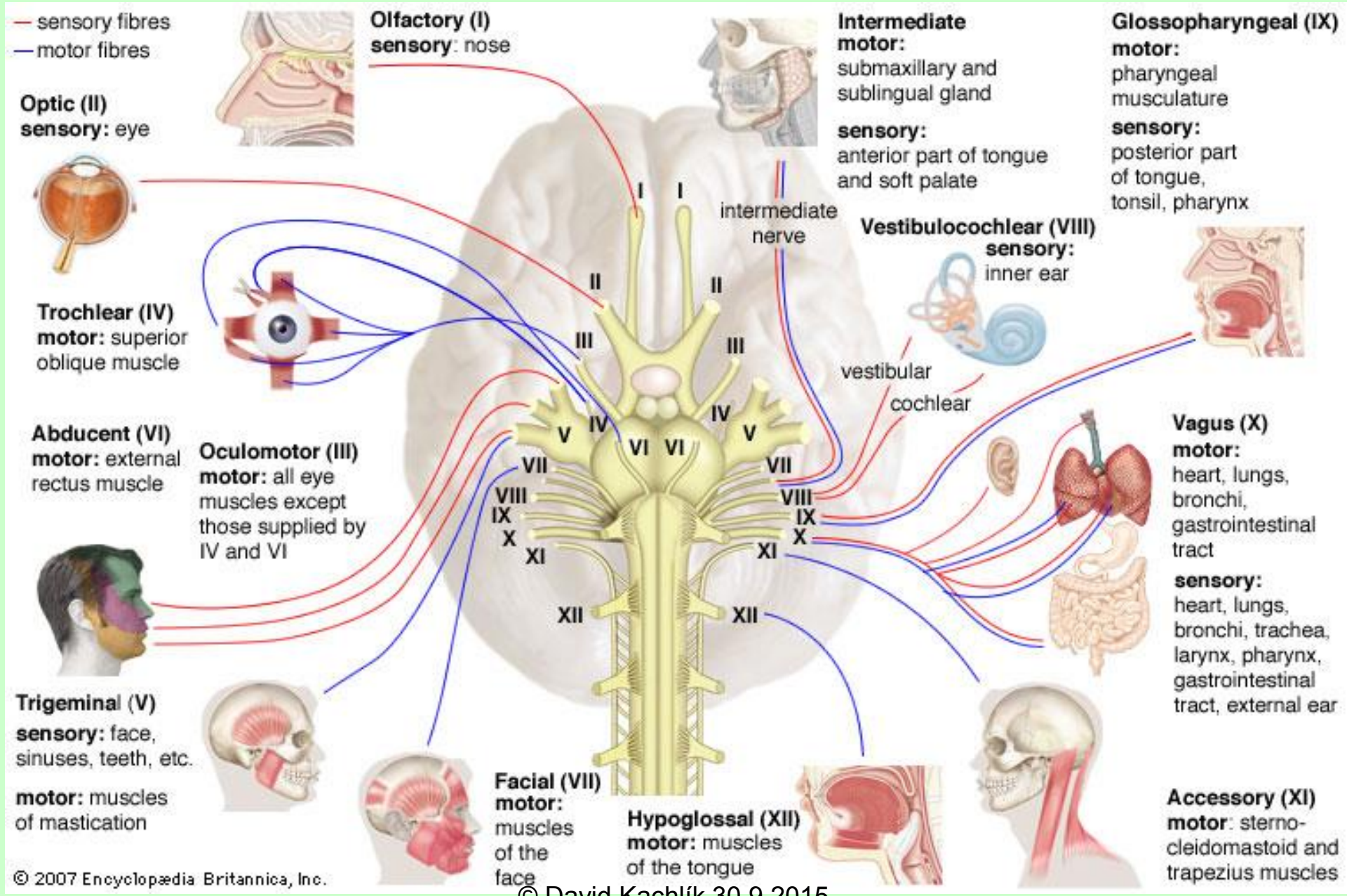
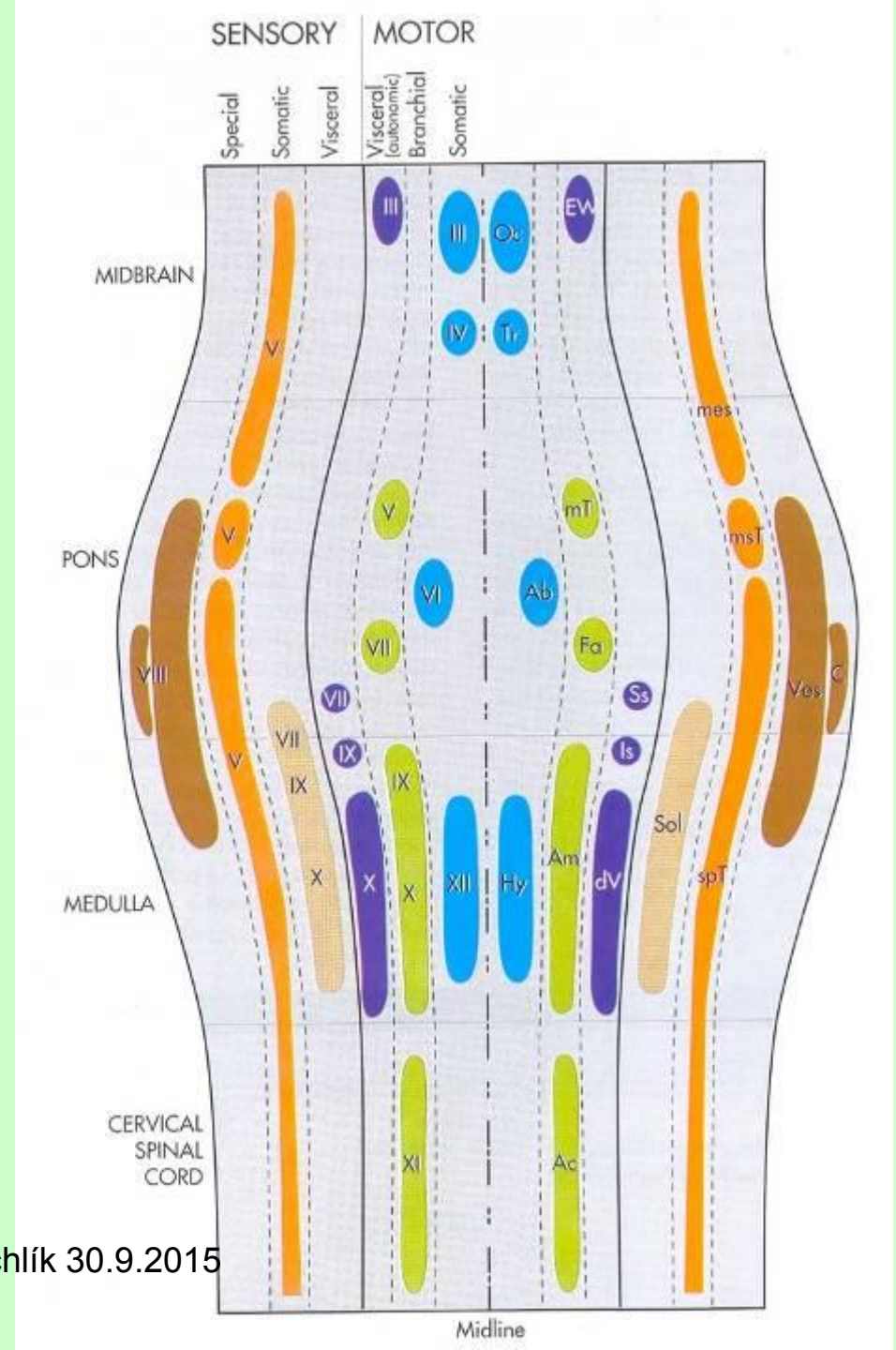
CRANIAL NERVES

2nd part

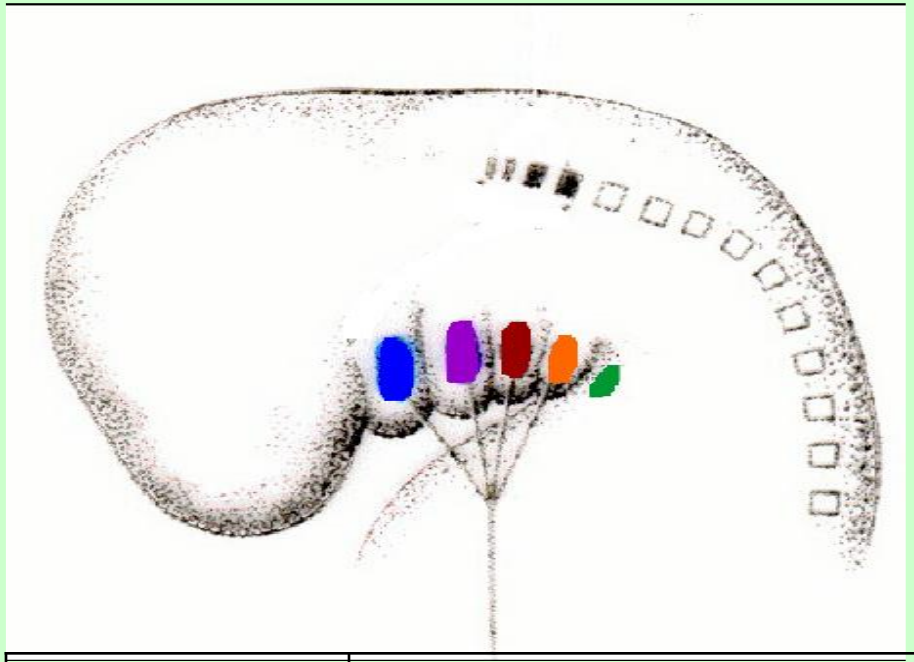


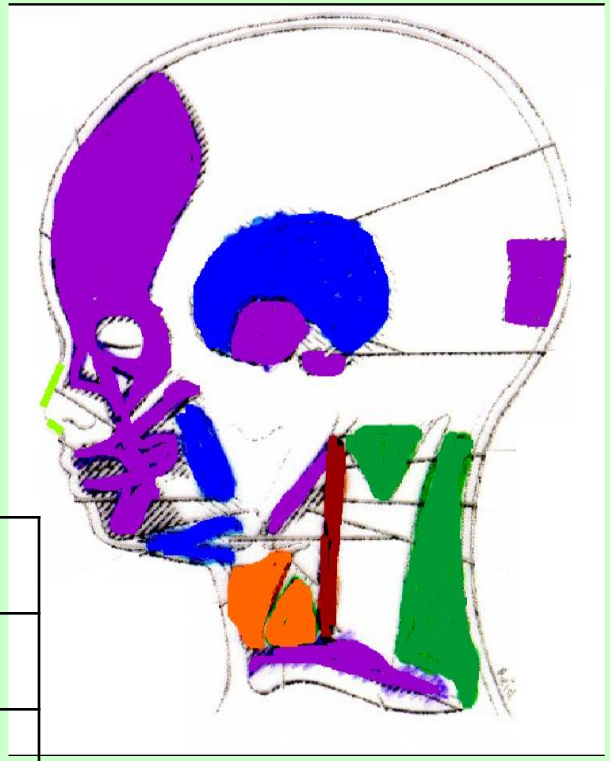
Developmental classification *mediolaterally*

- **somatomotor somatic**
- **somatomotor branchial**
- **visceromotor**
- **viserosensory**
- **somatosensory**
- **special sensory**



SomatoMotor Branchial CN





1st arch	V.
2nd arch	VII.
3rd arch	IX.
4th arch	X. – n. laryngeus sup.
6th arch	r. int. XI. - n. lar. recurrens

General scheme for CN studying

1. number, Latin and English term
2. developmental type of CN
3. nuclei + their location
4. transmitted modalities
5. where CN submerge into skull
6. course of CN + topography
7. branches
8. overview of supplied area
9. clinical examination, reflexes
10. palsy / iritation

VII. = N. facialis

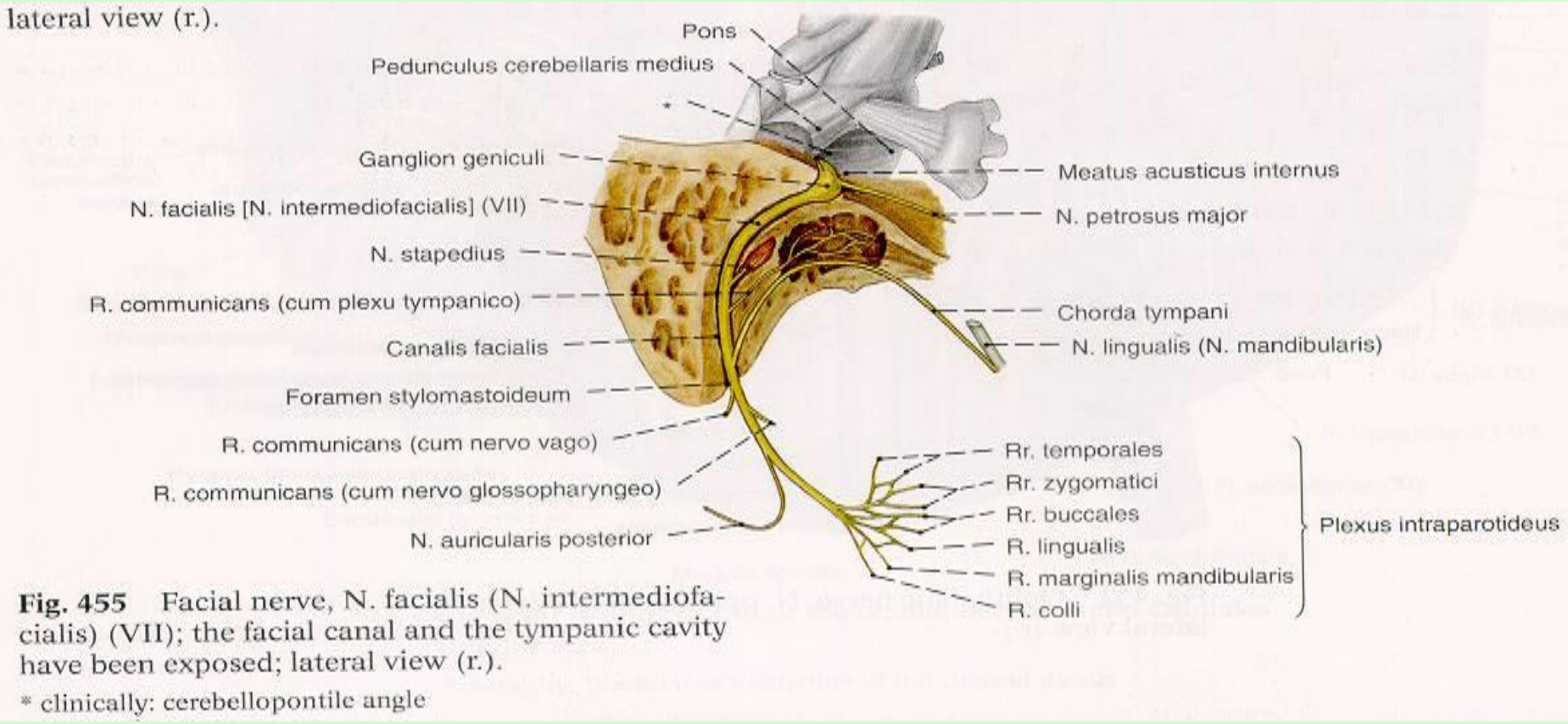


Fig. 455 Facial nerve, N. facialis (N. intermediofacialis) (VII); the facial canal and the tympanic cavity have been exposed; lateral view (r.).

* clinically: cerebellopontile angle

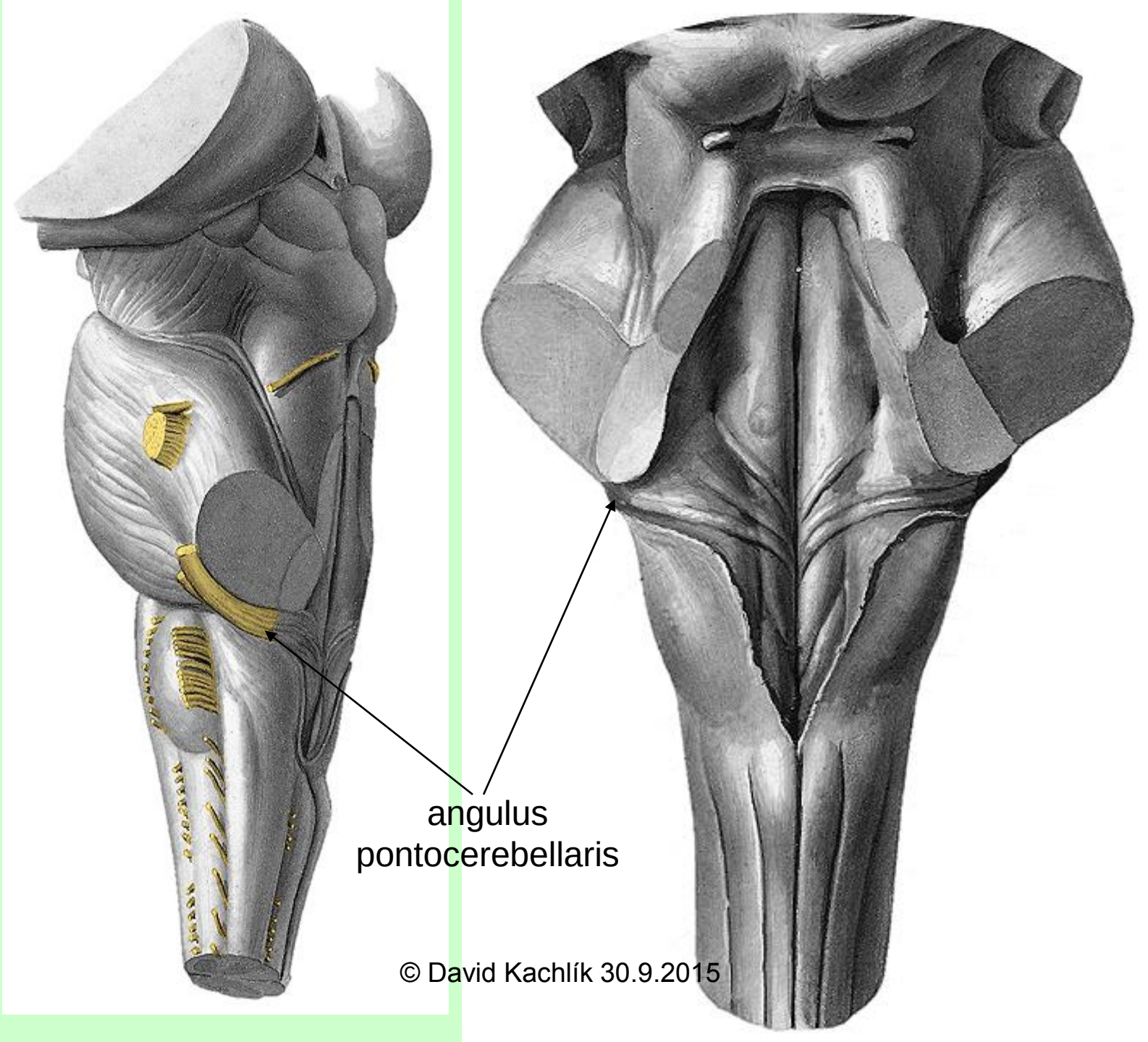
VII. = N. facialis

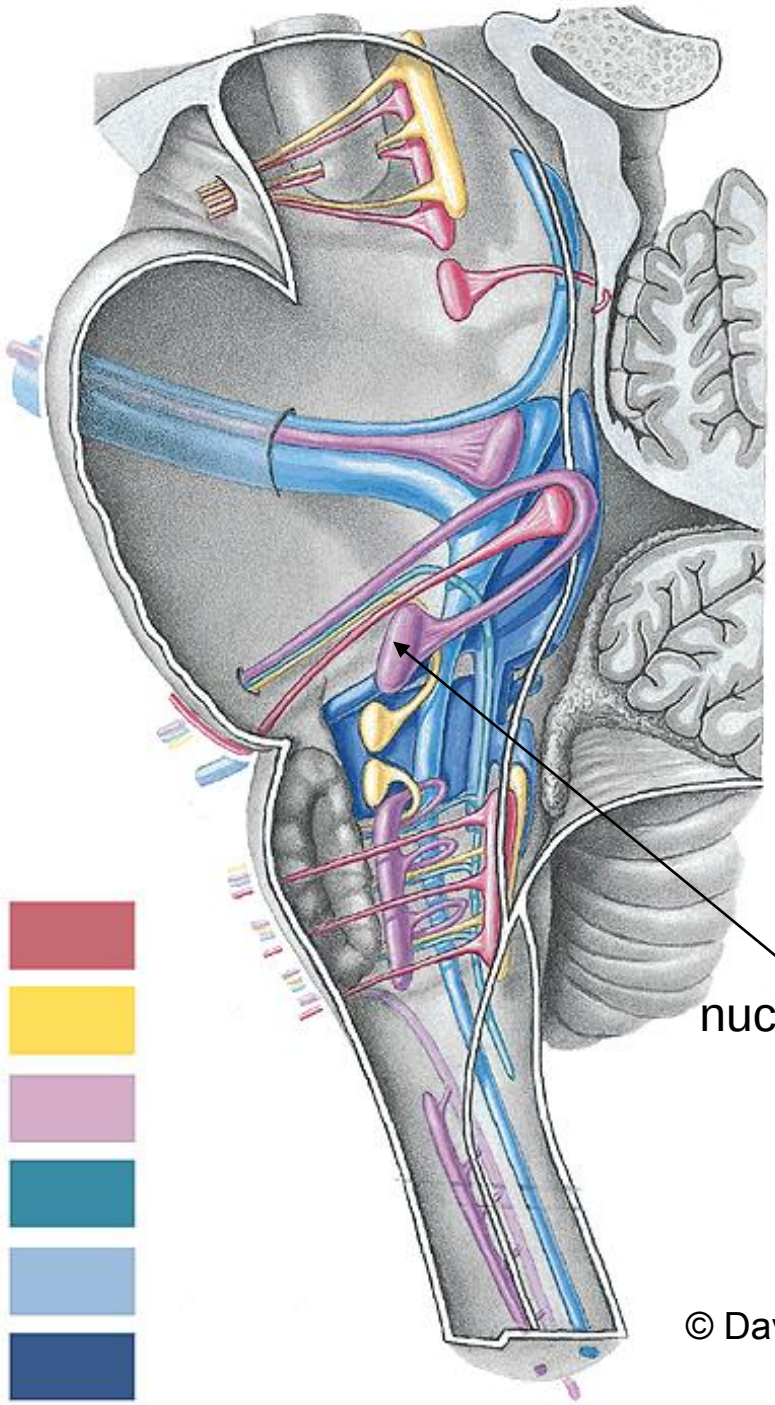
3 nuclei in pons

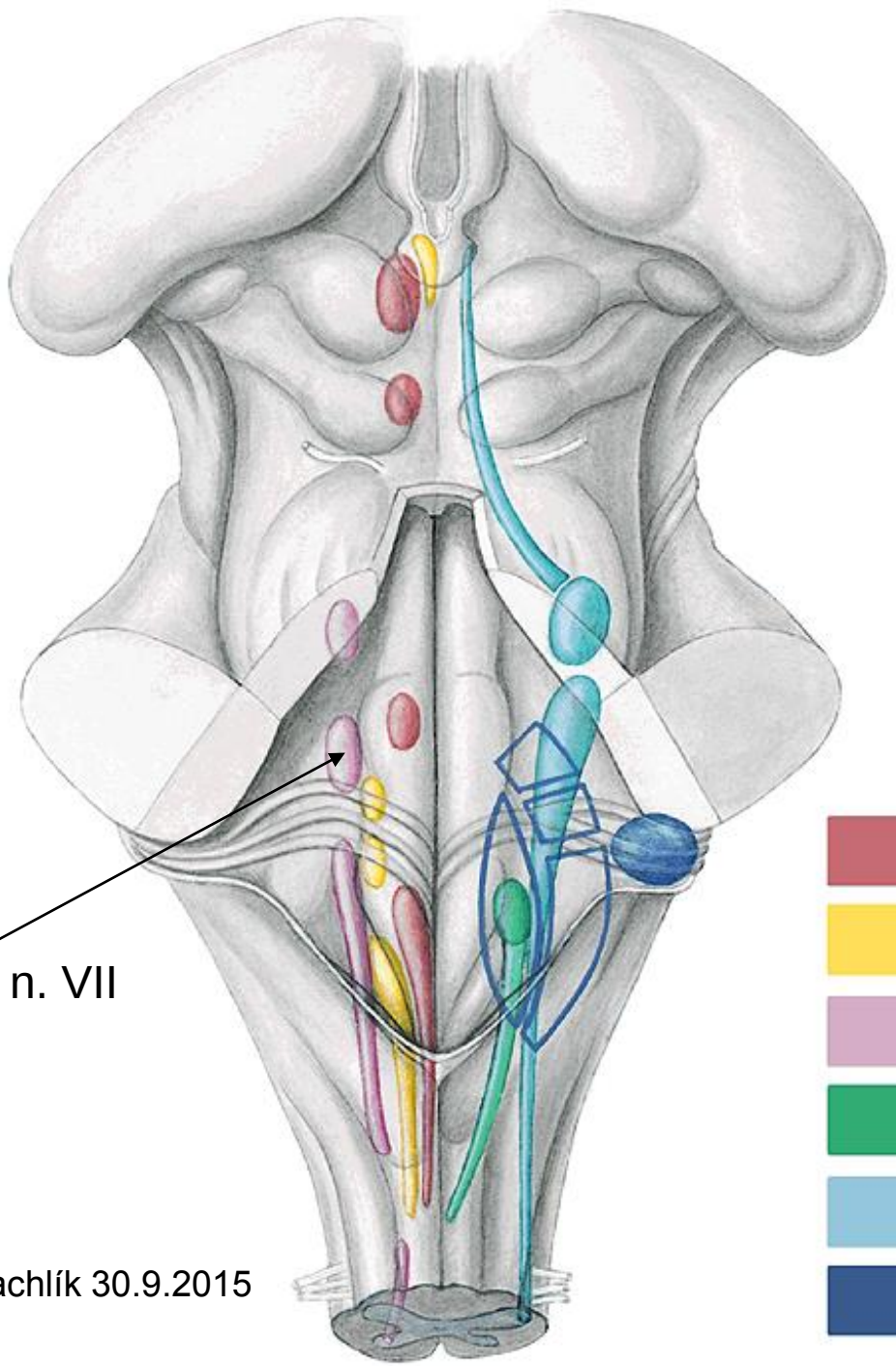
- *somatomotor branchial* (2nd arch) → ncl. n. VII
- *visceromotor* (parasympathetic) → ncl. salivatorius superior
- ncl. gustatorius (rostral part of ncll. tractus solitarii) → *sensory* (taste)

n. intermedius = VM fibres + taste fibres

course: pons → angulus pontocerebellaris → fossa cranii posterior → porus acusticus internus → meatus a.i. → fundus m.a.i. (vetrocranial quadrant) → canalis nervi facialis *Falloppii* → foramen stylomastoideum → glandula parotis

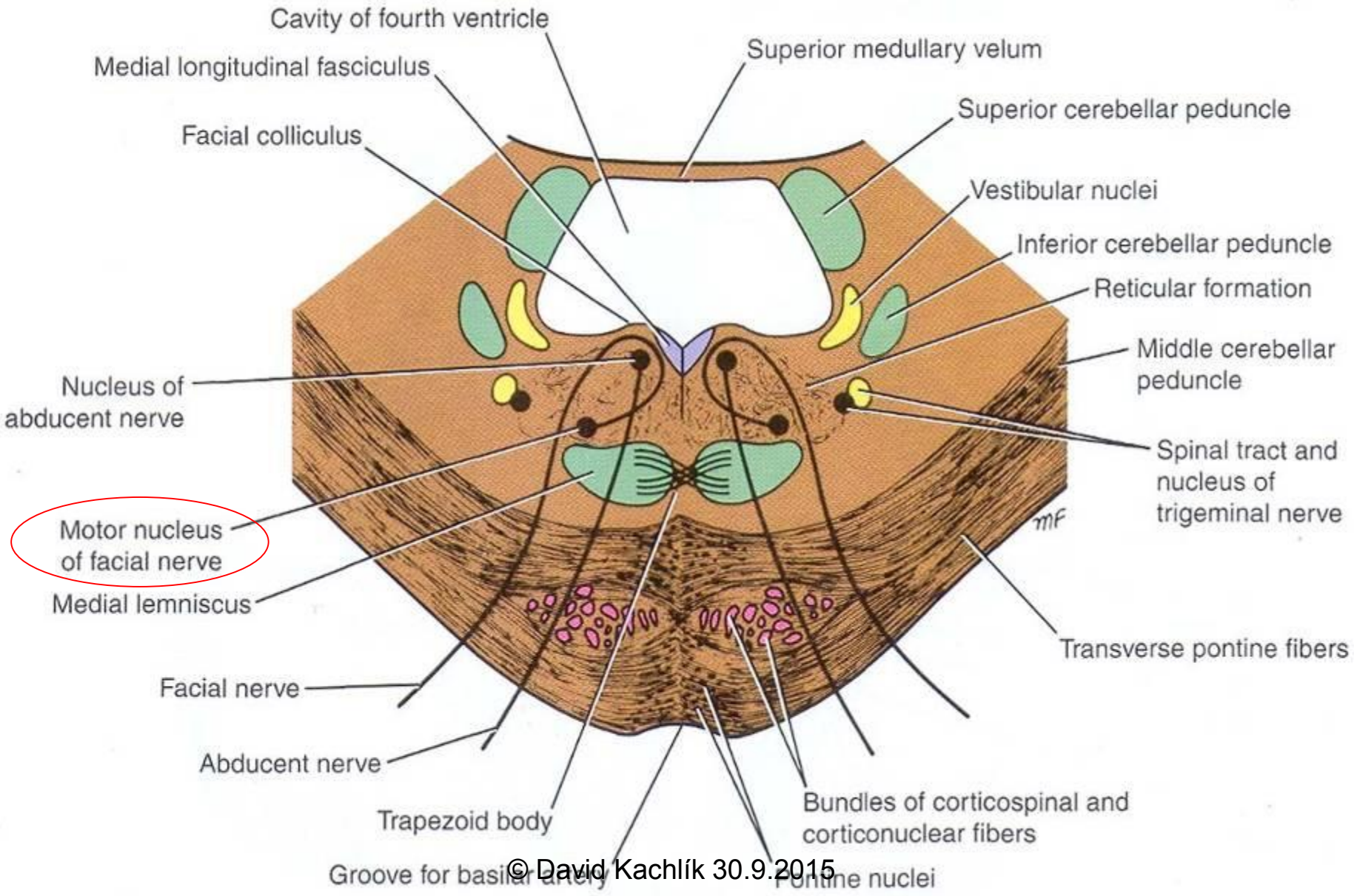




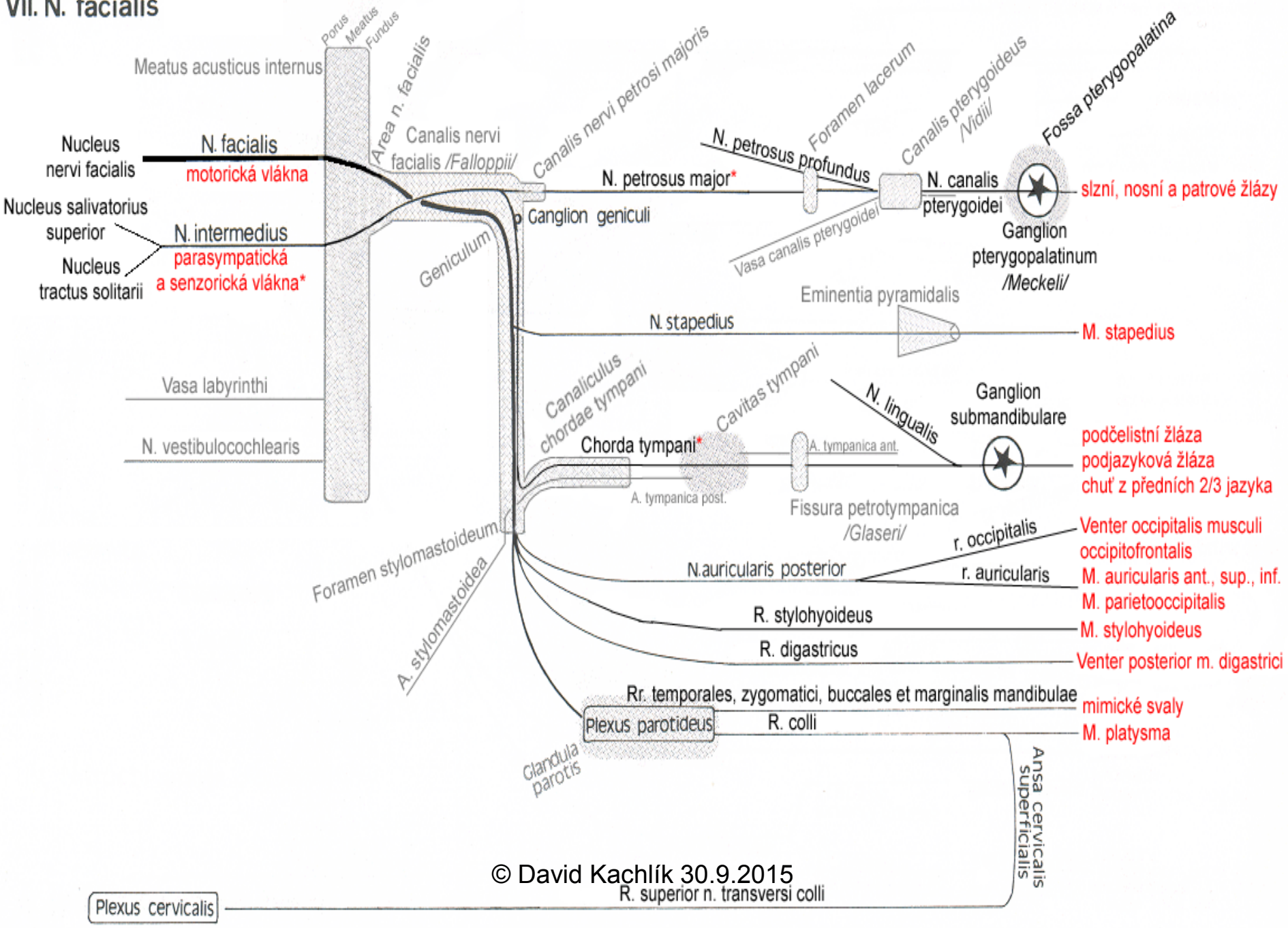


nucleus n. VII

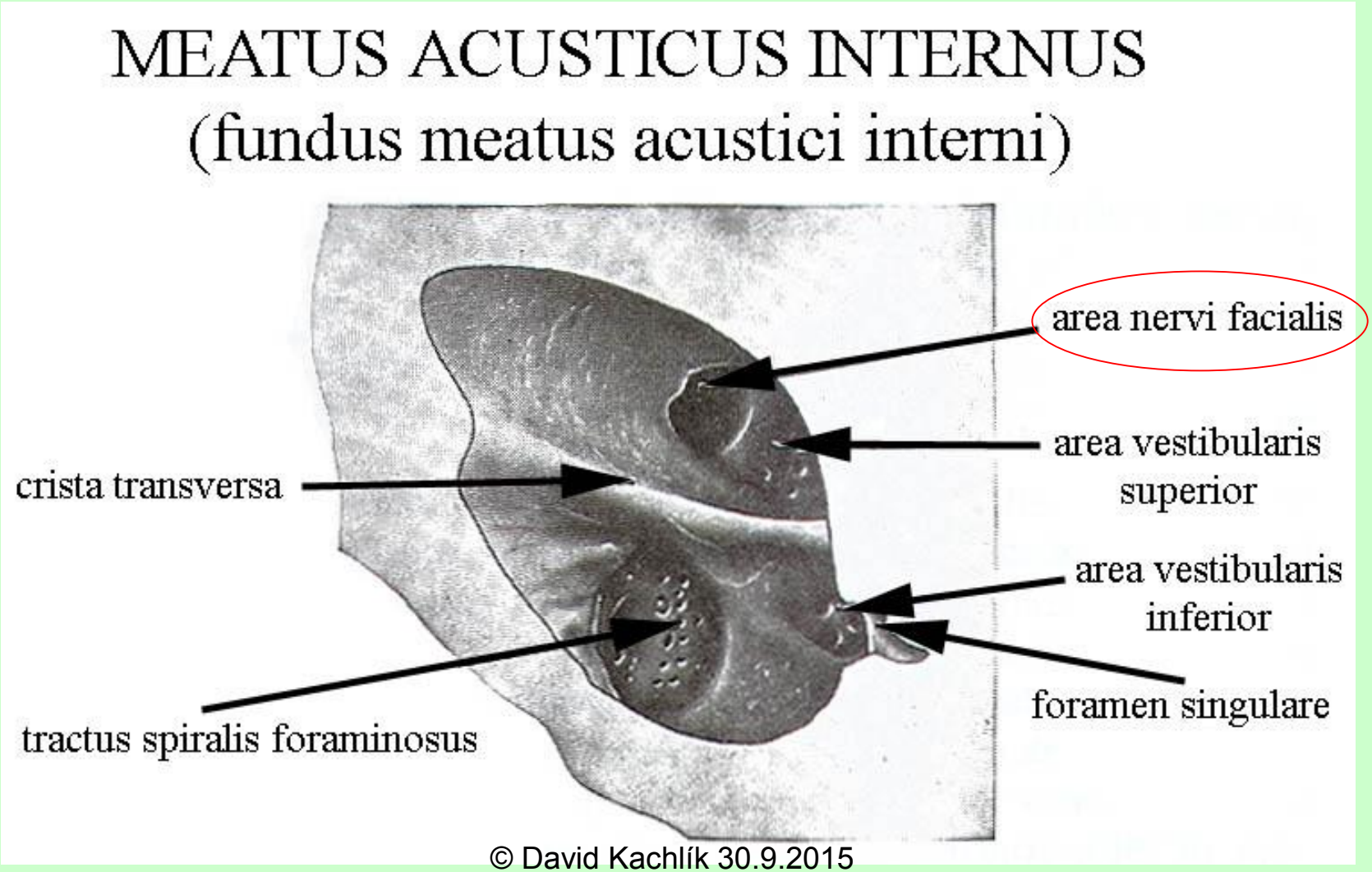
Pons - sectio in collicule faciale

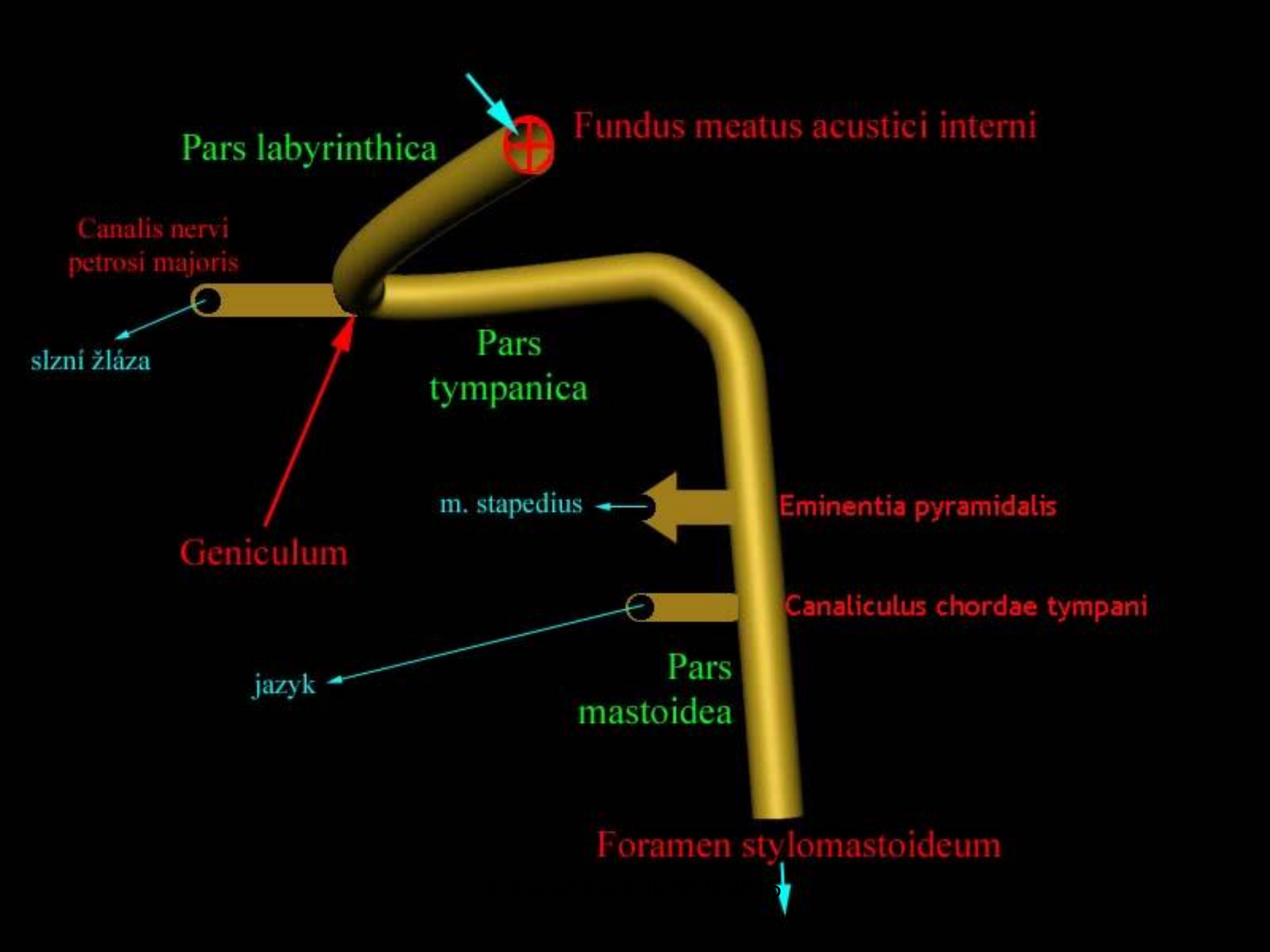


VII. N. facialis

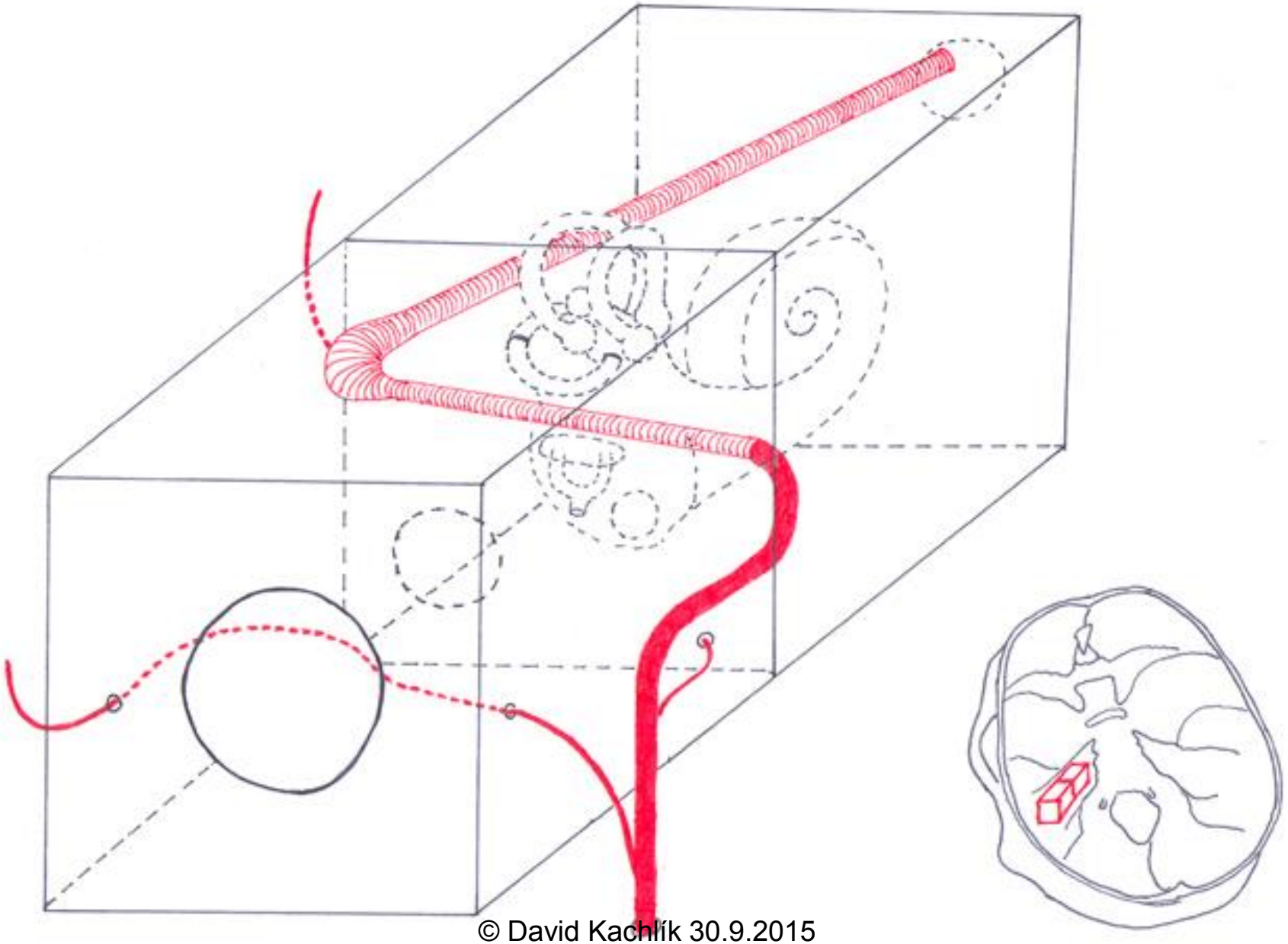


Canalis nervi facialis *Falloppii*




Pars labyrinthica
Fundus meatus acustici interni
Canalis nervi petrosi majoris
slzní žláza
Pars tympanica
m. stapedius
Eminentia pyramidalis
Geniculum
Canaliculus chordae tympani
jazyk
Pars mastoidea
Foramen stylomastoideum

CANALIS NERVI FACIALIS *FALLOPPII* l. sin.



VII. = N. facialis - branches

in canalis nervi facialis

- n. petrosus major – *parasympathetic fibres* → **gll. lacrimalis, nasales, palatinae, nasopharyngeae**
- n. stapedius → **m. stapedius**
- chorda tympani
  - *parasympathetic fibres* → **gll. linguales, submandibularis + sublingualis**
  - *taste* → ventral 2/3 of tongue = **dorsum linguae**

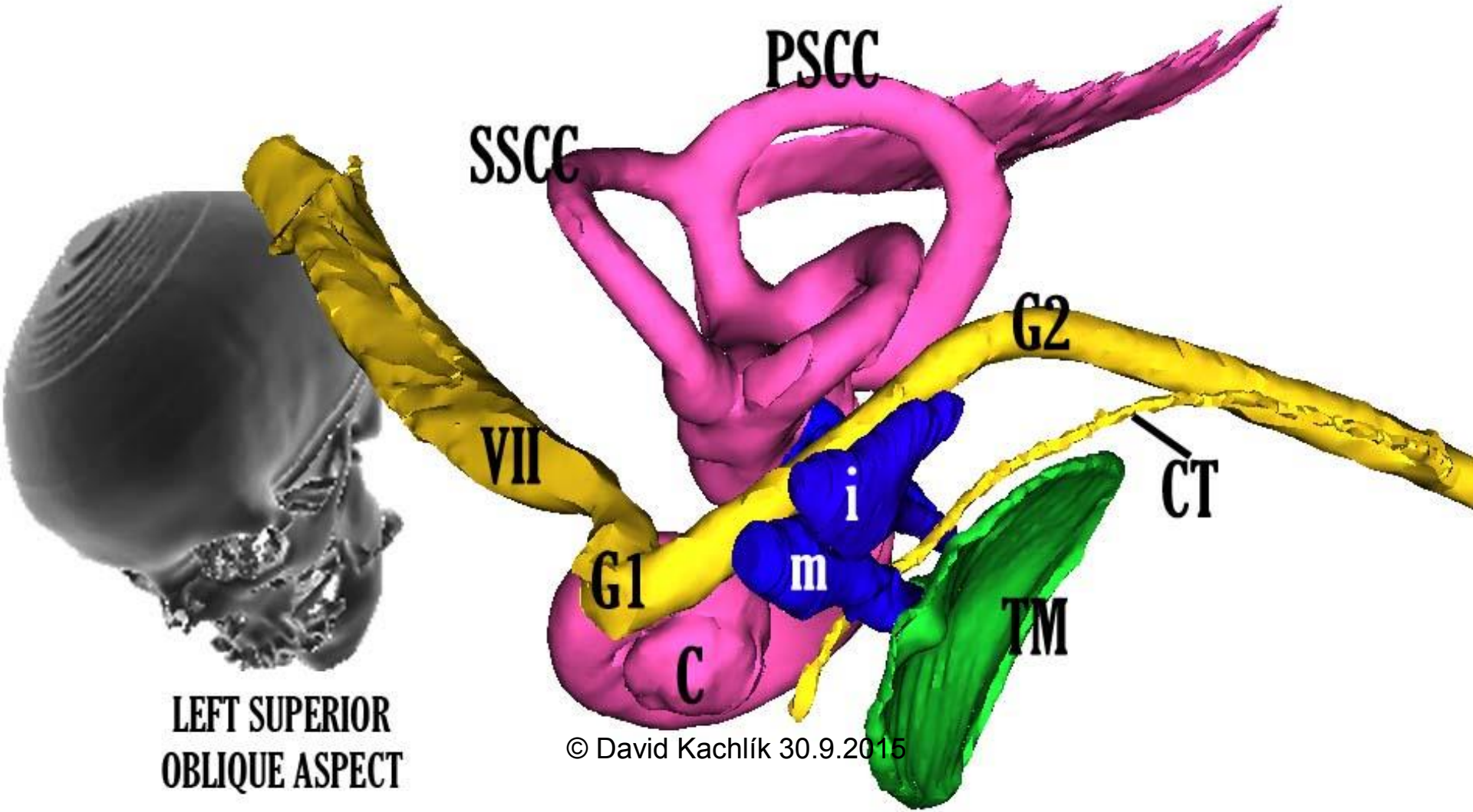
outside skull

- n. auricularis posterior – *somatomotor fibres* → rudimentary muscles of auricle + 3 mm. auriculares
- nn. for m. stylohyoideus + venter post. m. digastrici
- **plexus intraparotideus – 5 branches**

VII. = N. facialis – branches courses

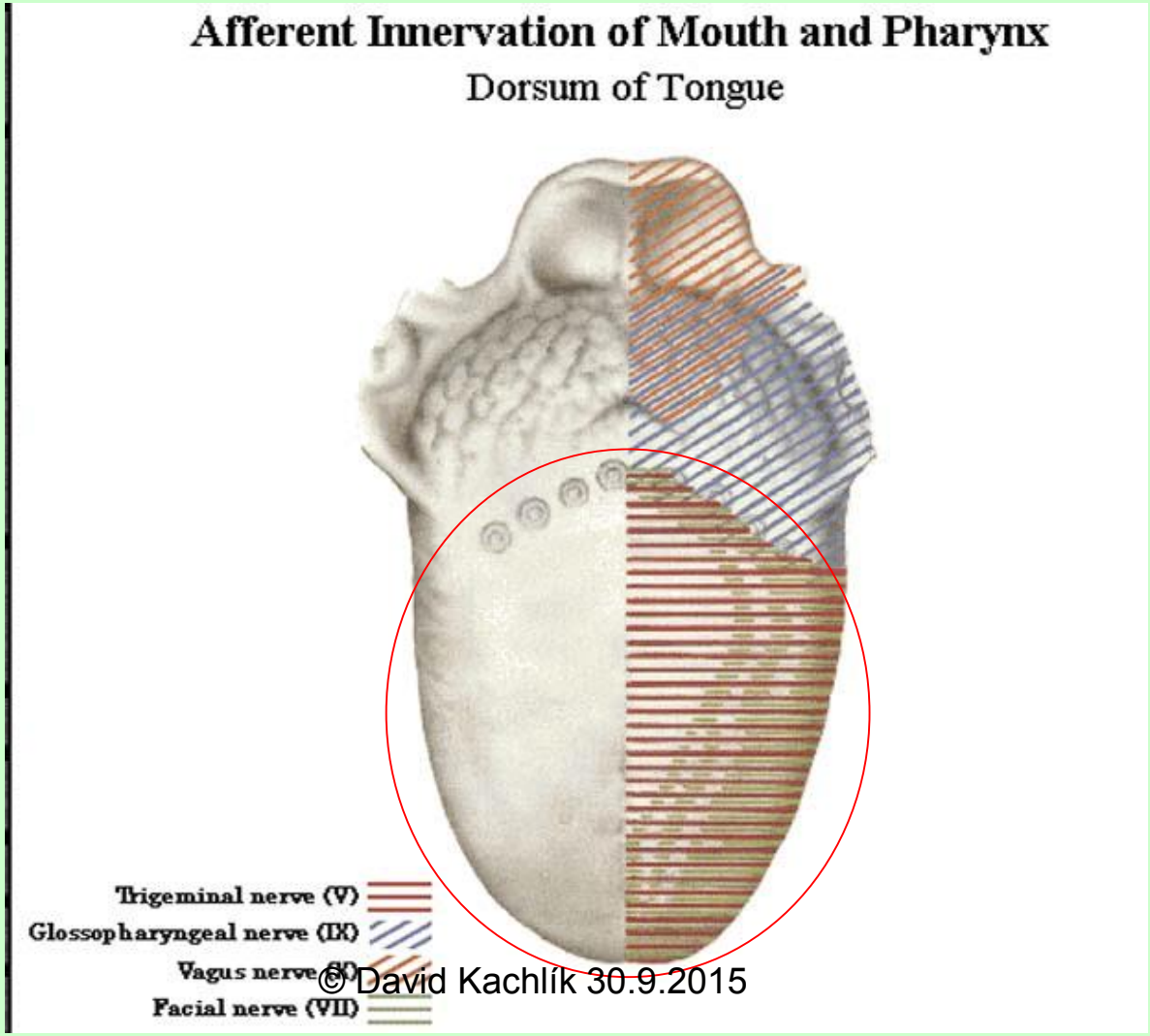
- n. petrosus major – *parasympathetic*
  - canalis n.p.m.→ sulcus n.p.m. → foramen lacerum → canalis pterygoideus *Vidii* → fossa pterygopalatina → ggl. pterygopalatinum → via branches of n.V2 to **gll. lacrimalis, nasales, palatinae, nasopharyngeae**
- n. stapedius – *somatomotor*
  - eminetia pyramidalis: **m. stapedius**
- chorda tympani – *parasympathetic + taste*
  - canaliculus ch.t. posterior → cavitas tympani → canaliculus ch.t. anterior → fissura petrotympanica *Glaseri* → fossa infratemporalis → n. lingualis
    - → gg. submandibulare → via branches of n. V3 to **gll. linguales, submandibularis + sublingualis**
    - → ventral 2/3 of tongue = **dorsum linguae - *taste***

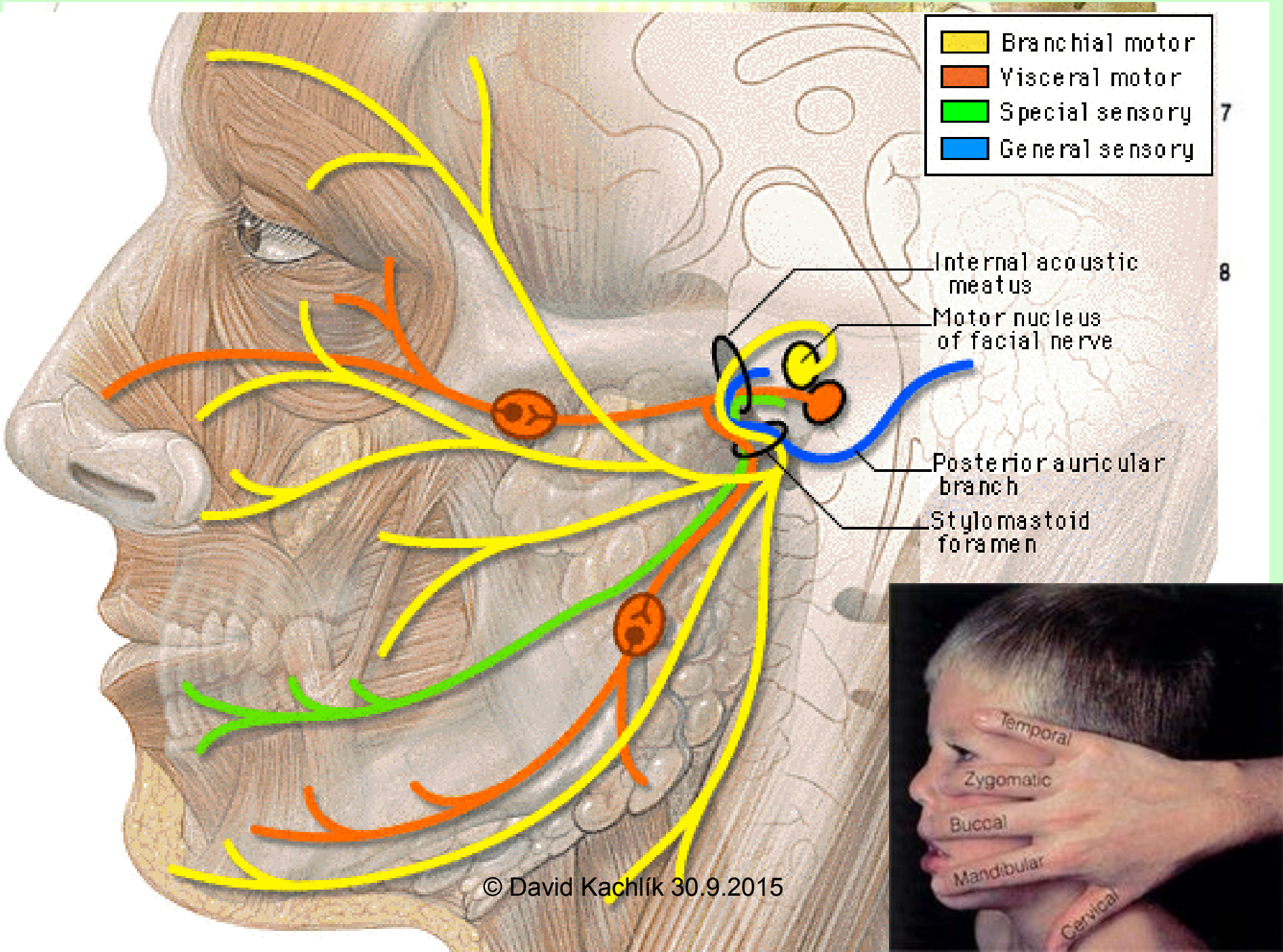
Canalis nervi facialis *Falloppii*



Innervation of tongue

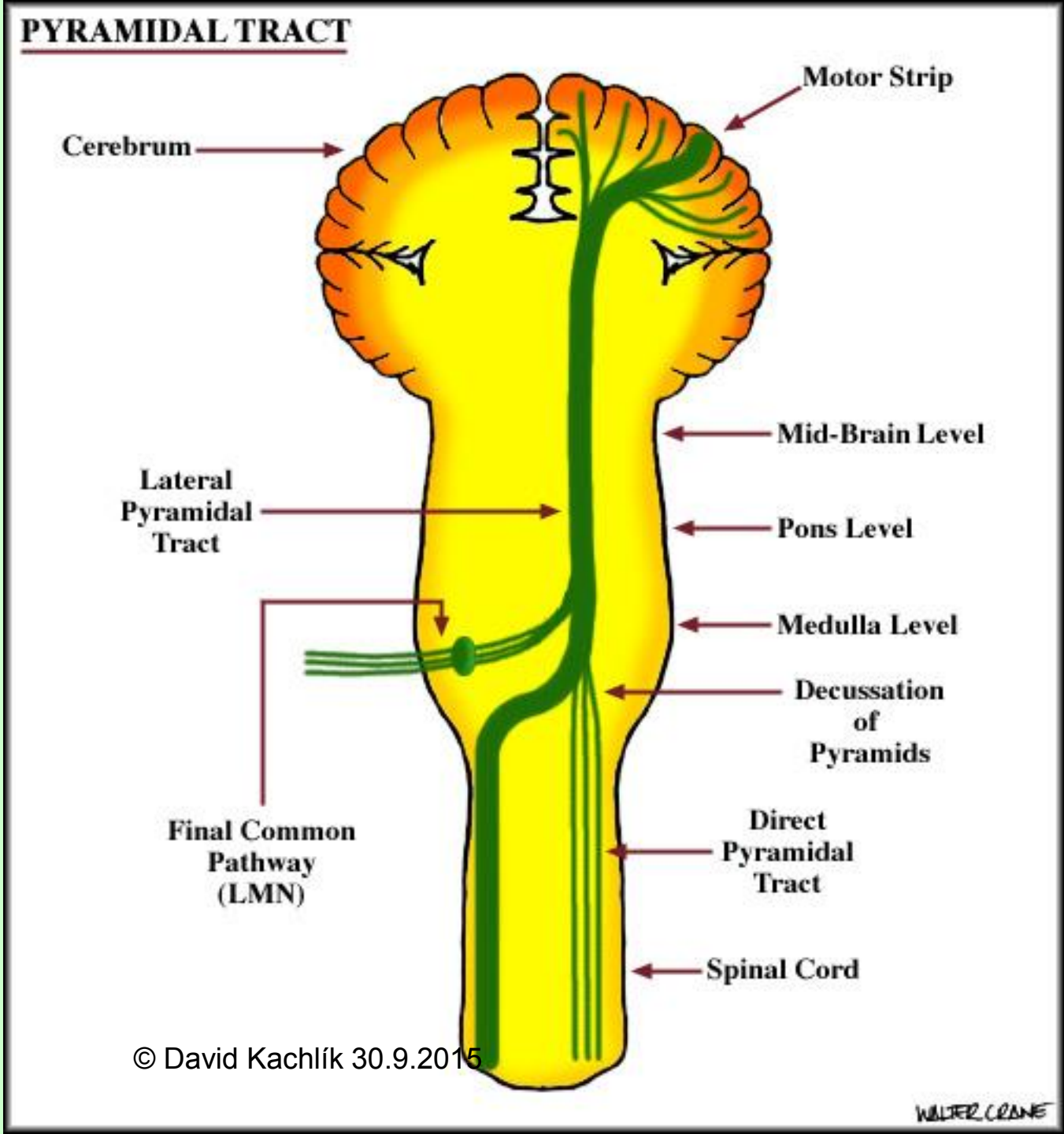
somatosensory x *sensory (taste)*




Branchial motor
Visceral motor
Special sensory
General sensory
7
Internal acoustic meatus
8
Motor nucleus of facial nerve
Posterior auricular branch
Stylomastoid foramen
Temporal
Zygomatic
Buccal
Mandibular
Cervical
© David Kachlík 30.9.2015

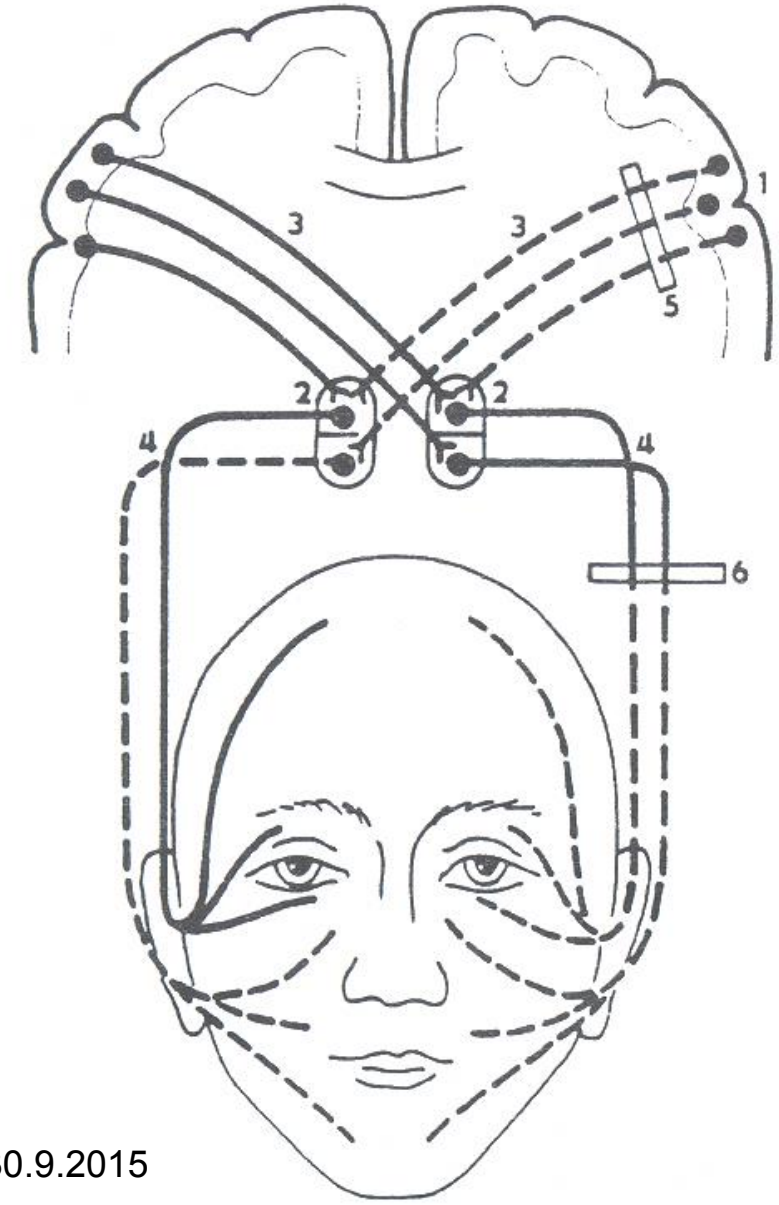
Motor pathway

- tractus pyramidalis
- fibrae cortico-nucleares
- decussated



Central palsy

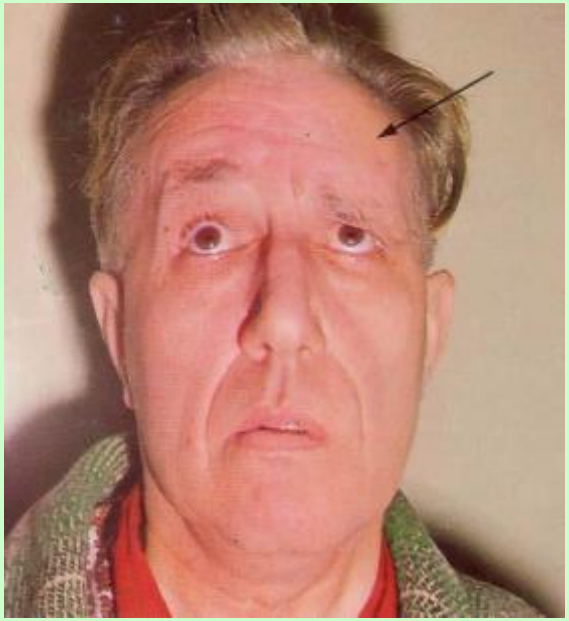
- supranuclear lesion (= affected pathway between cerebral cortex and nucleus in brain stem)
- palsy of ***only lower quadrant of face !!!***
- ***contralateral side !!!***

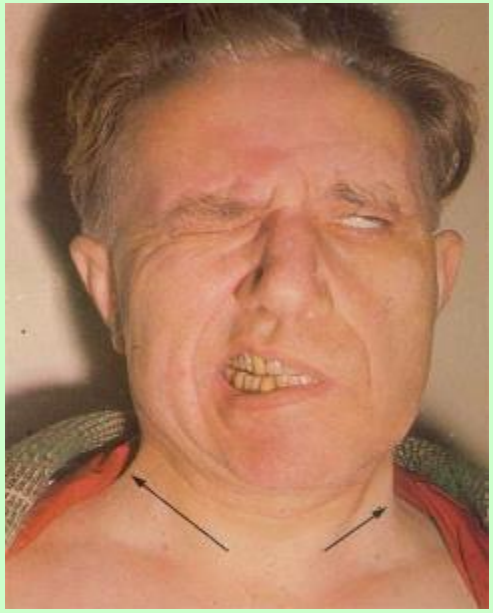


Peripheral palsy - homolateral

symptoms related to level of affection and branches of n. VII

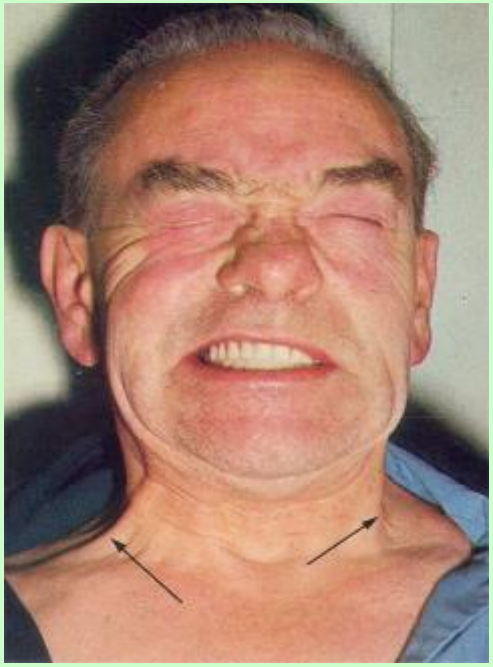
- Bell´s palsy – palsy of **all homolateral facial muscles** (sagged mouth angle + dribbling saliva, drooped lower lid = lagophthalmus, no gathers on forehead, smoothed nasolabila groove, no frowning and whistling)
- affection of chorda tympani
  - no taste on ventral 2/3 of tongue = hypogeusia→ageusia
  - dry mouth – no secretion from gl. submandibularis+sublingualis = xerostomia) – *weak symptom*
- affection of m. stapedius (sharp/painful = hyperacusis)
- affection of n. petrosus major
  - dry eye - no secretion from lacrinal gland, dry conjunctiva = xerophthalmia,
  - no secretion of gll. nasales, palatinae, nasopharyngeae - *weak symptom*

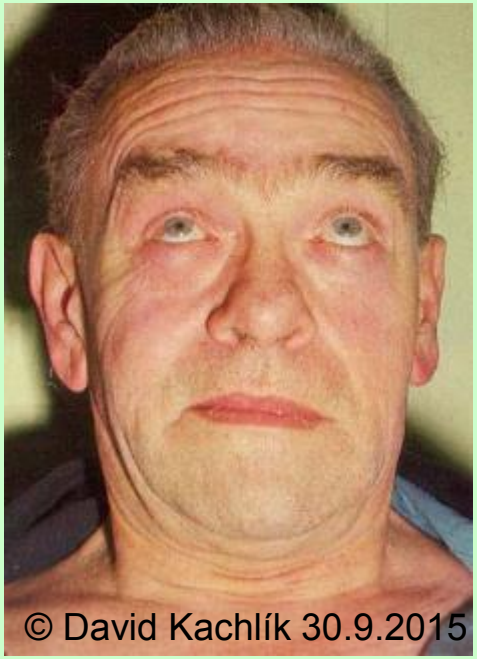




peripheral
„Bell´s“ palsy

n. VII

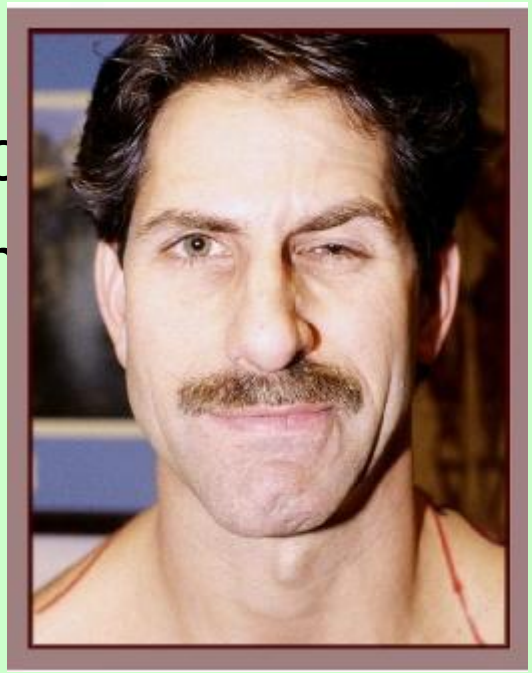




central palsy

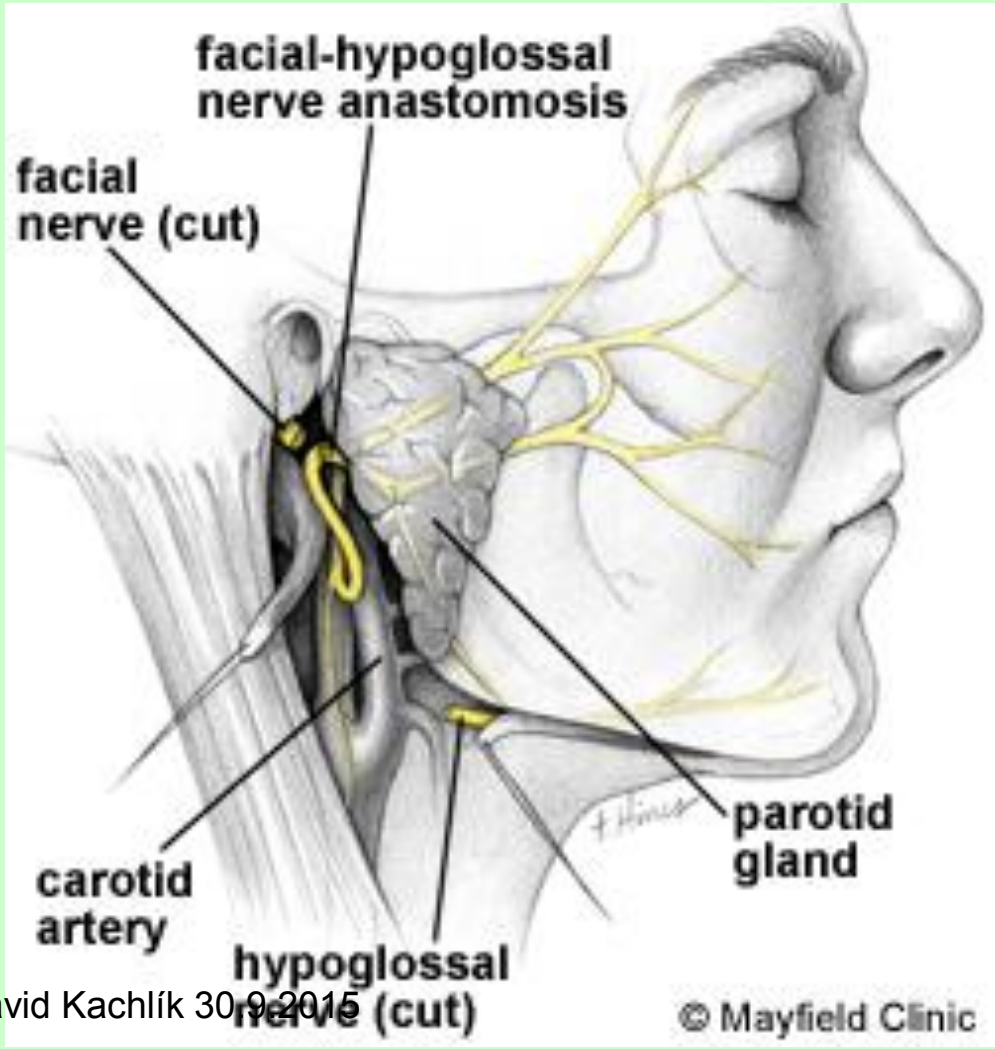
Spasmus hemifacialis = Hemispasmus faciei

- mostly: compression in border of CNS and PNS – contact of sheath of oligodendrocytes and Schwann cells = „Obersteiner-Redlichóva zóna")
  - mostly loop of a. ric
  - treatment: micro om



Treatment of n.VII traumatic injury

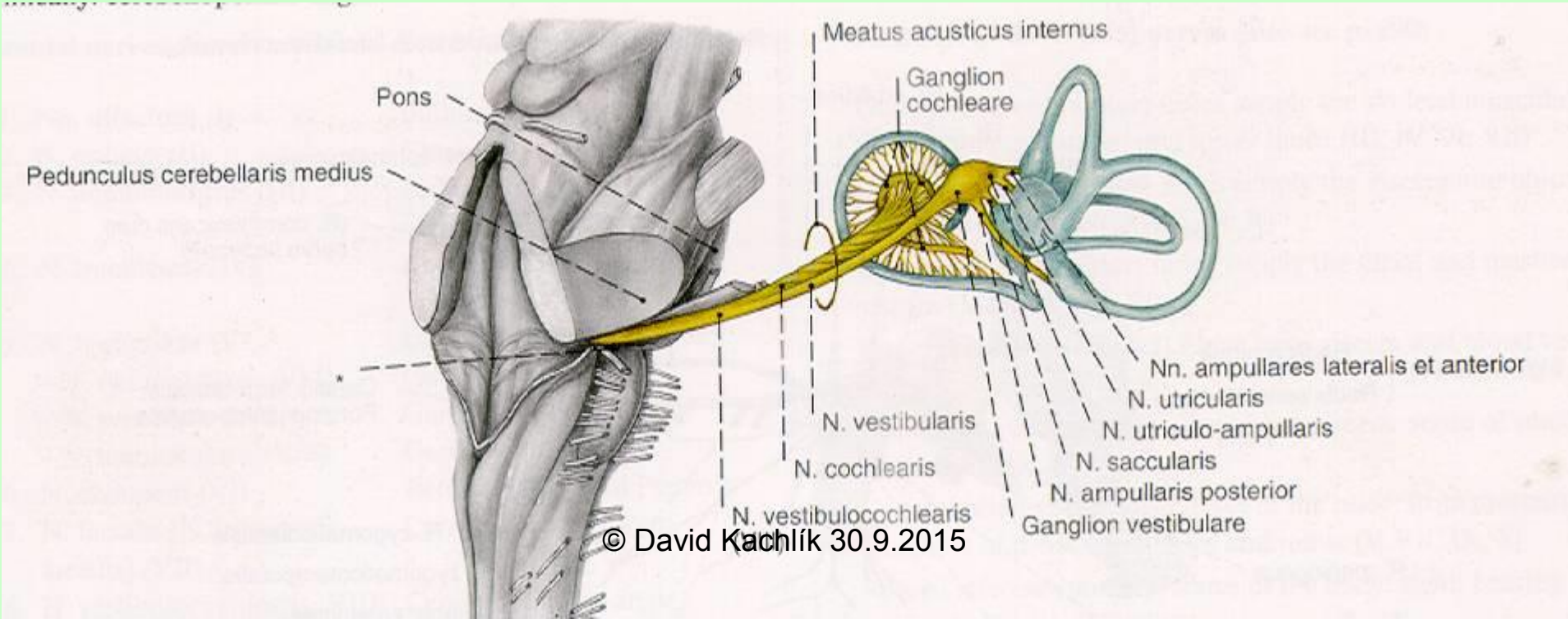
- transplantation
- usage of other close nerve
  - n. XII
  - n. auricularis magnus



VIII. - Nervus vestibulocochlearis

obsolete term: n. statoacusticus

- *special sensory – hearing + balance*



VIII. - Nervus vestibulocochlearis

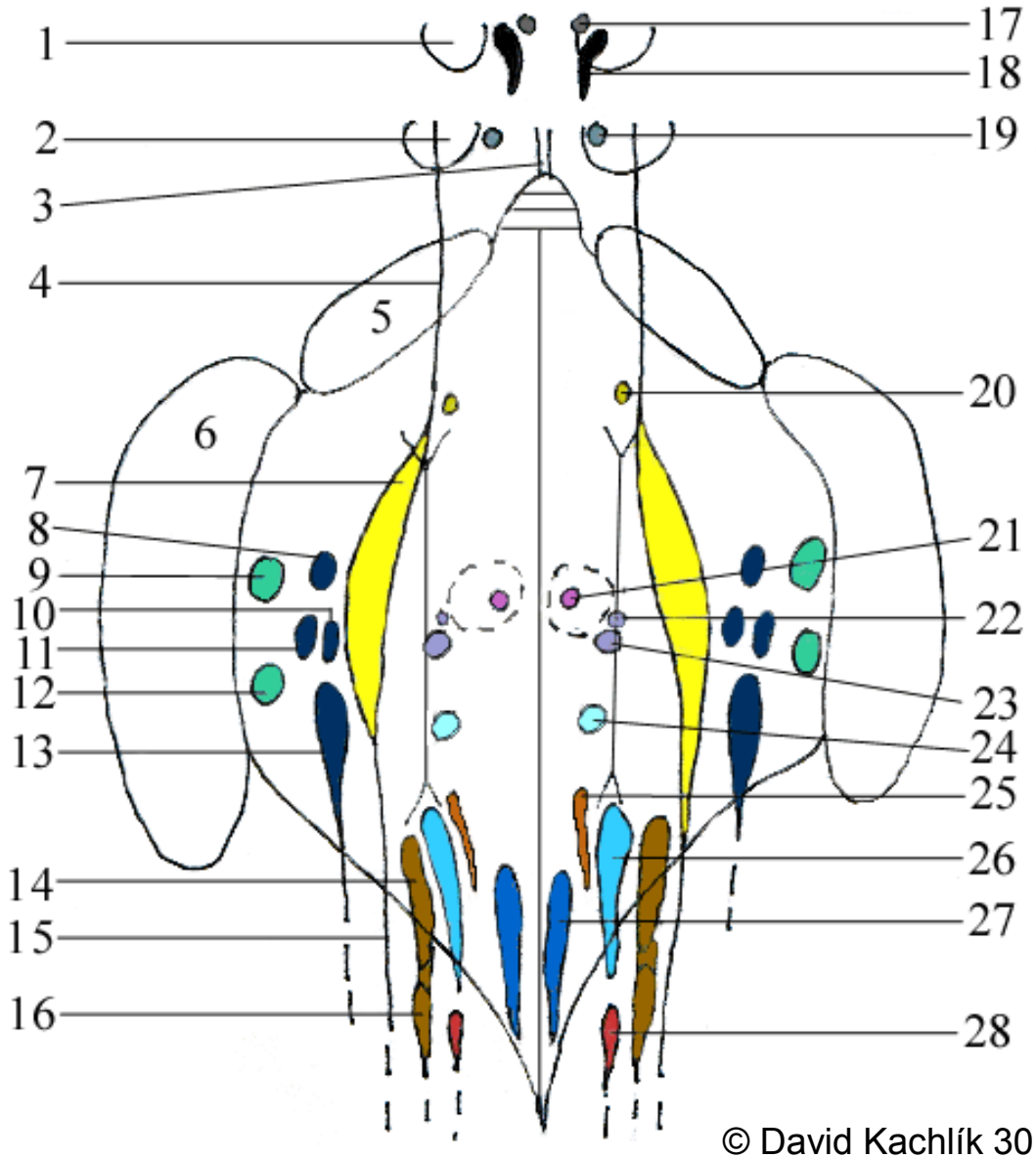
6 nuclei in pons (under recessus lat. fossae rhomboidae)

- 2 cochlear: ncl. cochlearis ant.+post.
- 4 vestibular: ncl. vestibularis sup.+inf.+medi.+lat.

course: angulus pontocerebellaris → fossa cranii posterior → porus acusticus internus → meatus a.i. → fundus m.a.i.

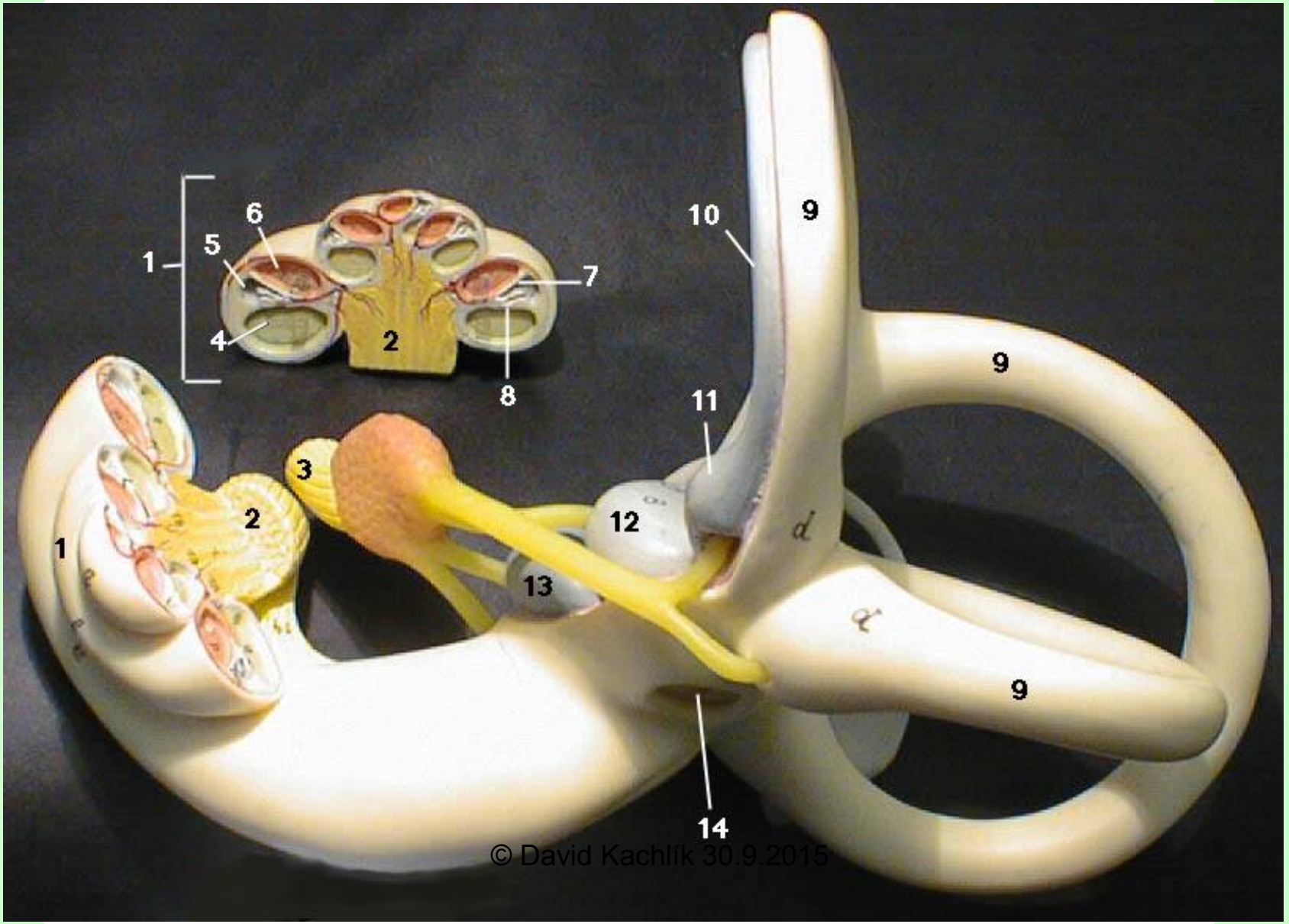
- pars vestibularis – ganglion vestibulare *Scarpae* on floor of meatus.a.i. (bipolar neurons)
- pars cochlearis – ganglion cochleare *Corti* inside bony cochlea (spiral shape, bipolar neurons)

FLOOR OF FOURTH VENTRICLE (RHOMBOID FOSSA) WITH SURFACE PROJECTION OF CRANILA NERVES NUCLEI

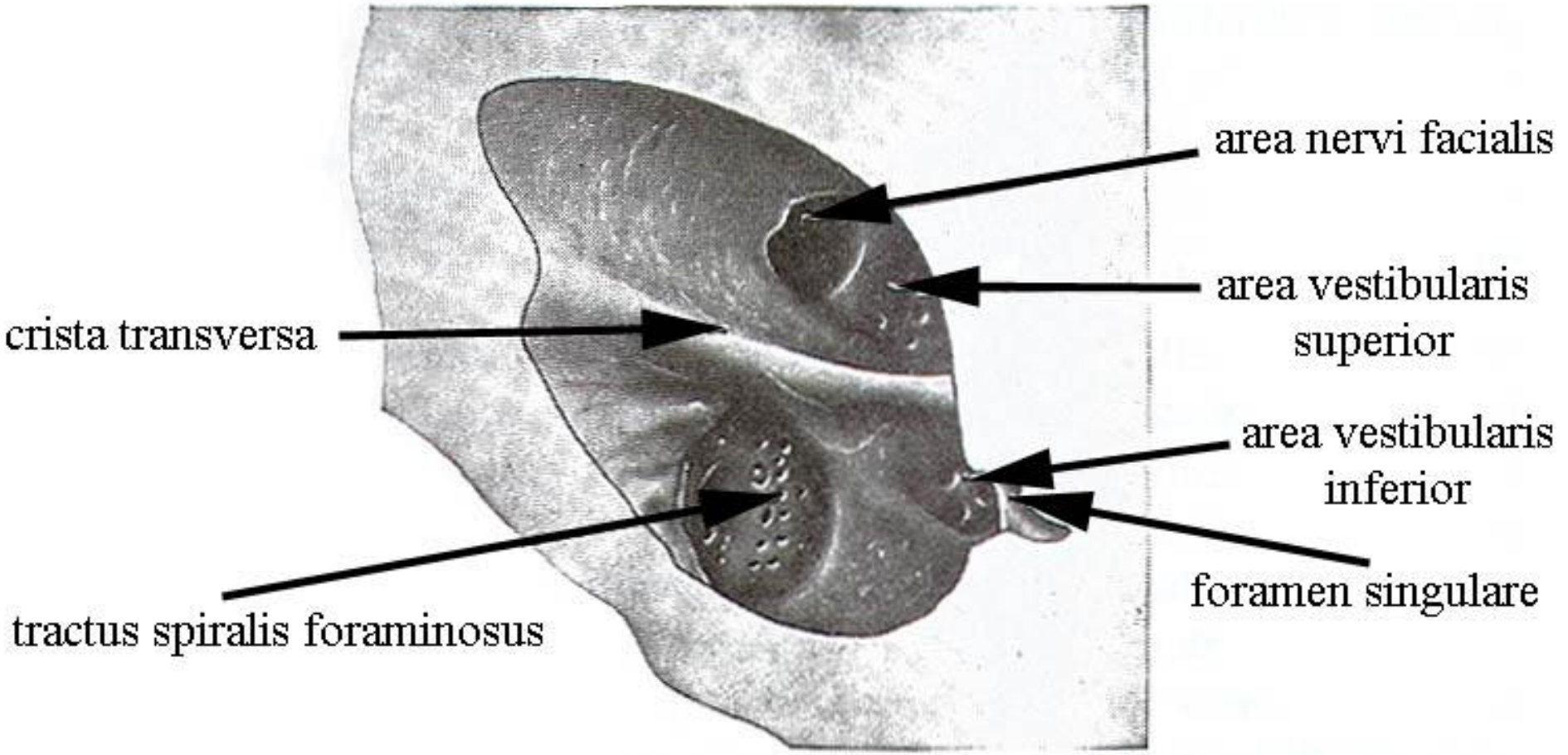


1 - superior colliculus
2 - inferior colliculus
3 - frenulum of superior medullary velum
4 - mesencephalic tract of n. V.
5 - superior cerebellar peduncle
6 - middle cerebellar peduncle
7 - principal nucleus of n. V.
8 - superior vestibular nucleus */Bechtětrev/*
9 - posterior cochlear nucleus
10 - medial vestibular nucleus */Schwalbe/*
11 - lateral vestibular nucleus */Deiters/*
12 - anterior cochlear nucleus
13 - inferior vestibular nucleus */Roller/*
14 + 16 - nuclei tractus solitarii
15 - spinal tract of n. V.
17 - accessory nucleus of n. III. */Edinger-Wesphal/*
18 - nucleus of n. III.
19 - nucleus of n. IV.
20 - motor nucleus of n. V.
21 - nucleus of n. VI.
22 - superior salivatory nucleus
23 - nucleus of n. VII.
24 - superior salivatory nulceus
25 - posterior nucleus of n. X.
26 - nucleus ambiguus
27 - nucleus of n. XII.
28 - nucleus of n. XI.
(= part of nucleus ambiguus and retroambiguus)

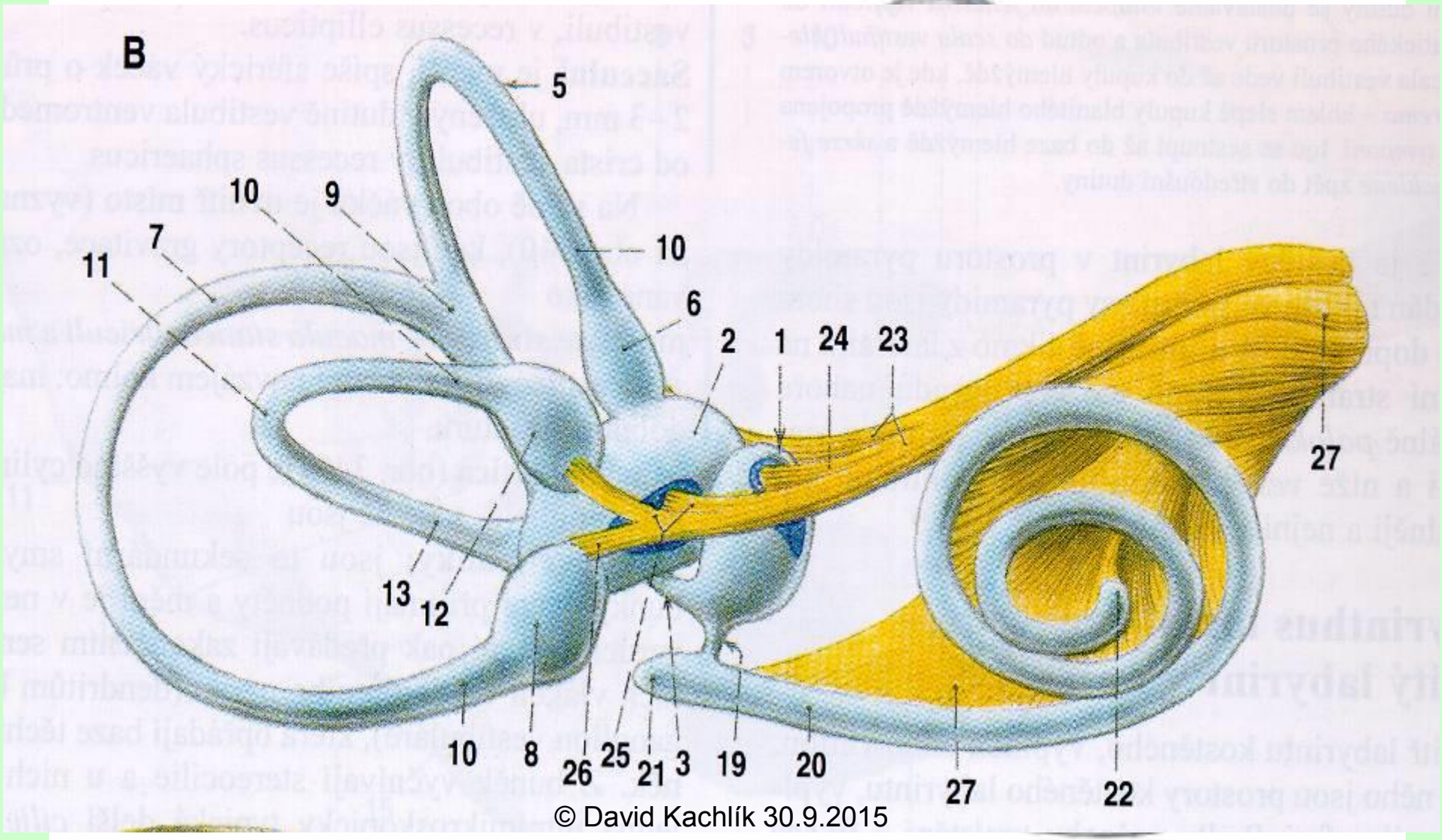
Auris intena = Inner ear
Labyrinthus membranaceus = Membranous l.



MEATUS ACUSTICUS INTERNUS
(fundus meatus acustici interni)



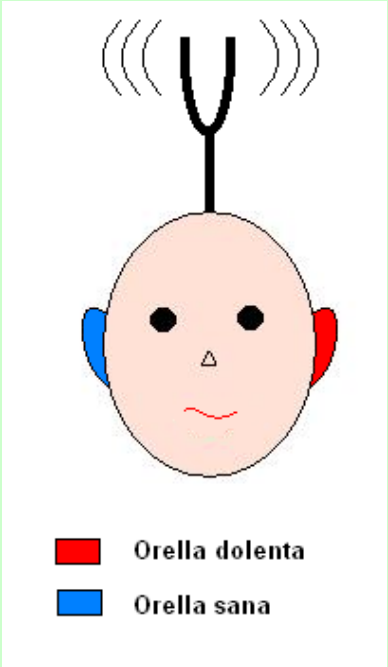
VIII. - Nervus vestibulocochlearis



VIII. - Nervus vestibulocochlearis

examination

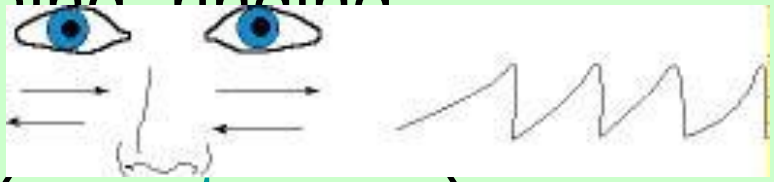
- tuning-fork examination (Rinné, Weber, Schwabach)
- examination of nystagmus (9 direction after Hering)
- Romberg – stand with closed eyes
- Hautant – sit, strecht arms forwards and close eyes
- Unterberger – close eyes and march on site for 30 s



VIII. - Nervus vestibulocochlearis
irritation / palsy

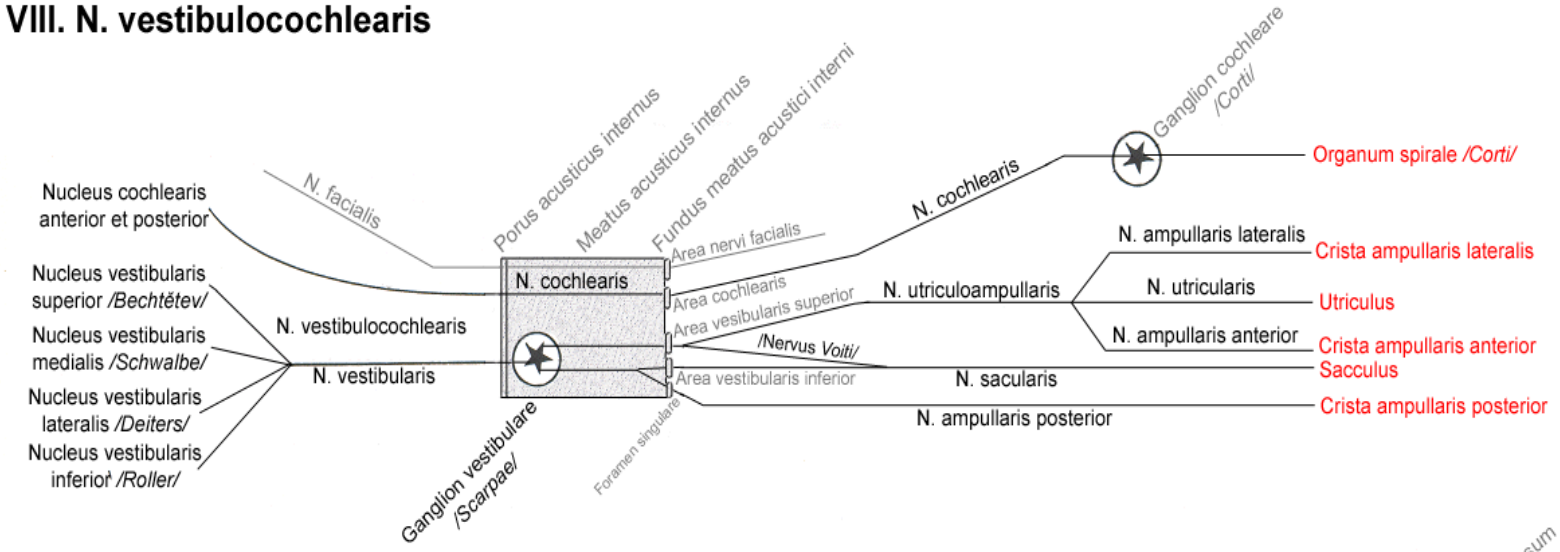
- affection of hearing (= hypacusis → anacusis)
  - deafness (= surditas)

- tinnitus – humming, screeching, ringing
- dizzines (= vertigo)
- involuntary eye movement (= nystagmus)

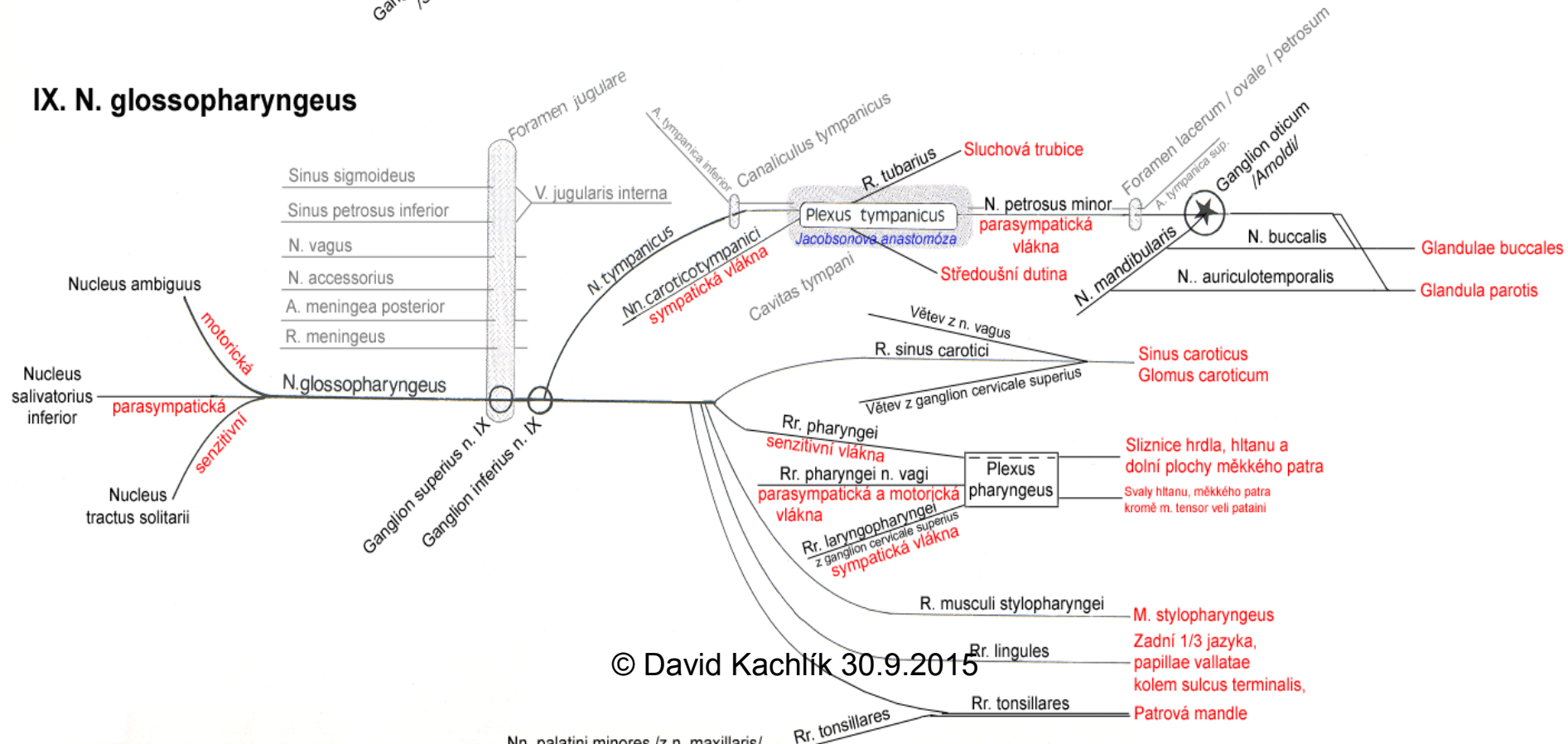


= alternating smooth pursuit in one direction and saccadic movements in the other direction.
  - slow-phase – stronger side suppresses the weaker one
  - fast-phase – compenstory movements back – serve for description of nystagmus
- disorders of stand and gait (= ataxia)

VIII. N. vestibulocochlearis

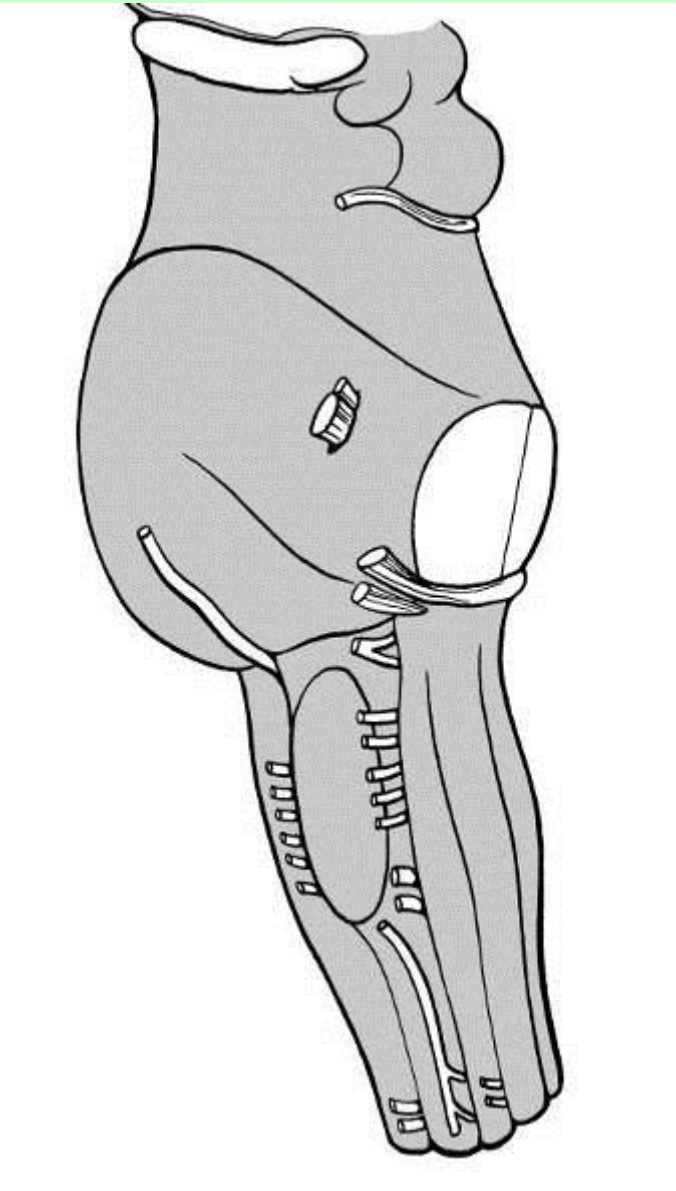


IX. N. glossopharyngeus



Lateral mixed system

- **n.IX + n.X + n.XI**
- roots emerge dorsally to olive from medulla oblongata (= *sulcus retroolivaris*)
- common nuclei
- transmit all types of modalities except sympathetic fibres
- leave skull via foramen jugulare

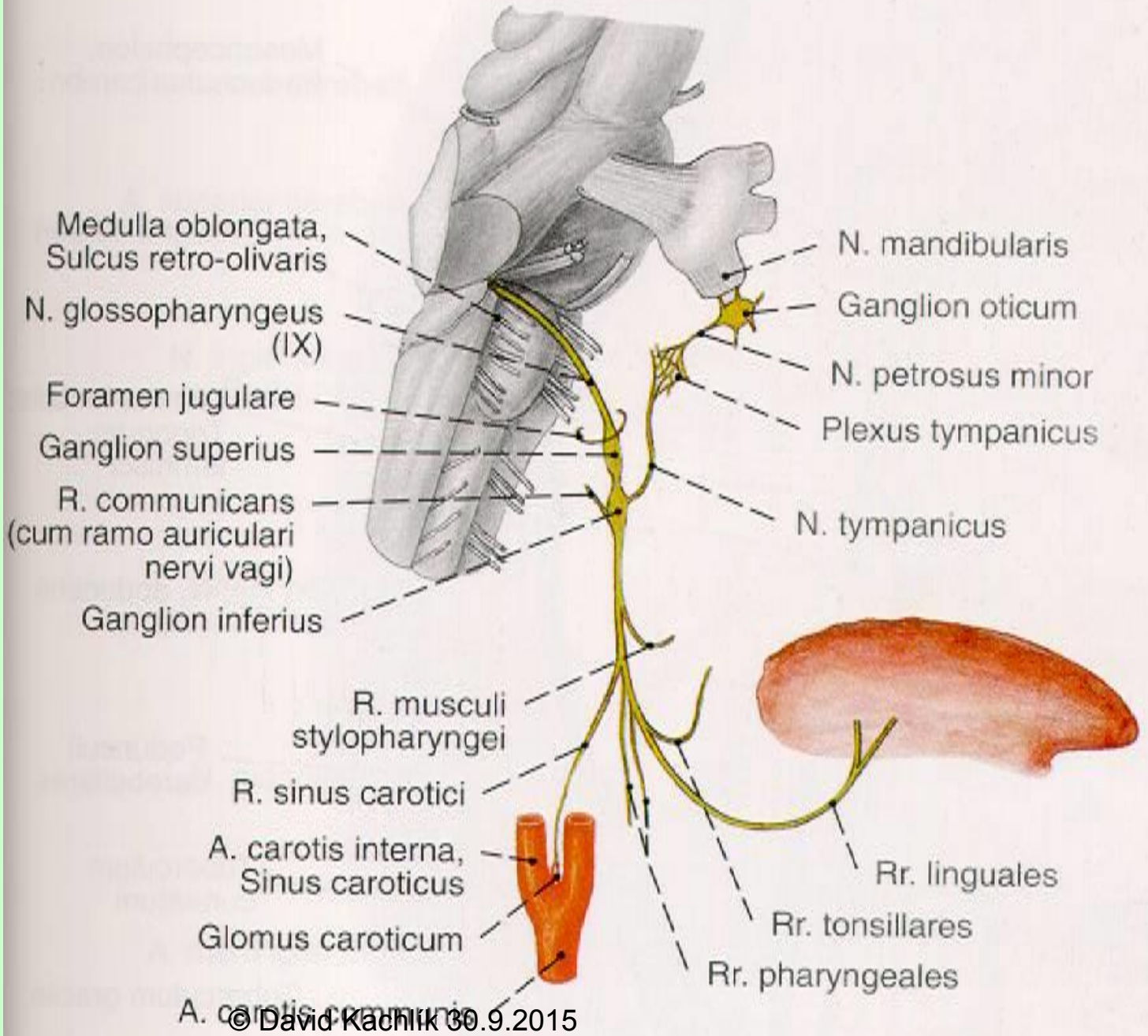


Lateral mixed system

- **Ncl. ambiguus**
  - *somatomotor nucleus*
  - muscles of soft palate, pharynx, larynx, upper oesopagus
- **Ncl. salivatorius inf. (n.IX)**
  - *visceromotor nucleus – parasympathetic*
  - parotid and buccal glands (interpolated in ggl. oticum)
- **Ncl. posterior n. X**
  - *visceromotor nucleus – parasympathetic*
  - glands and smooth muscles of pharynx, lower respiratory tract, foregut and midgut, heart, thymus
- **Ncll. tractus solitarius**
  - its rostral part is called **ncl. gustatorius (n. VII)**
  - *viscerosensory nucleus*
  - taste
  - infomation from lower respiratory tract, foregut and midgut, heart, thymus, spleen, kidneys, suprarenal glands, testes/ovaries, uterine tubes and chemoreceptors
- **Ncl.spinalis n.V**
  - *somatosensory nucleus*
  - touch from external acoustic meatus, meninges and tongue

n. IX

- SM
- VM
- SS
- taste
- VS

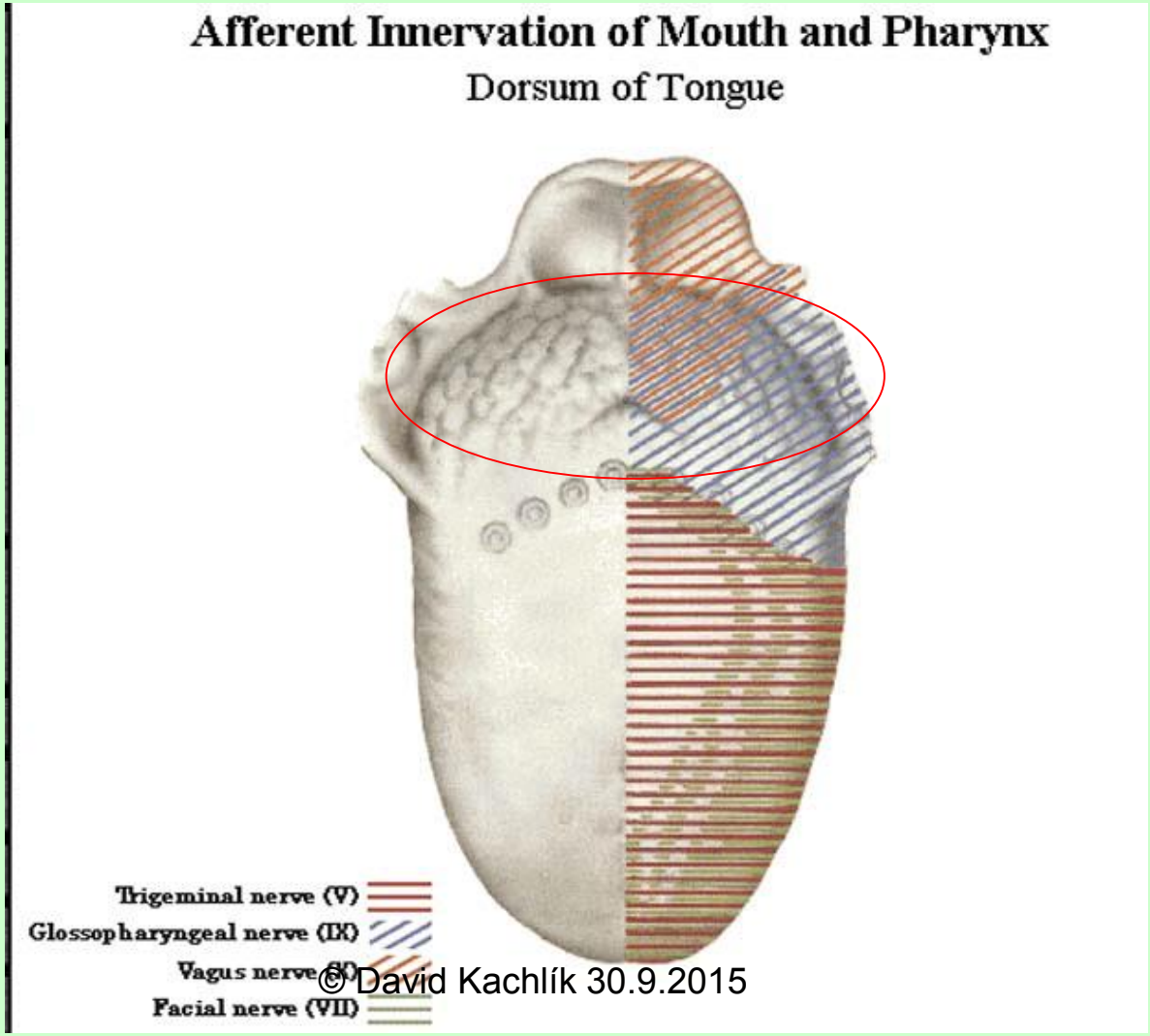


IX. - N. glossopharyngeus

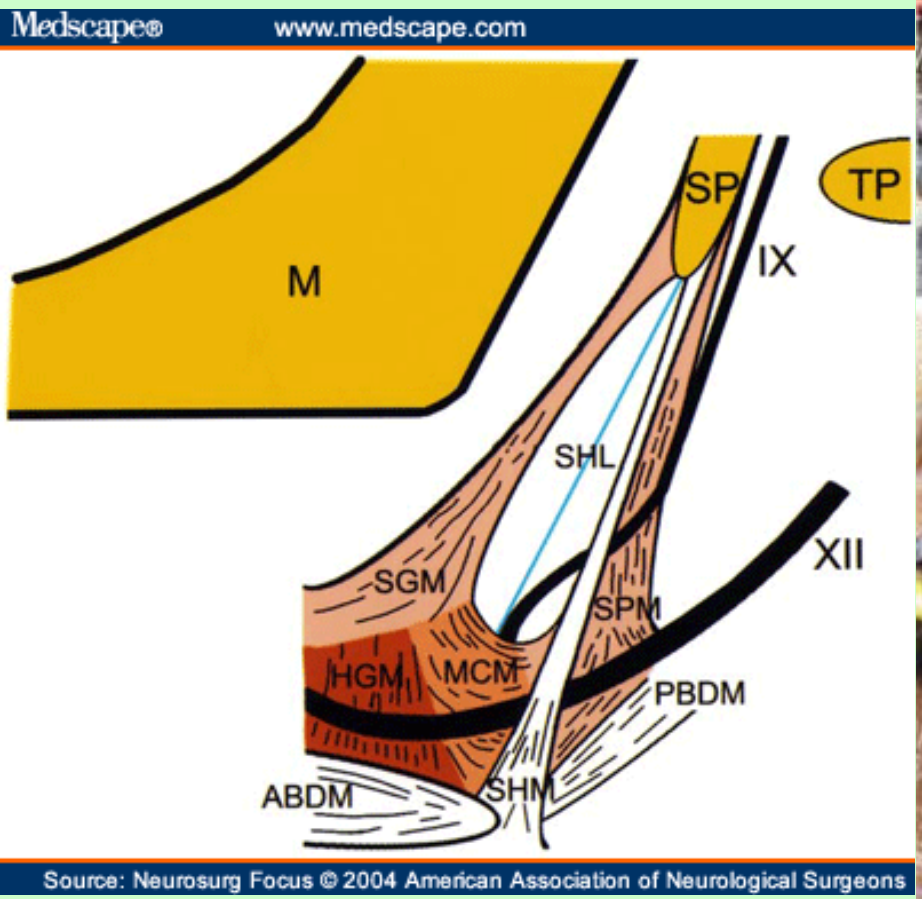
- SM: m. stylopharyngeus – *3rd arch*
- SS-VS: upper half of pharynx, root of tongue, tympanic cavity, ½ tonsilla palatina, sinus caroticus (Hering´s nerve)
- ggl. superius n.IX + inferius n.IX.
- VM: gl. parotis + gll. buccales
- taste: posterior third of tongue = root of tongue
- Jacobson´s anastomosis: n.IX → n. tympanicus → plexus tympanicus → n. petrosus minor → gll. oticum (→ *gl. parotis* + *gll. buccales*)

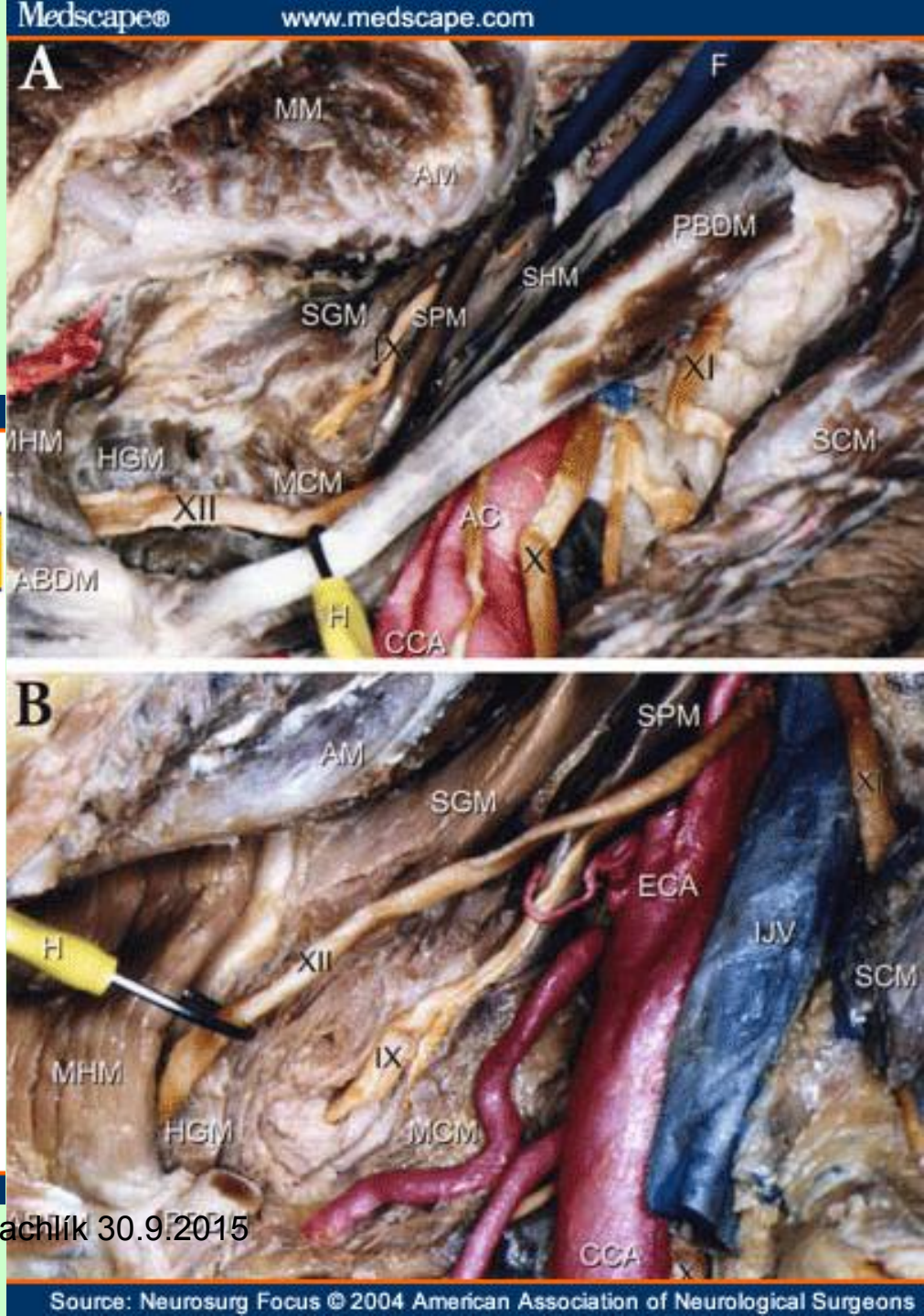
Innervation of tongue

somatosensory + sensory (taste)



n. IX





IX. - N. glossopharyngeus

Palsy

unila

- aff
- aff
  vor
- aff

s –
we

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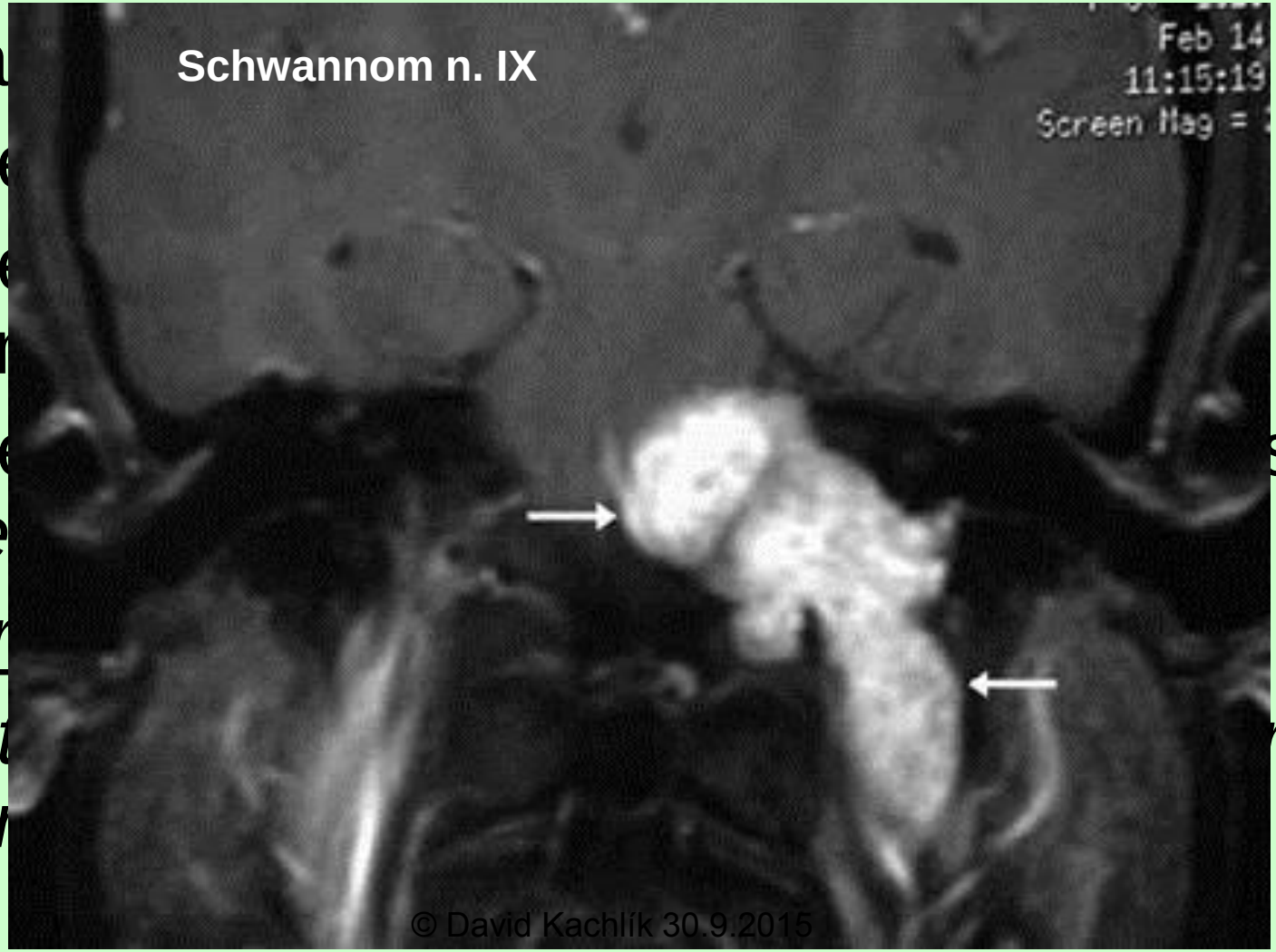
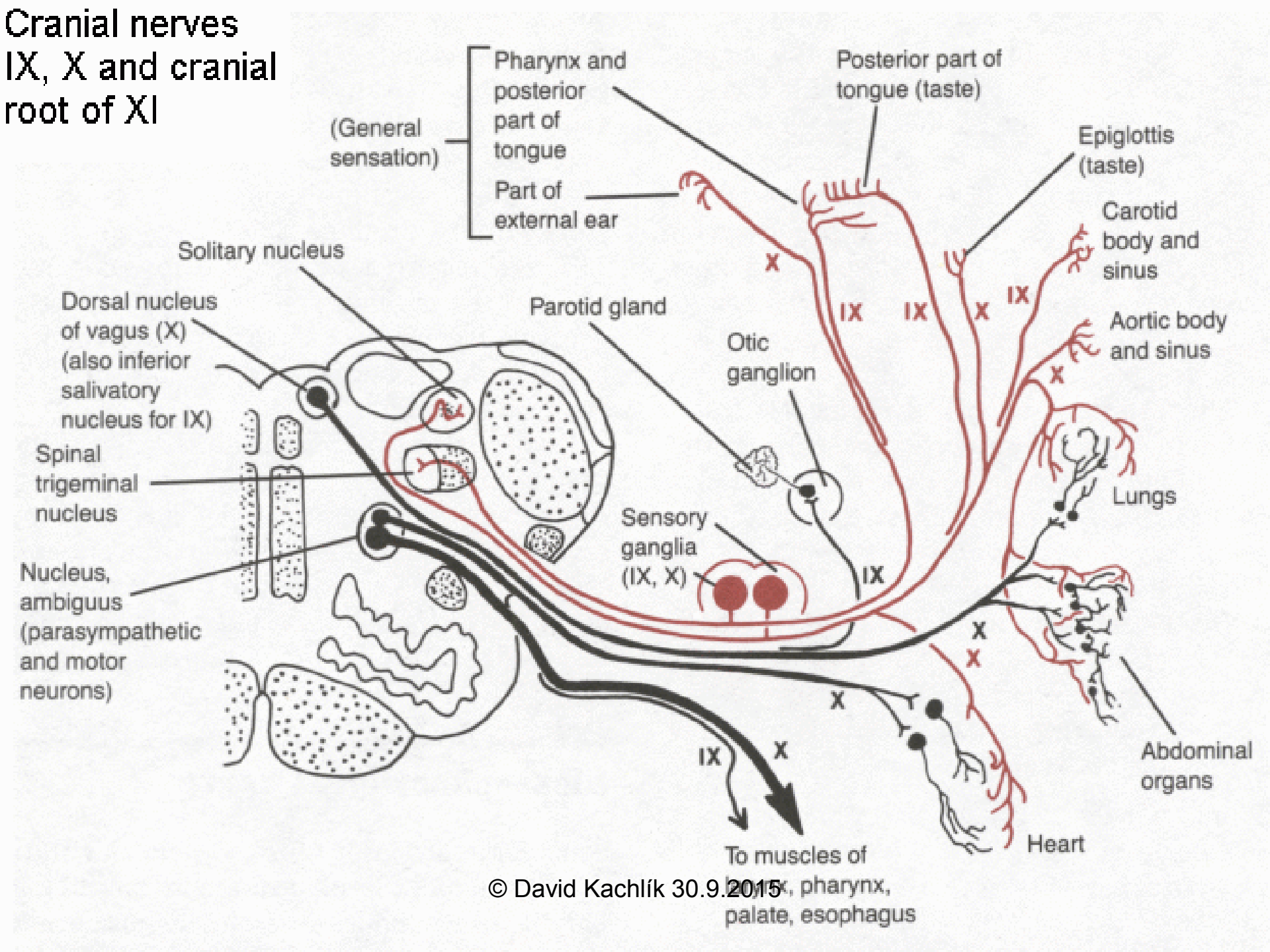
irritat

ry
fibr



Cranial nerves IX, X and cranial root of XI

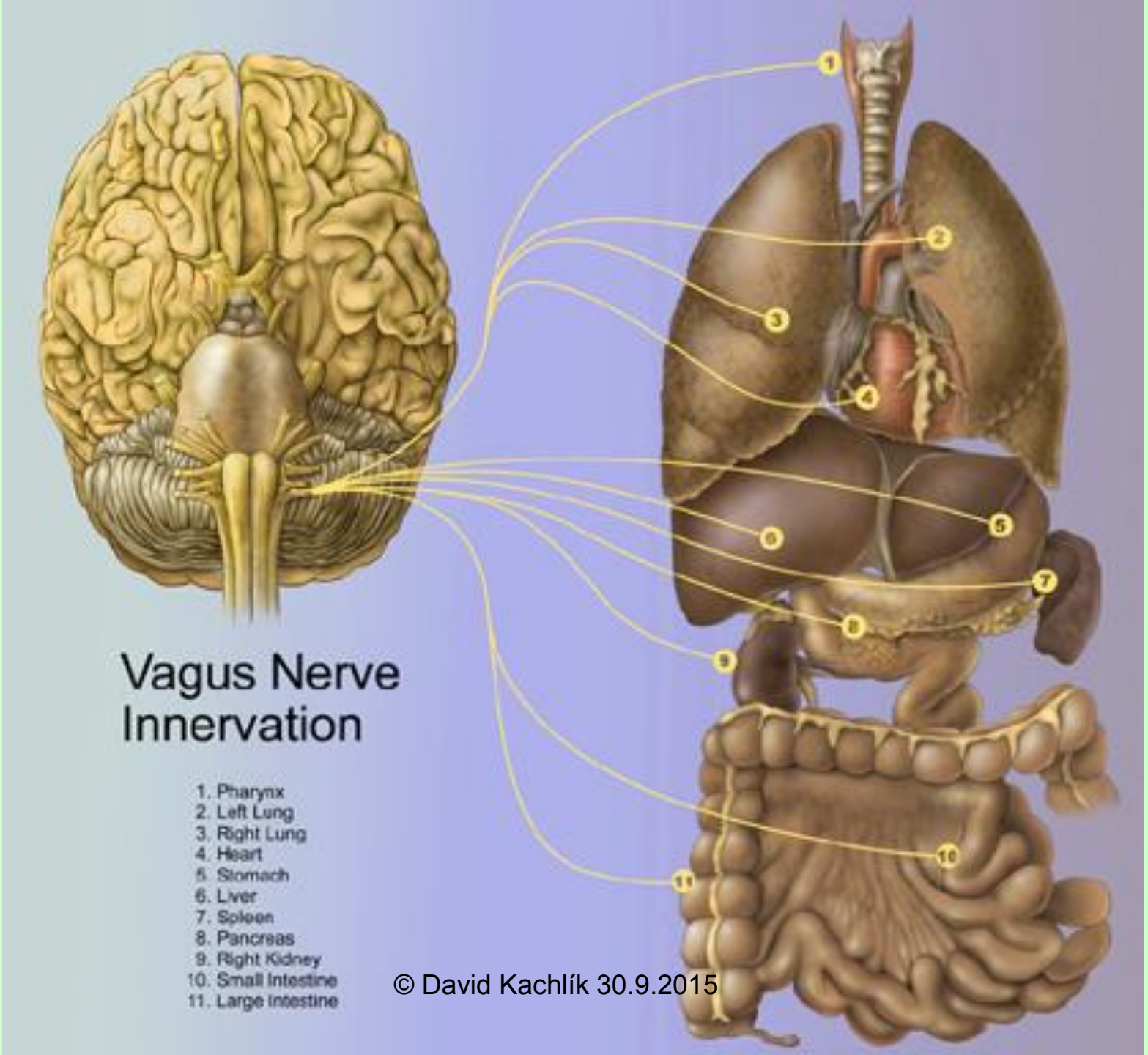


X. - N. vagus

- SM: pharynx (*except m. stylopharyngeus*), soft palate (*except m. tensor veli palatini*), larynx (*4th arch),* upper half of oesophagus
- SS: part of meatus acusticus externus + of meninges
- VS: ggl. superius n.X + inferius n.X.

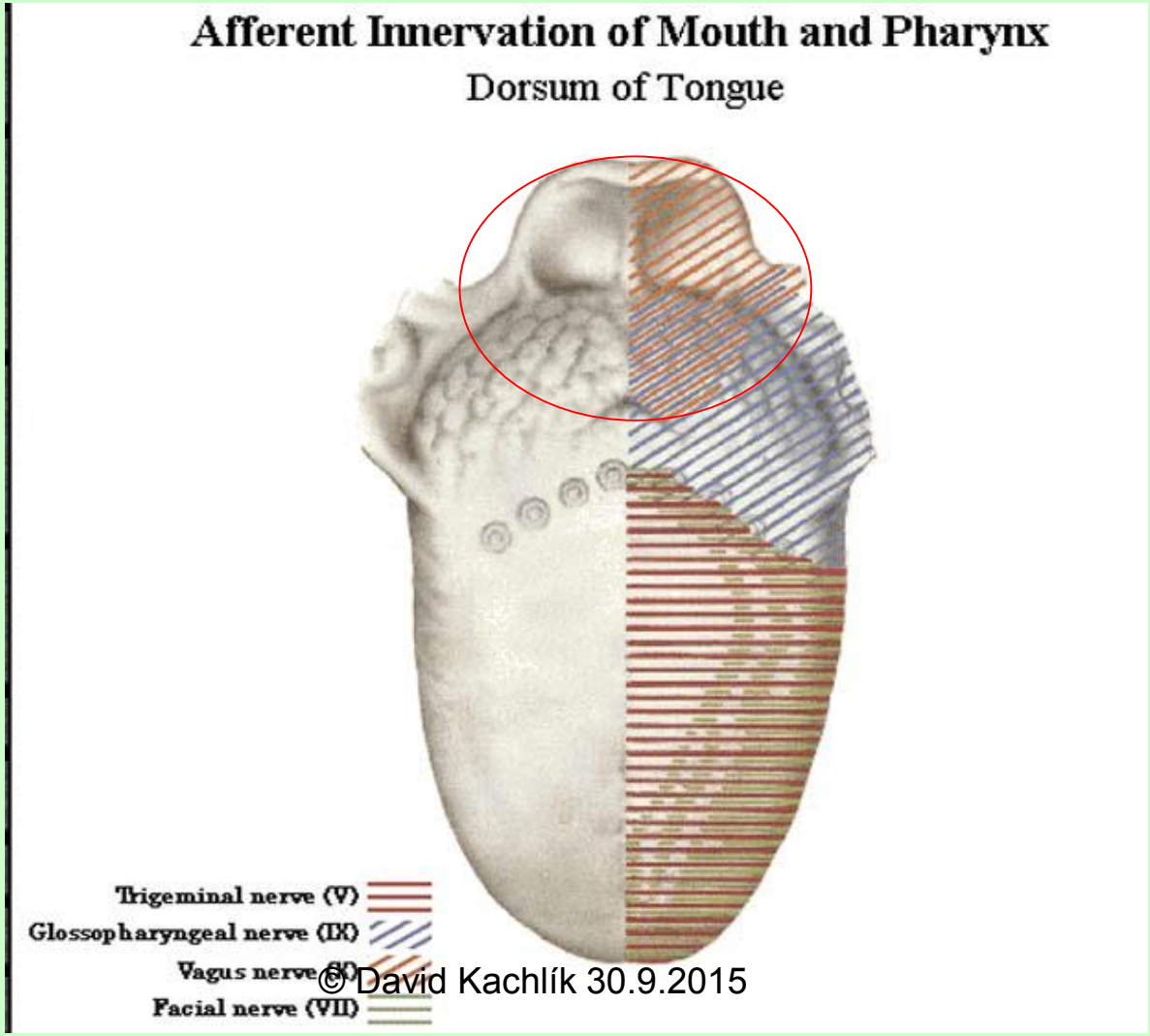
mucosa of larynx, lower ½ of pharynx , foregit and midgut + liver, gallbladder, pancreas; spleen, kidneys, suprarenal glands, testis/ovaries, ½ of uterine tube

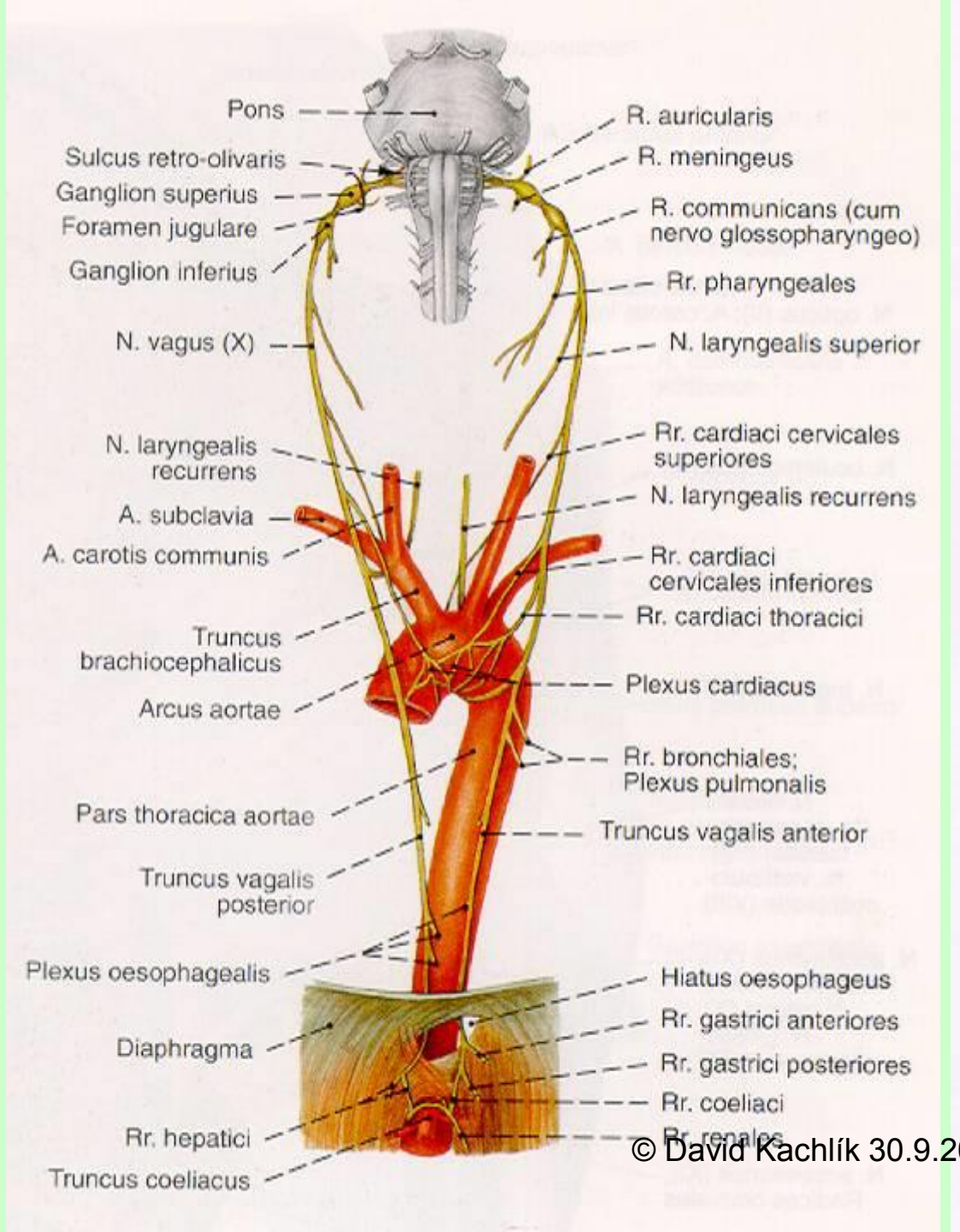
- taste: part of root of tongue, epiglottis
- VM: glands and smooth muscles of pharynx, lower respiratory tract, foregut and midgut, heart, thymus

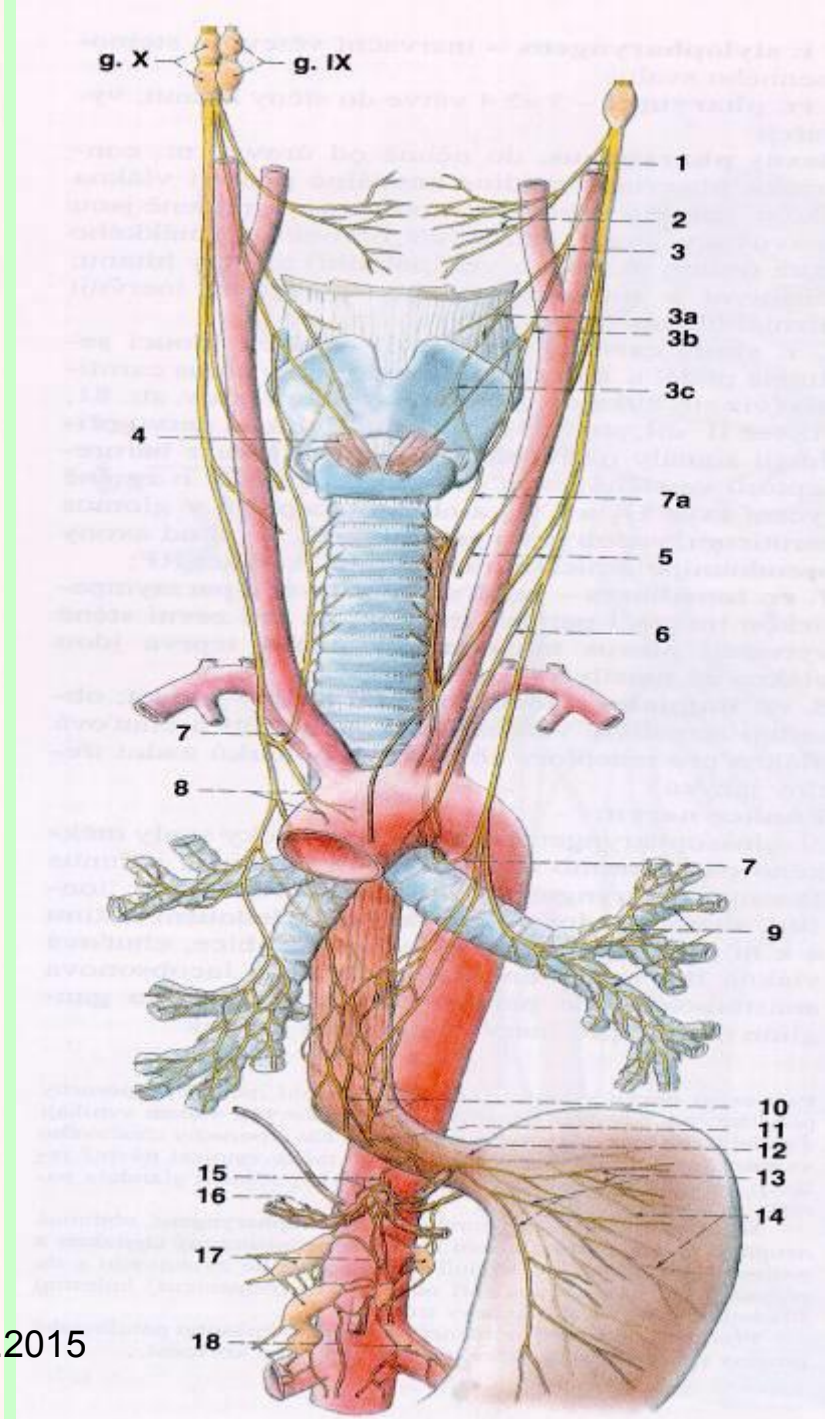


Innervation of tongue

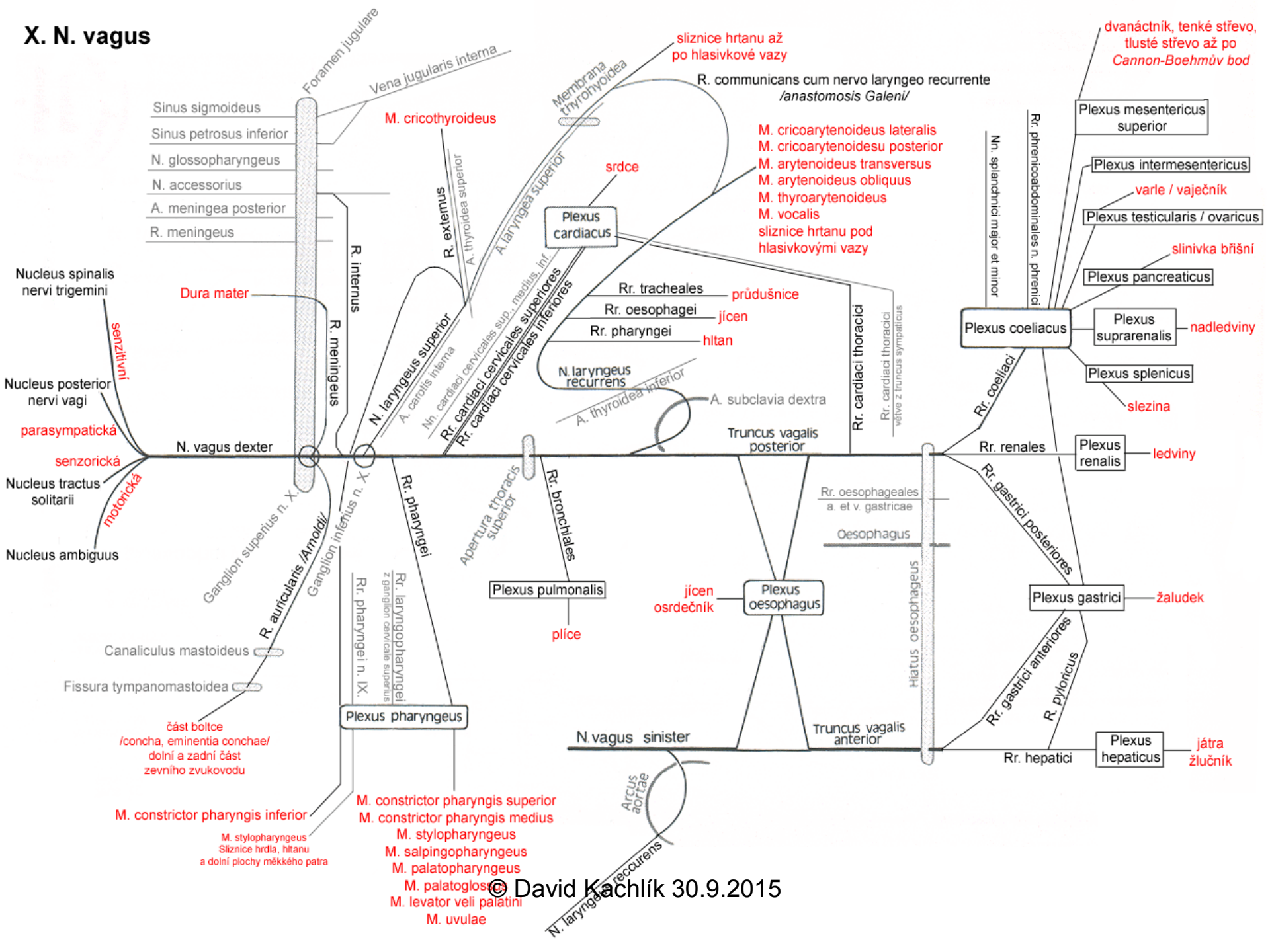
somatosensory x *sensory (taste)*





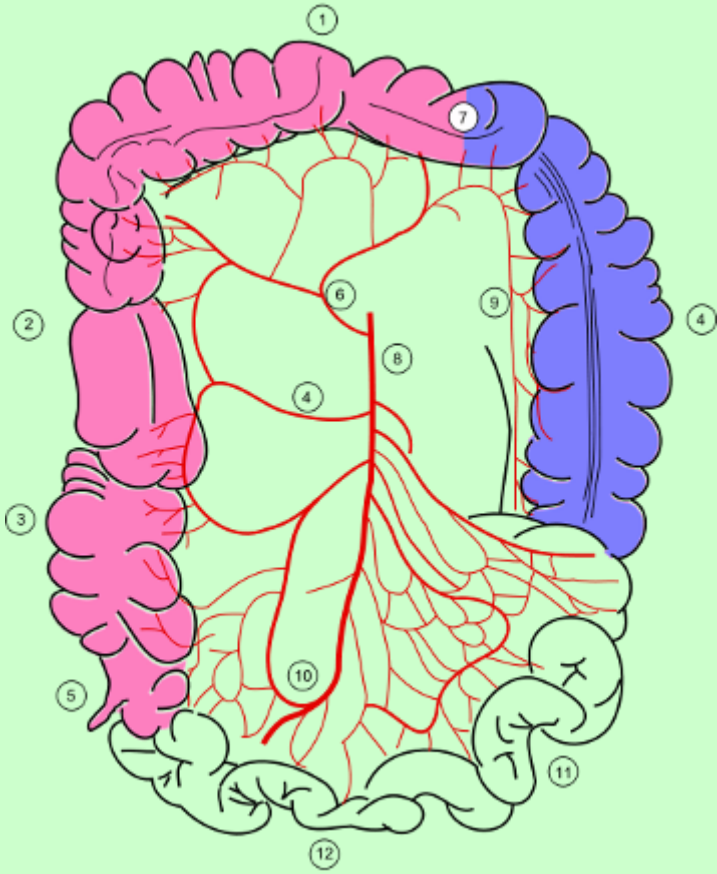


X. N. vagus

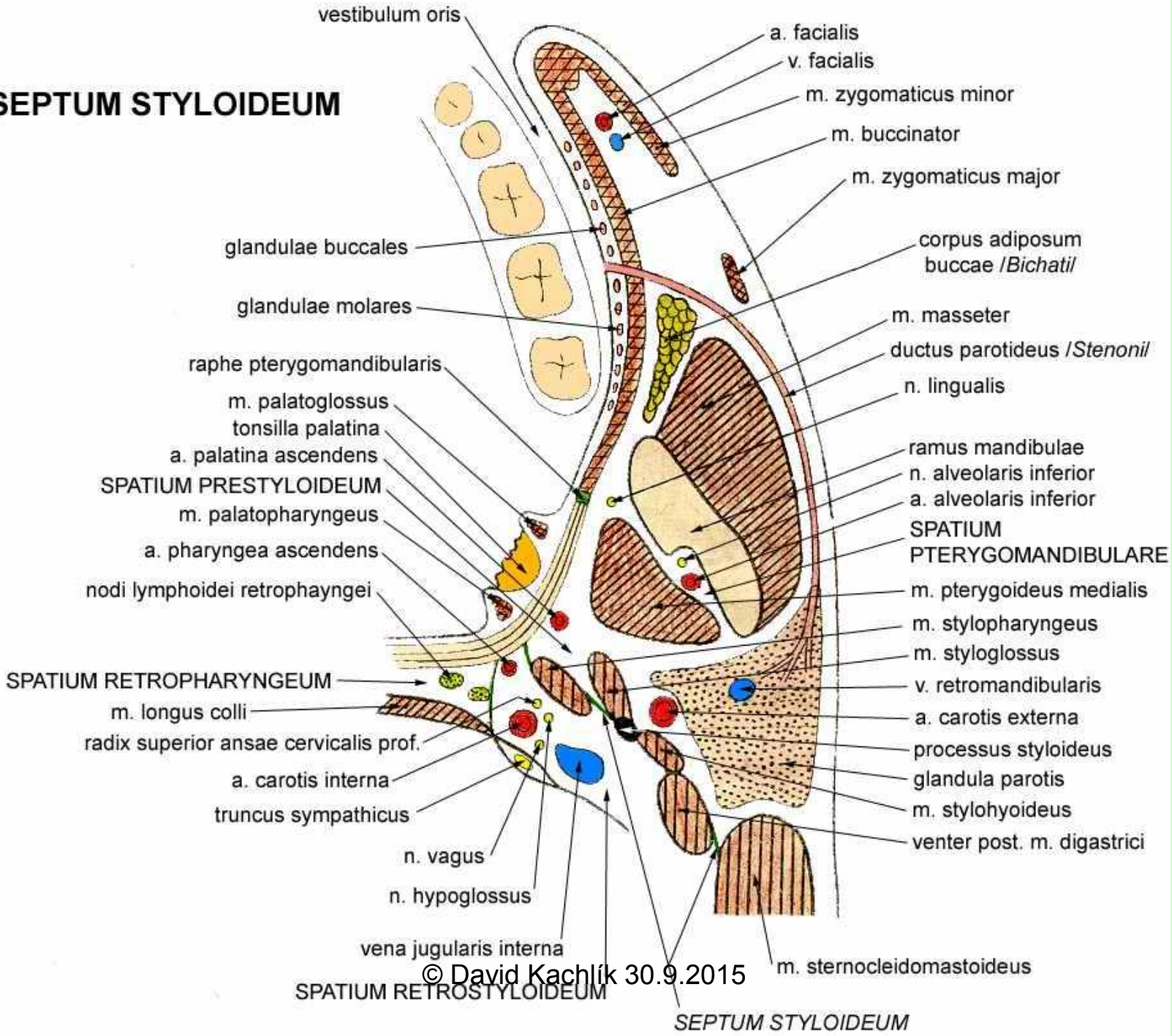


X. - N. vagus - course

- fossa cranii posterior
- foramen jugulare – ventromedial part
- spatium retrostylodeium
- spatium parapharyngeum
- apertura thoracis superior
- mediastinum superius
  →plexus oesophageus → truncus vagalis ant.+post.
- mediastinum inferius posterius
- hiatus oesohageus
- Cannon-Böhm´s point



SEPTUM STYLOIDEUM



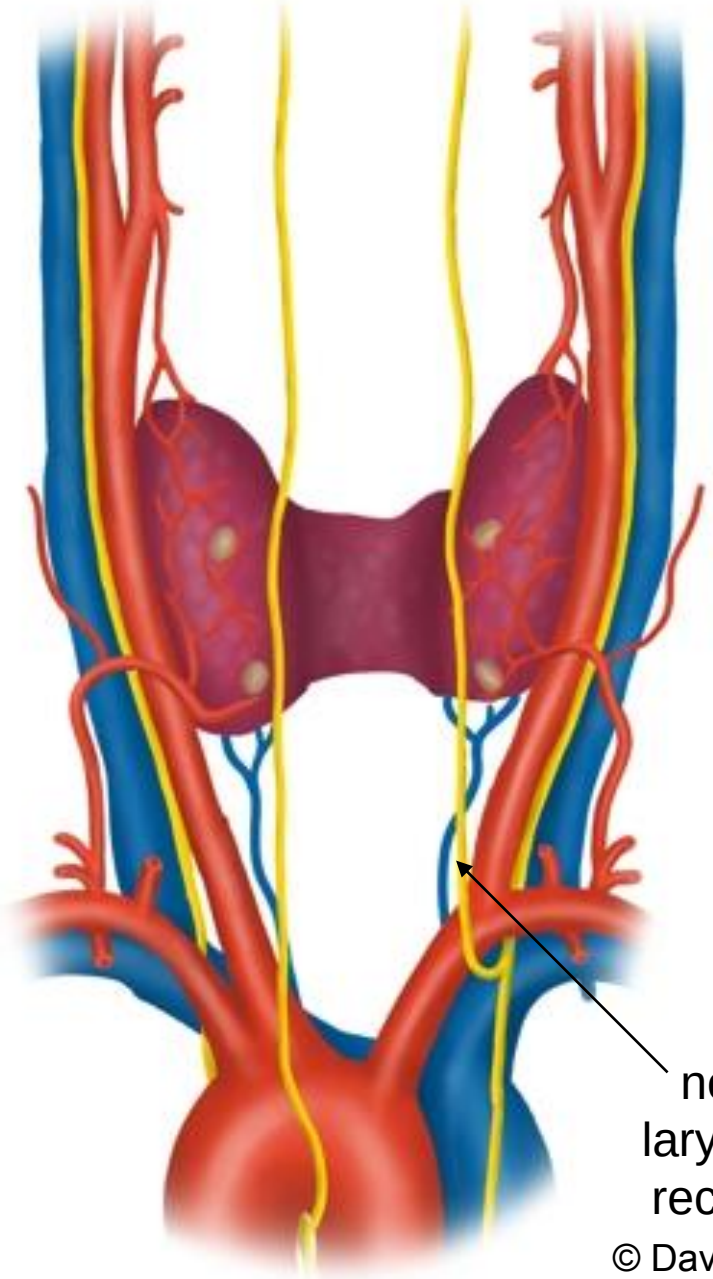
X. - N. vagus - braches

- r. meningeus
- r. auricularis (Arnold´s; Alderman´s nerve) – *Ramsay-Hunt´s zone*

„ALDI nen bal
cou dmi n
the Sax
hab nen
wat ula iate
vomiting. In this way he could empty his
stomach quickly and restart eating“.

X. - N. vagus - branches

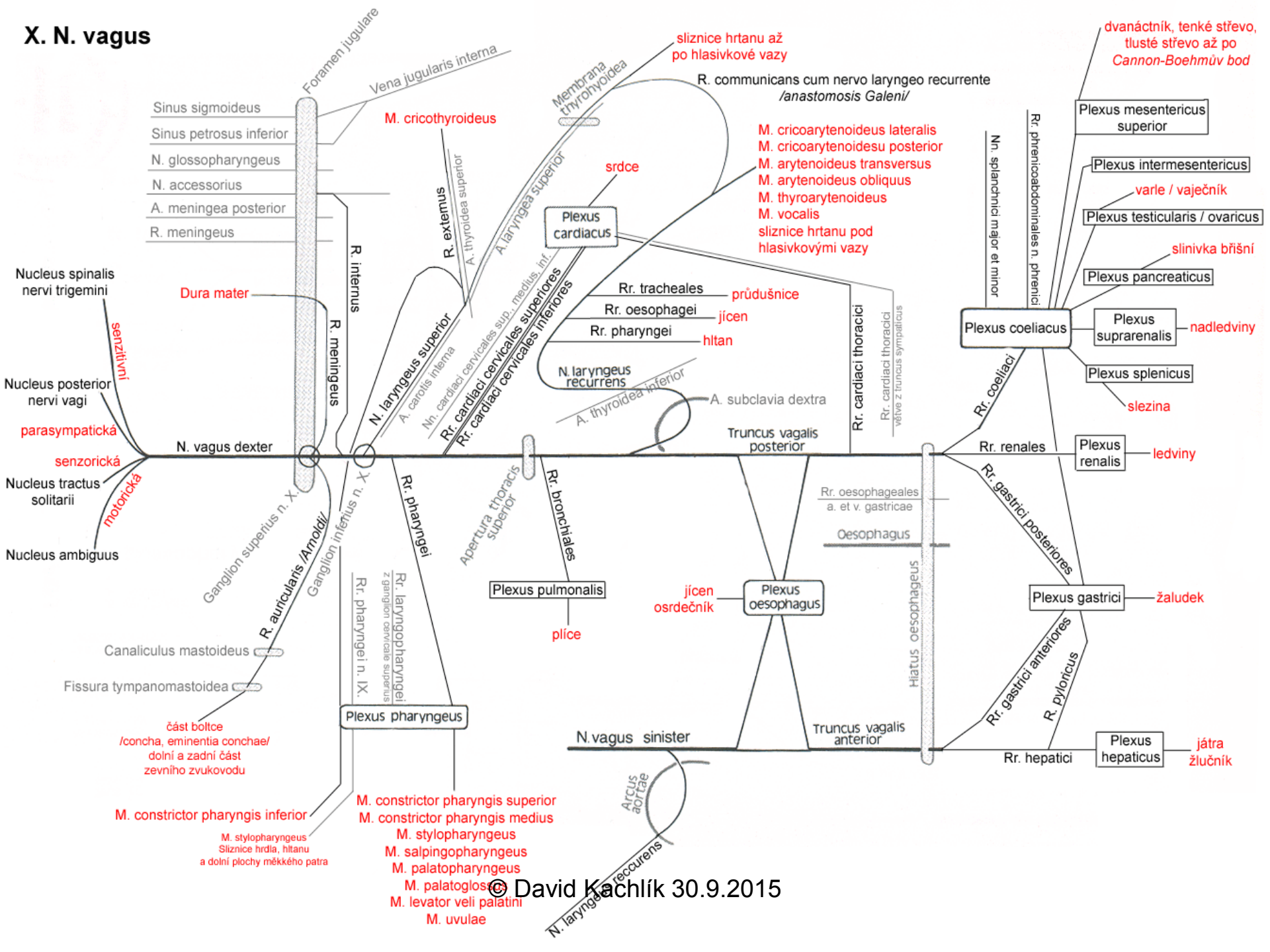
- **rr. pharyngei** – mucosa, glands, muscles
- **n. laryngeus superior** – mucosa, glands, muscles
- **n. laryngeus recurrens** – idem
  - right is shorter and passes under a. subclavia dextra
  - left is longer and úasses under arcus aortae
- **rr. cardiaci** cervicales sup.+inf., thoracici
- **rr. bronchiales**
- **rr. coeliaci, hepatici, renales, gastrici ant.+post.**



nervus laryngeus superior

nervus laryngeus recurrens

X. N. vagus



X. - N. vagus

Palsy

- unilateral
- affected swallo
  hoarsness, bloc
  deviation of uvu
- bilateral
- rhinolalia (= na
  (= dysarthria), h
  breathing

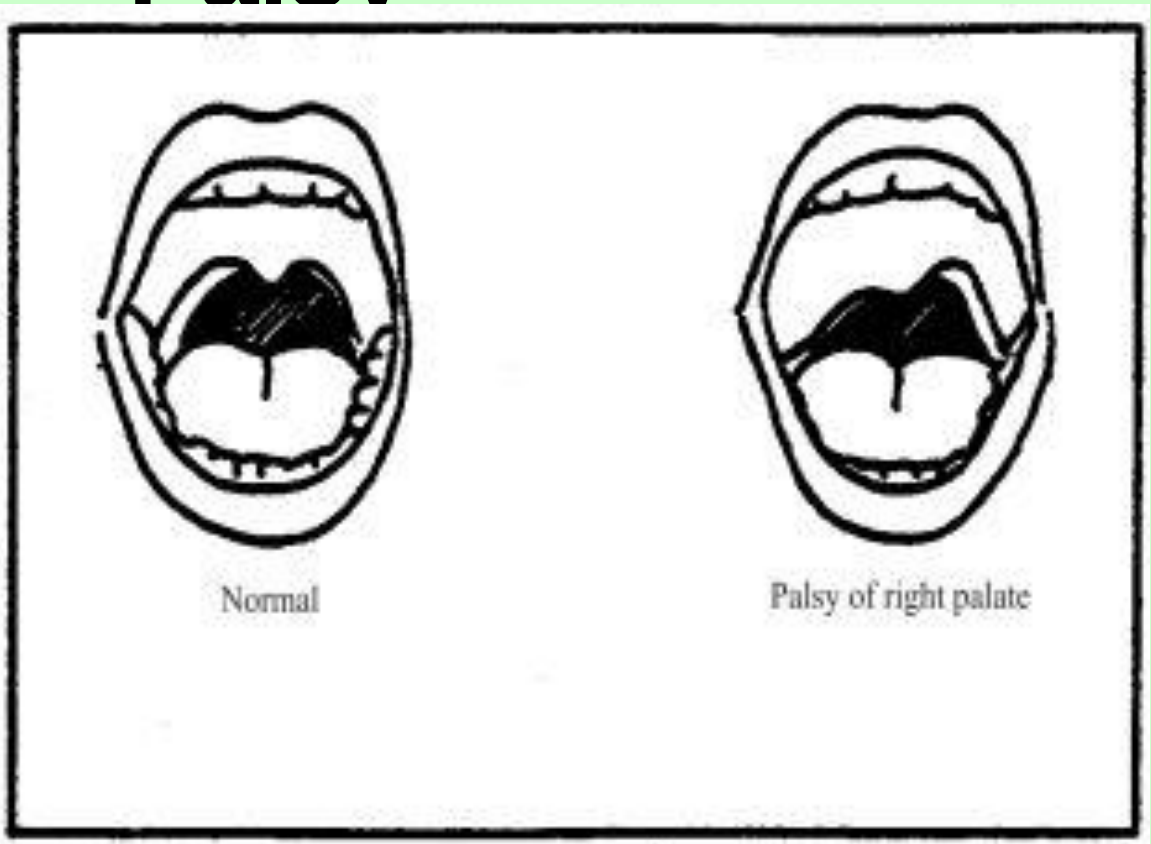


Figure 2-15: A normal soft palate is illustrated on the left. On the right, a right palatal palsy from a lower motor neuron X nerve lesion has resulted in deviation of the uvula to the left.

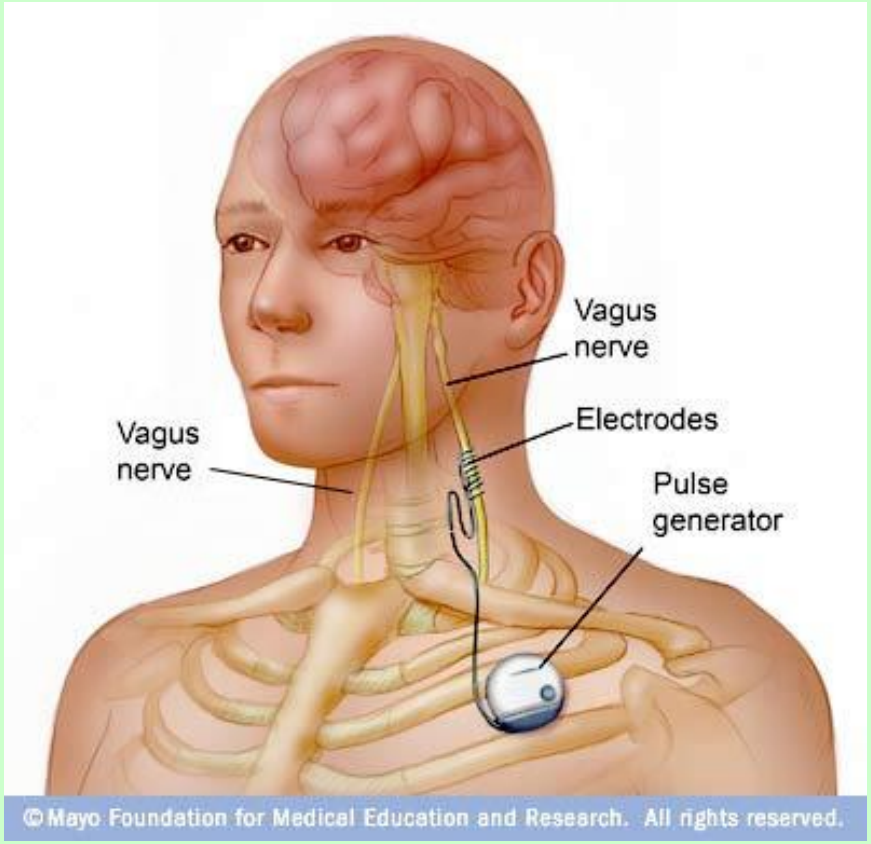
Irritation of n.X

- bradycardia, sp
  (laryngospasmu
  pylorospamus)

X. - N. vagus
Clinical notes

- examination: vomiting reflex
- reflexes:
  - oculocardial (Aschner-Dagnini´s reflex)
- stimulation of n.X

epilepsy, depression



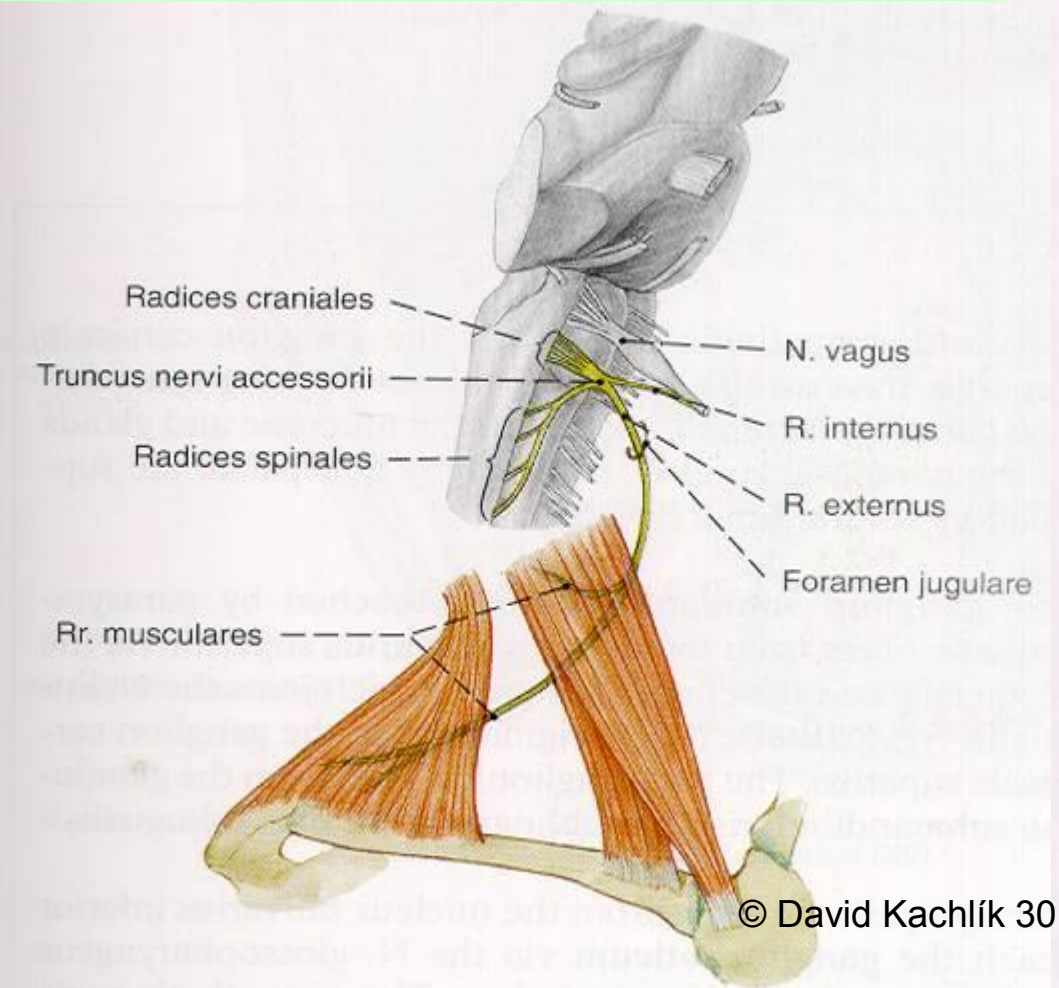
XI. = N. accessorius

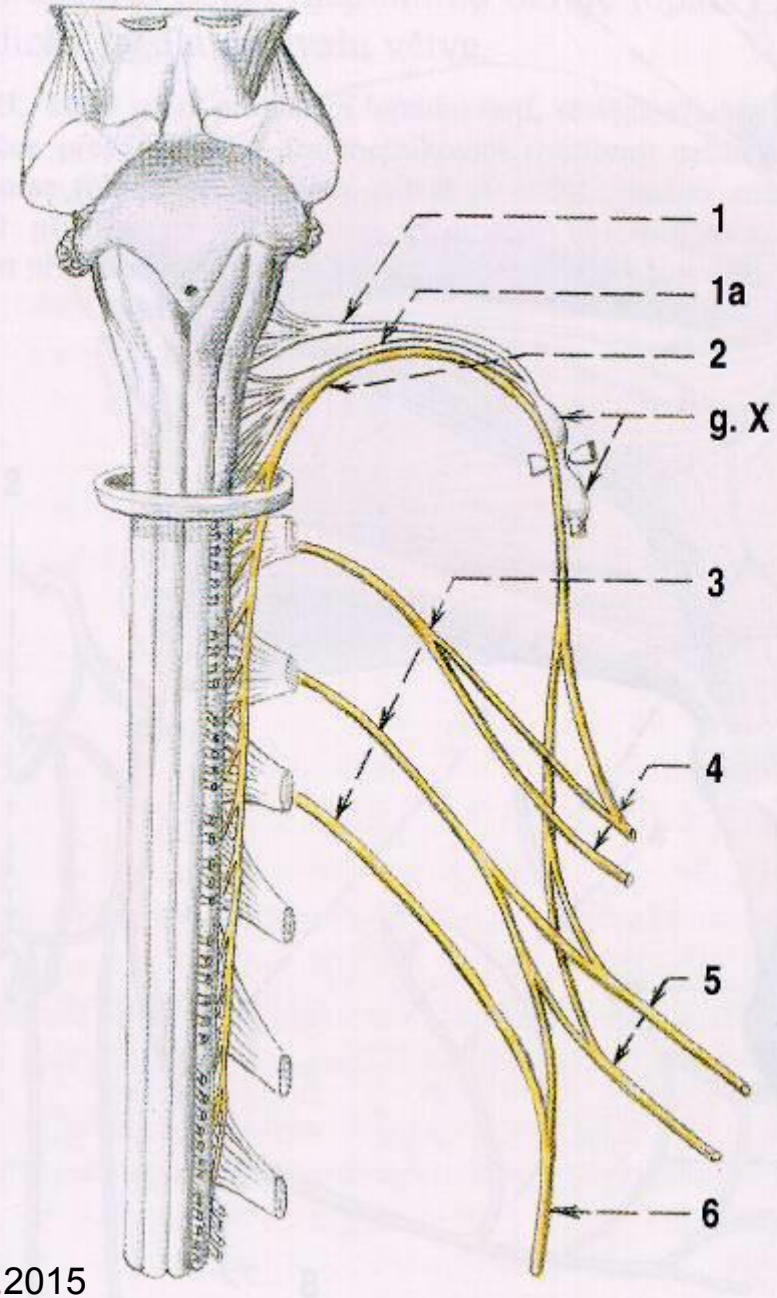
combined nerv (2 independent components grown in one trunk)

2 nuclei → 2 roots → **1 trunk** → 2 branches

- *somatomotor branchial* (6th arch)
  - nucleus in medulla oblongata: ncl. ambiguus → radix cranialis → truncus n.XI → ramus internus → n. X → soft palate muscles (4) + lateral muscle group of larynx (3)
- *somatomotor somite (cervical somites)*
  - nucleus in cervical spinal cord: ncl. n. XI. medullae spinalis → radix spinalis → truncus n.XI → ramus externus → m. sternocleidomastoideus + m. trapezius
  - direct fibres via n. spinalis C2-4 → loop between both ways = *ansa Maubraci*

XI. = N. accessorius





XI. - N. accessorius

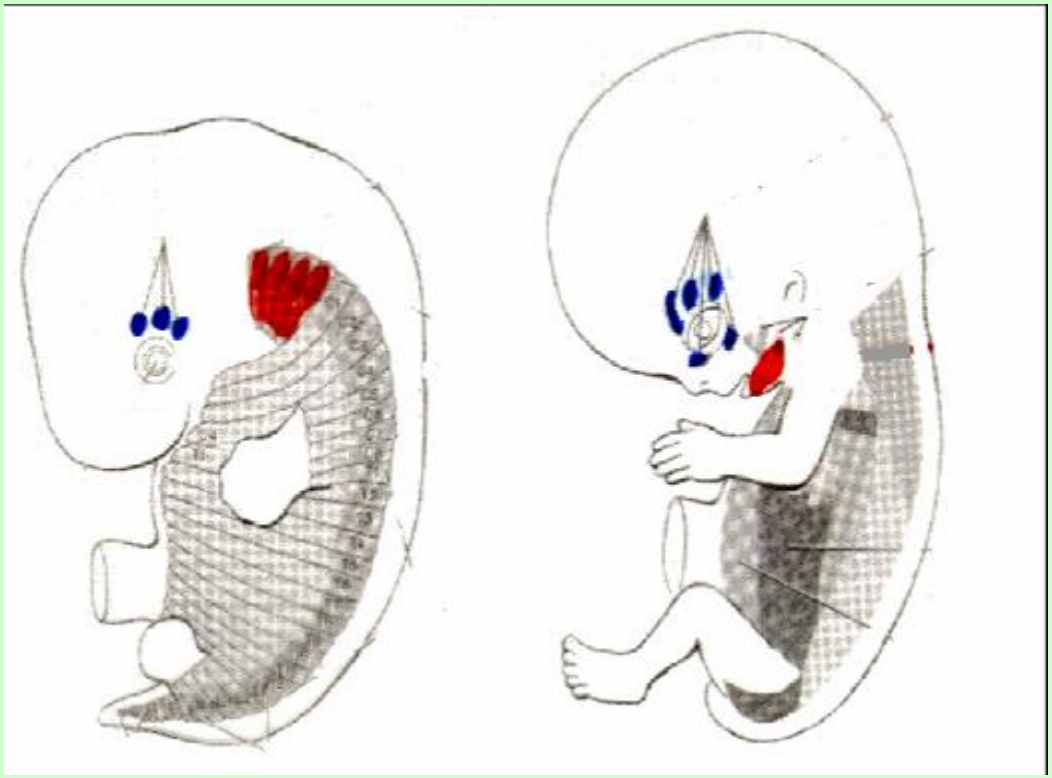
Palsy

unilateral

- palsy of r. internus (*Avelis´ syndrome)*

– very rare!

SomatoMotor somatic CN



• preotic myotoms (somitomers) form external muscles of eyeball – n. III, IV, VI

• **occipital somites form muscles of tongue – n. XII**

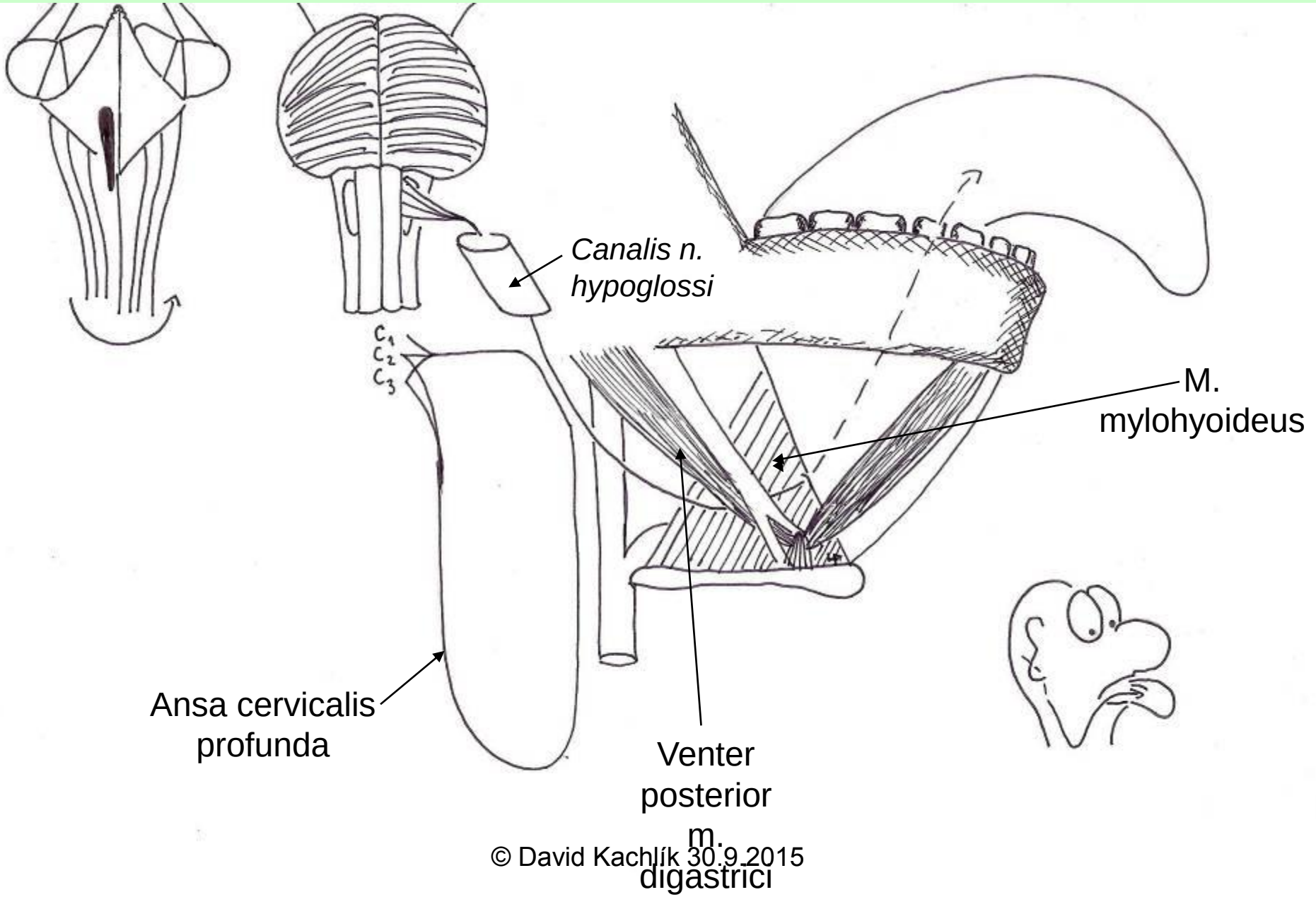
XII. = N. hypoglossus

- *somatomotor somite* (occipital somites)
- 1 nucleus in medulla oblongata: ncl. n. XII

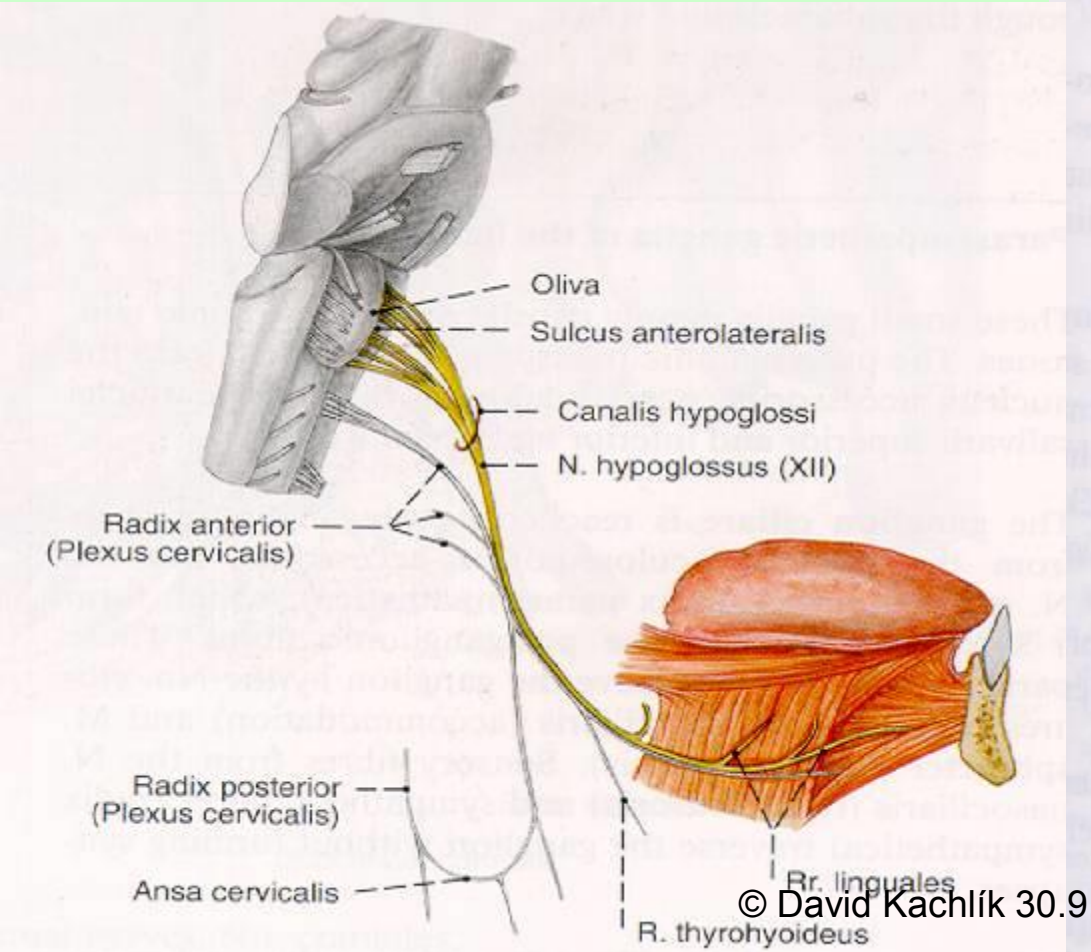
course: ventrally to olive from medulla obongata (= *sulcus preolivaris*) → fossa cranii posterior → canalis nervi hypoglossi → spatium retrostyloideum (spatium parapharyngeum) → trigonum caroticum → trigonum submandibulare → tongue

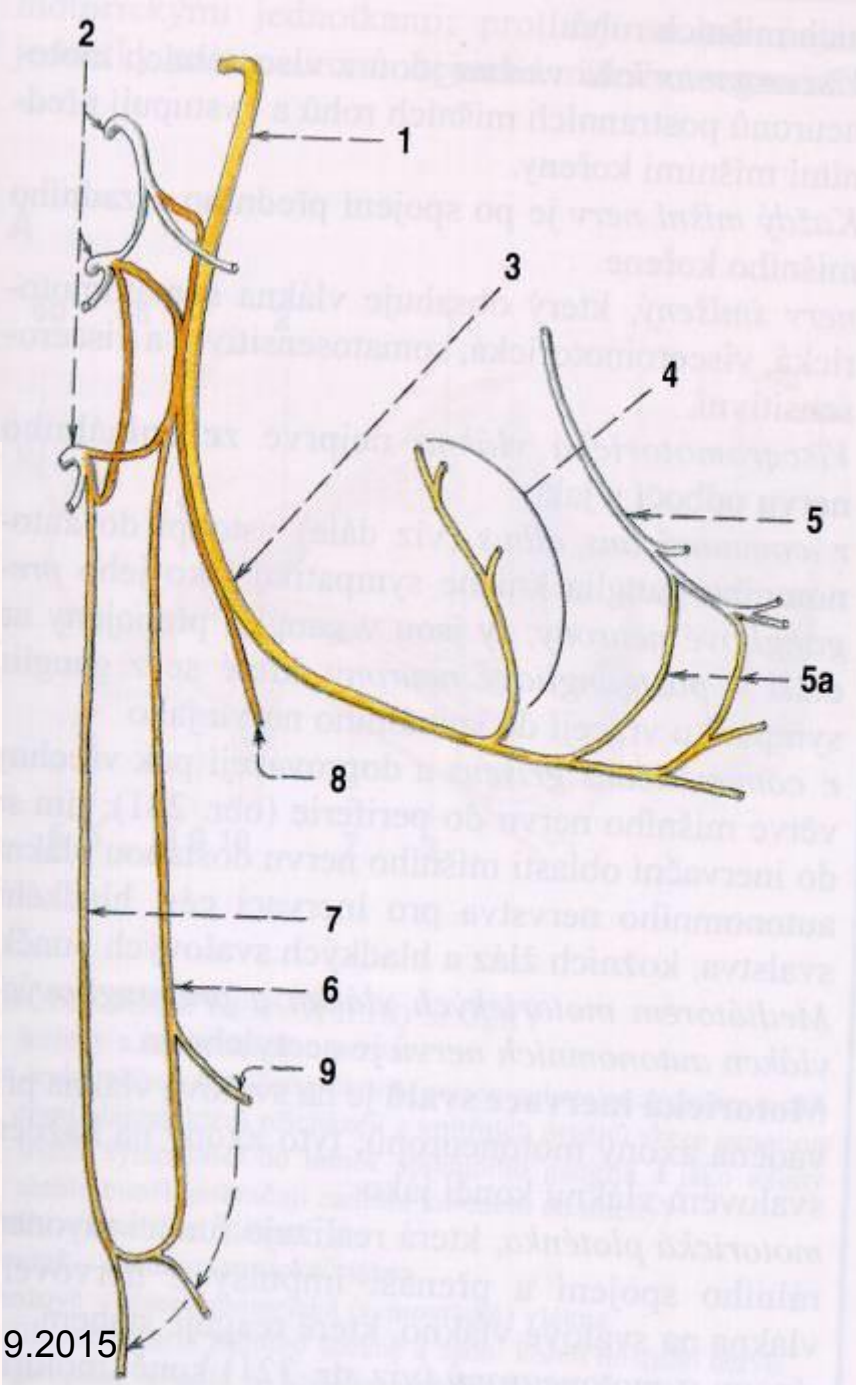
- **7 muscles of tongue**
  - 3 extraglossal and 4 intraglossal

XII. = N. hypoglossus

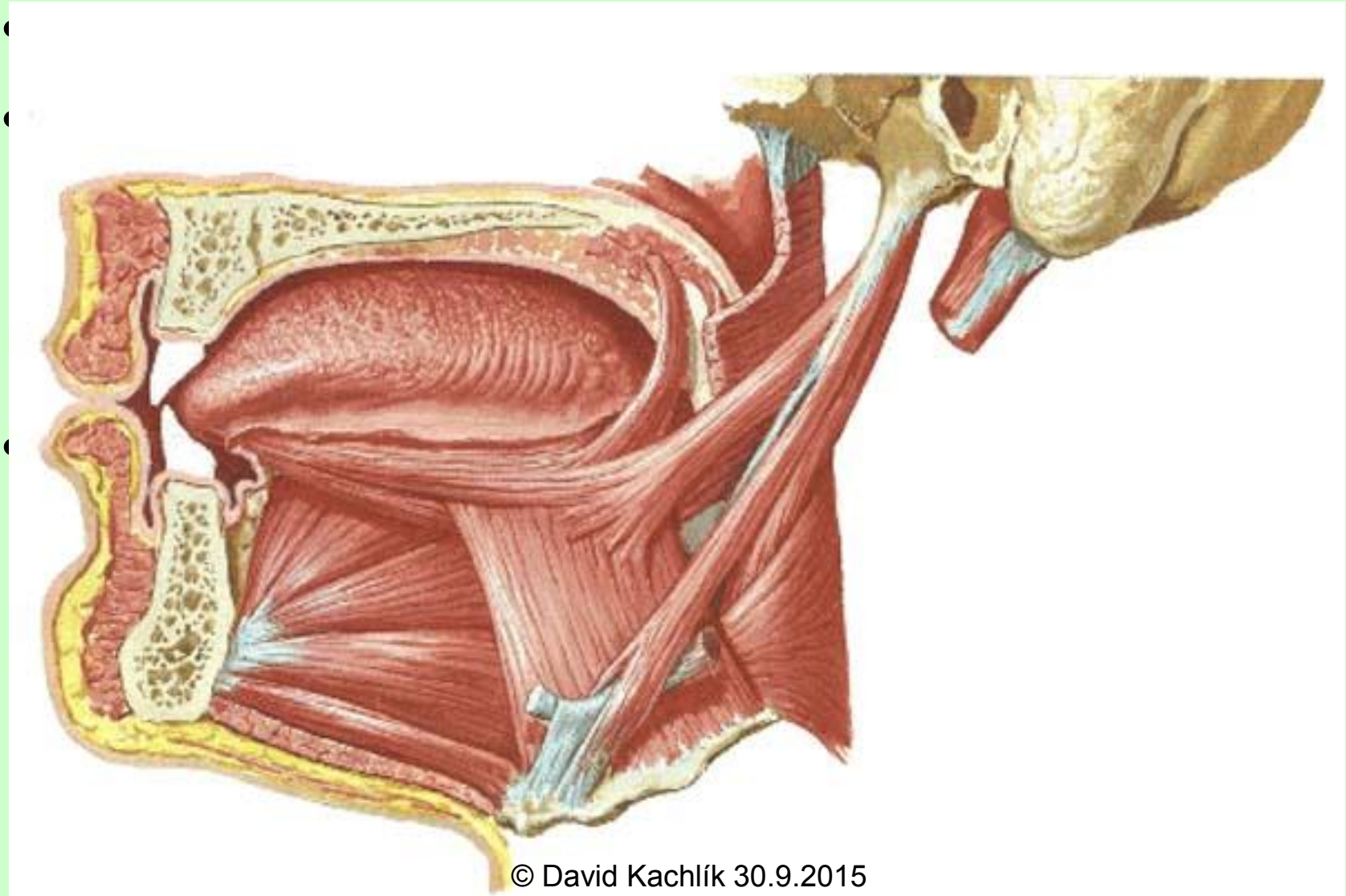


XII. = N. hypoglossus





Muscles of tongue



Hemiglossoplegia