

Univerzitet u Beogradu
Filozofski fakultet
Odeljenje za psihologiju

PSIHOLOGIJA OPAŽANJA

Tematske celine

PSIHOFIZIKA

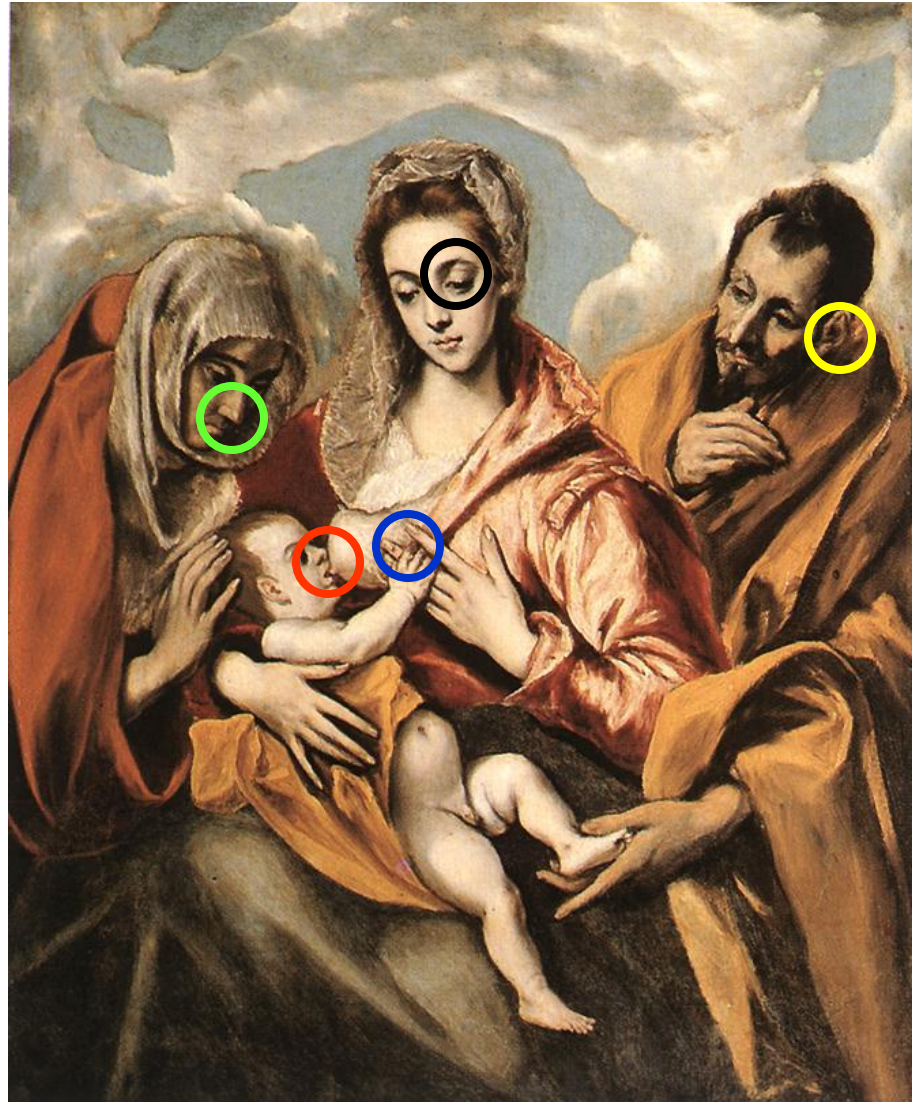
ČULA

PERCEPCIJA

KLASIFIKACIJA ČULA

MIRIS

UKUS



VID

SLUH

DODIR

El Greco

KLASIFIKACIJA ČULA



H. Makart

KLASIFIKACIJA ČULA

... po Ψ modalitetu: VID, SLUH, MIRIS, UKUS ...

... po vrsti energije: FOTO, MEHANO, HEMO, TERMO ...

... po tipu eksplorativnih aktivnosti (J. J. Gibson):

VIZUELNI SISTEM + posmatranje, gledanje

AUDITORNI SISTEM + oslušivanje

HAPTIČKI SISTEM + pipanje, hvatanje, manipulacija

ORIJENTACIONI SISTEM + kretanje, održanje ravnoteže

HEMIJSKI SISTEM + žvakanje, njuškanje, ušmrkivanje

KLASIFIKACIJA ČULA

... po izvoru informacija:

EKSTEROCEPCIJA: spolj. objekti

DISTANTNA ČULA: vid, sluh, miris

KONTAKTNA ČULA: koža, ukus

INTEROCEPCIJA: sopstveno telo

KINESTEZIJA: mišići, zglobovi

STATIKA: ravnoteža, orijentacija

CENESTEZIJA: visceralni organi

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**SOMATOSENZORNI
SISTEM**

KLASIFIKACIJA ČULA

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HEMIJSKI SISTEM

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PROPRIOCEPCIJA

STRUKTURA IZLAGANJA

EKOLOŠKI KONTEKST

FUNKCIJA ČULA

DRAŽ

GRAĐA ČULA

NEUROFIZIOLOGIJA

RECEPTORI

PUTEVI

CENTRI

PSIHOFIZIKA

INTENZITET I ADAPTACIJA

KVALITET

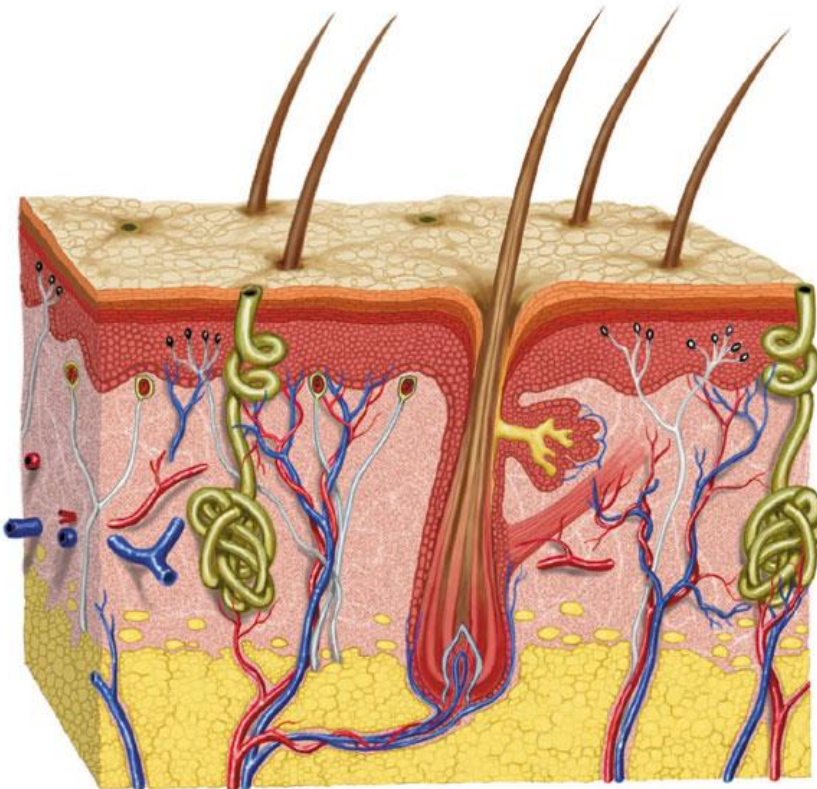
ILUZIJE I PATOLOGIJA

PERCEPCIJA

KOŽA



FUNKCIJE



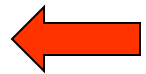
Zaštita

Disanje

Izlučivanje

Termoregulacija

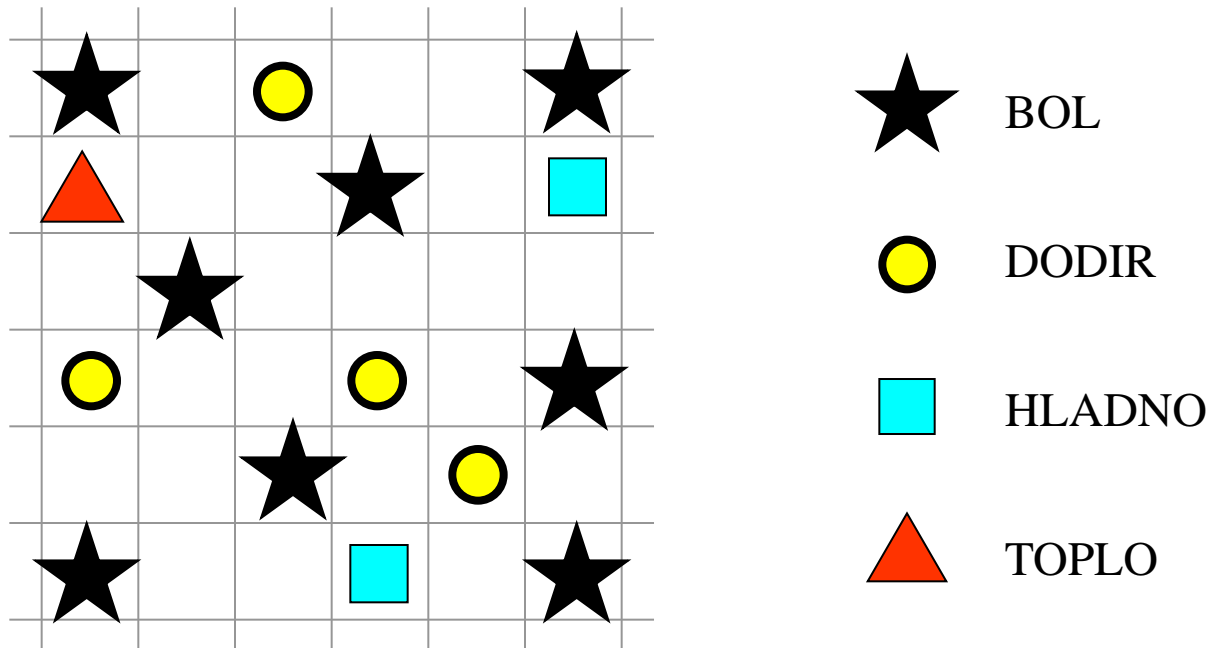
Osetljivost



OSETLJIVOST

Koža nije jedinstveno čulo!

1881-85: *Blix, Donaldson, Goldscheider, von Frey*



OSETLJIVOST

Koža nije jedinstveno čulo!

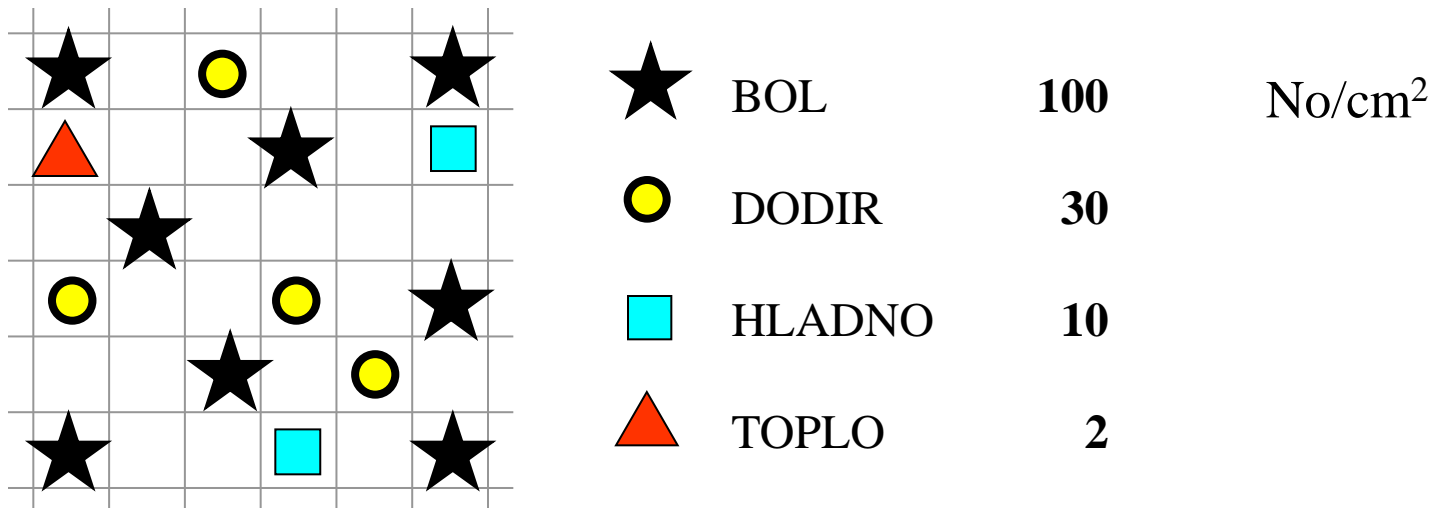
DOKAZI

OSETLJIVOST

Koža nije jedinstveno čulo!

Psihofizički dokaz

von Frey: nejednak broj tačaka osetljivosti



OSETLJIVOST

Koža nije jedinstveno čulo!

Hirurški dokaz

Head: redosled vraćanja osetljivosti

Protopatička os.

starija



BOL

2 meseca



HLADNO

3-4 meseca

Epikritička os.

mlađa



TOPLO

5-6 meseci



DODIR

12 meseci

OSETLJIVOST

Koža nije jedinstveno čulo!

DOKAZI	Psihofizički	
	Hirurški	
	Patološki	→ npr. Syringomyelia
	Fiziološki	→ npr. Hypoxia
	Farmakološki	→ npr. Cocain

GRAĐA ORGANA

Površina: oko 2 m²



GRAĐA ORGANA

Presek

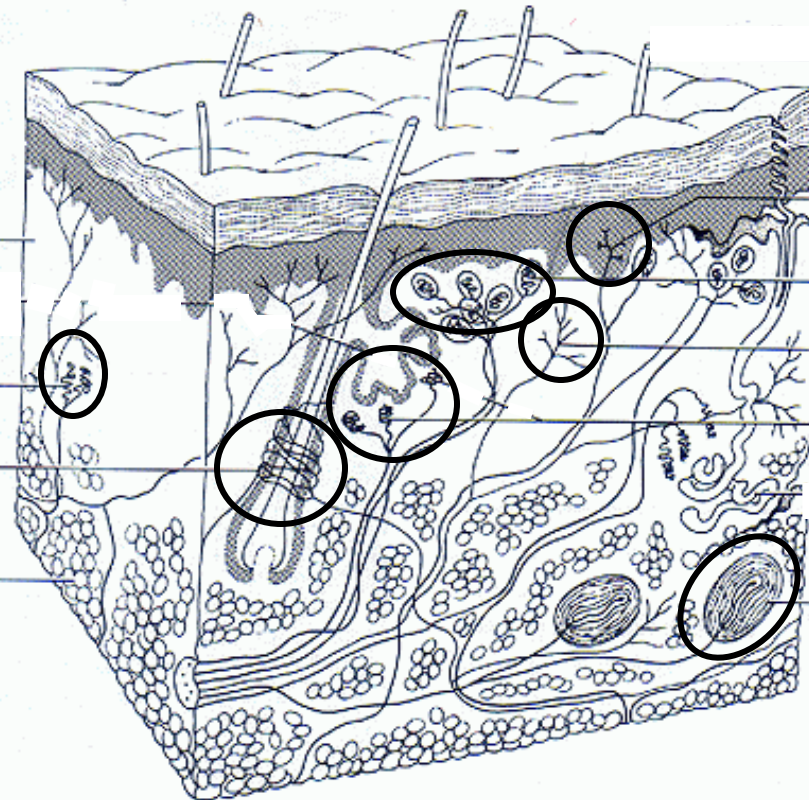
EPIDERM

DERM

Rufinjevi c.

Košarasti r.

**POTKOŽNO
TKIVO**



Merkelovi d.

Majsnerova t.

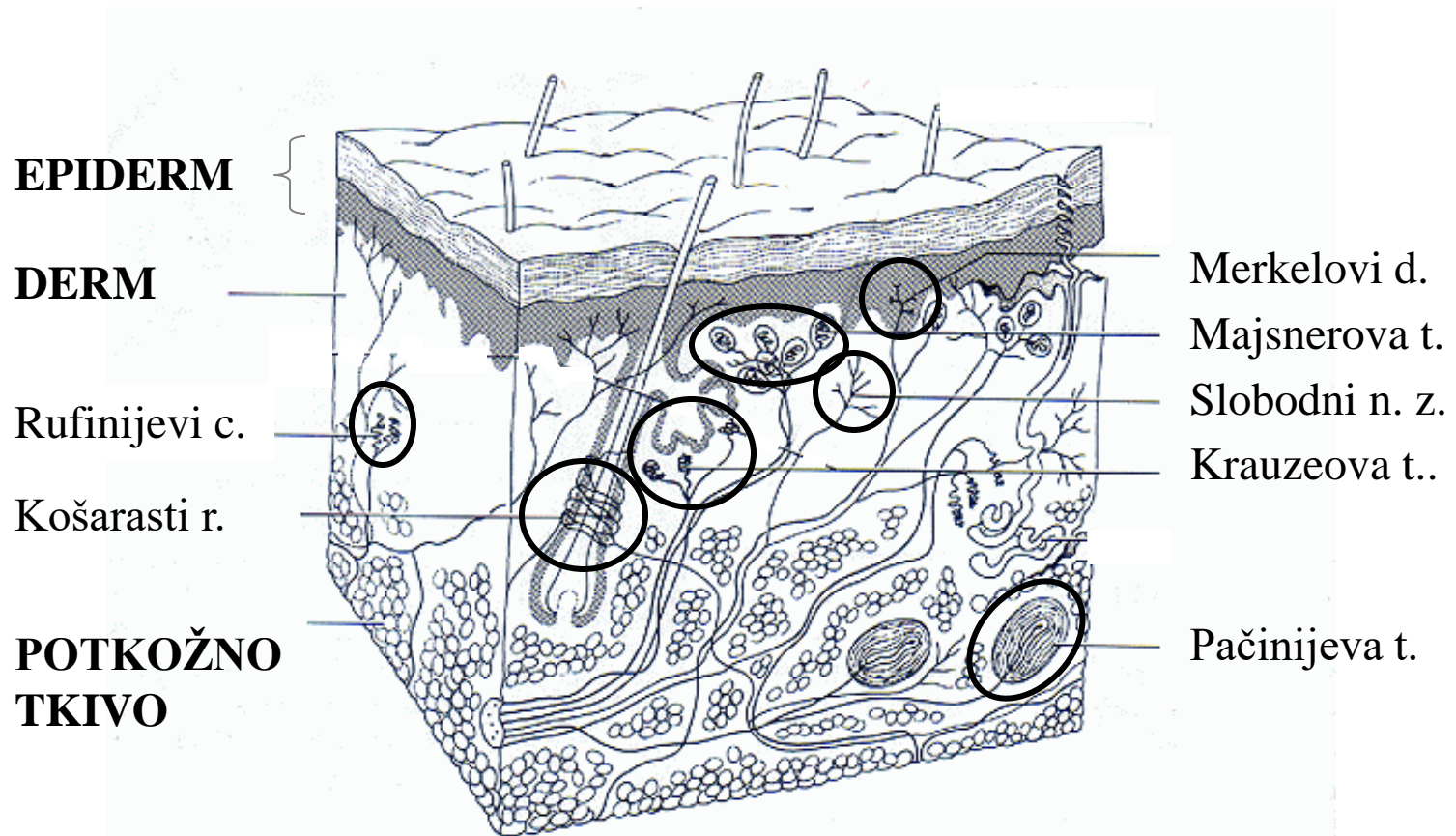
Slobodni n. z.

Krauzeova t..

Pačinijeva t.

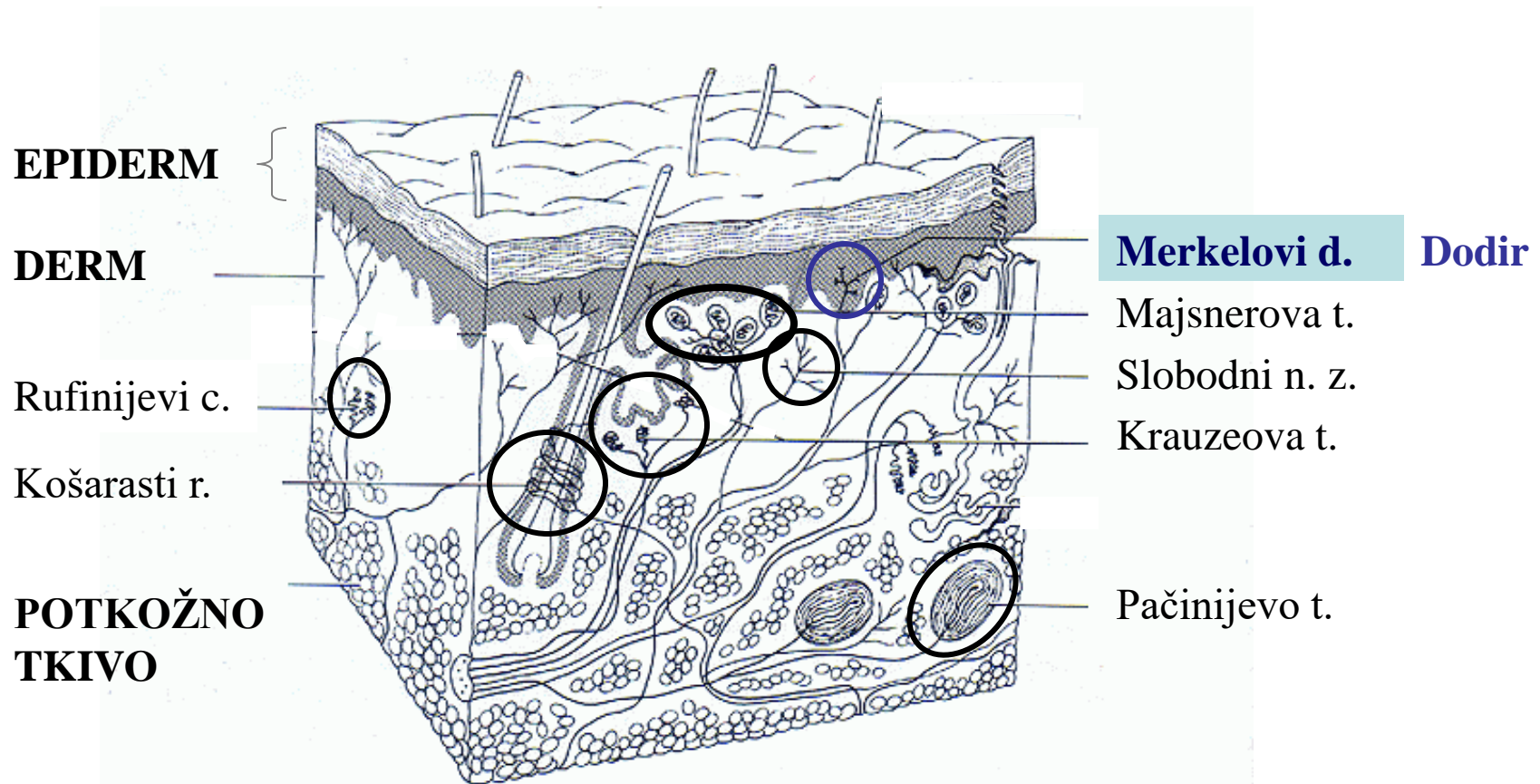
RECEPTORI

T. specifične energije (*von Frey*)



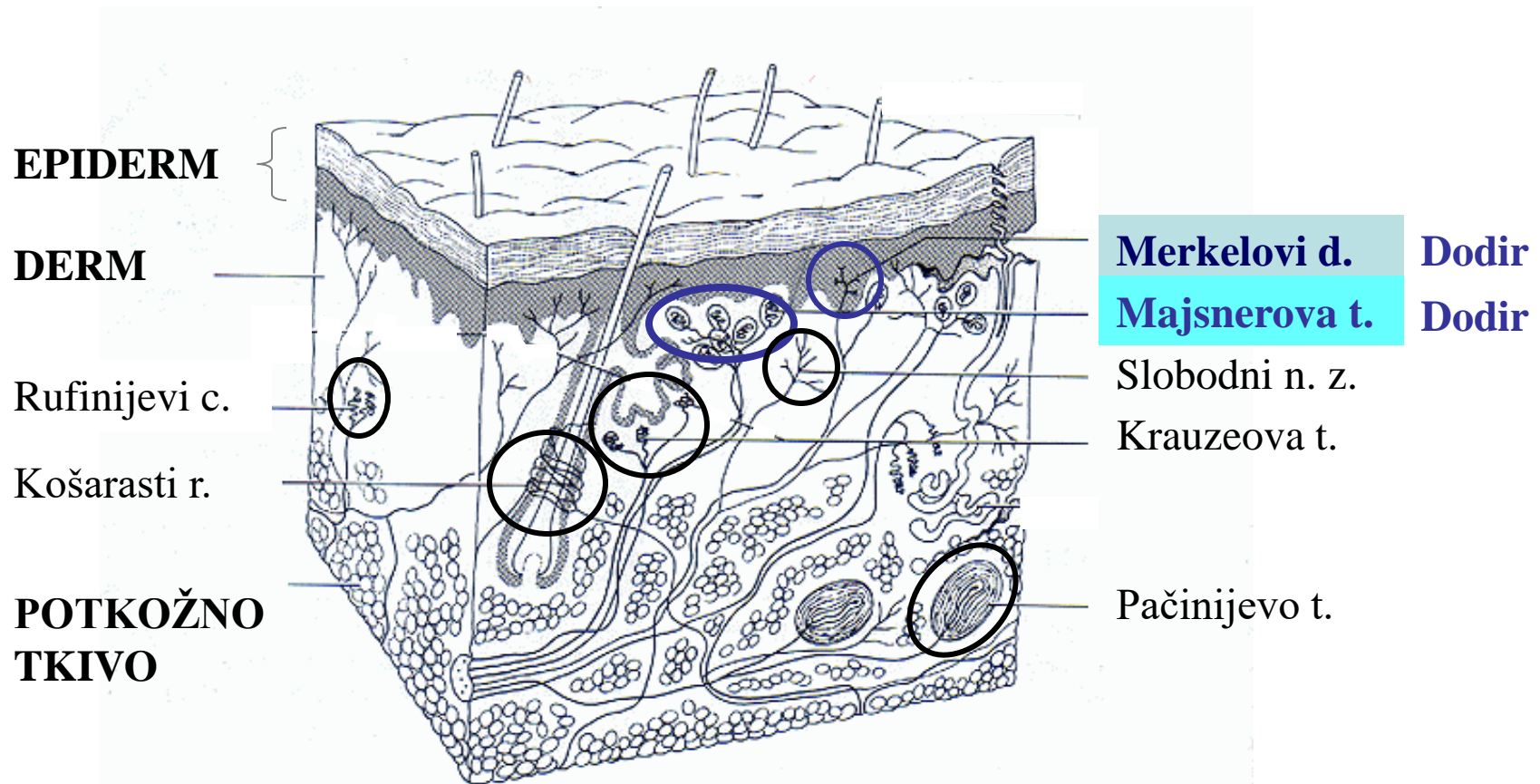
RECEPTORI

T. specifične energije (*von Frey*)



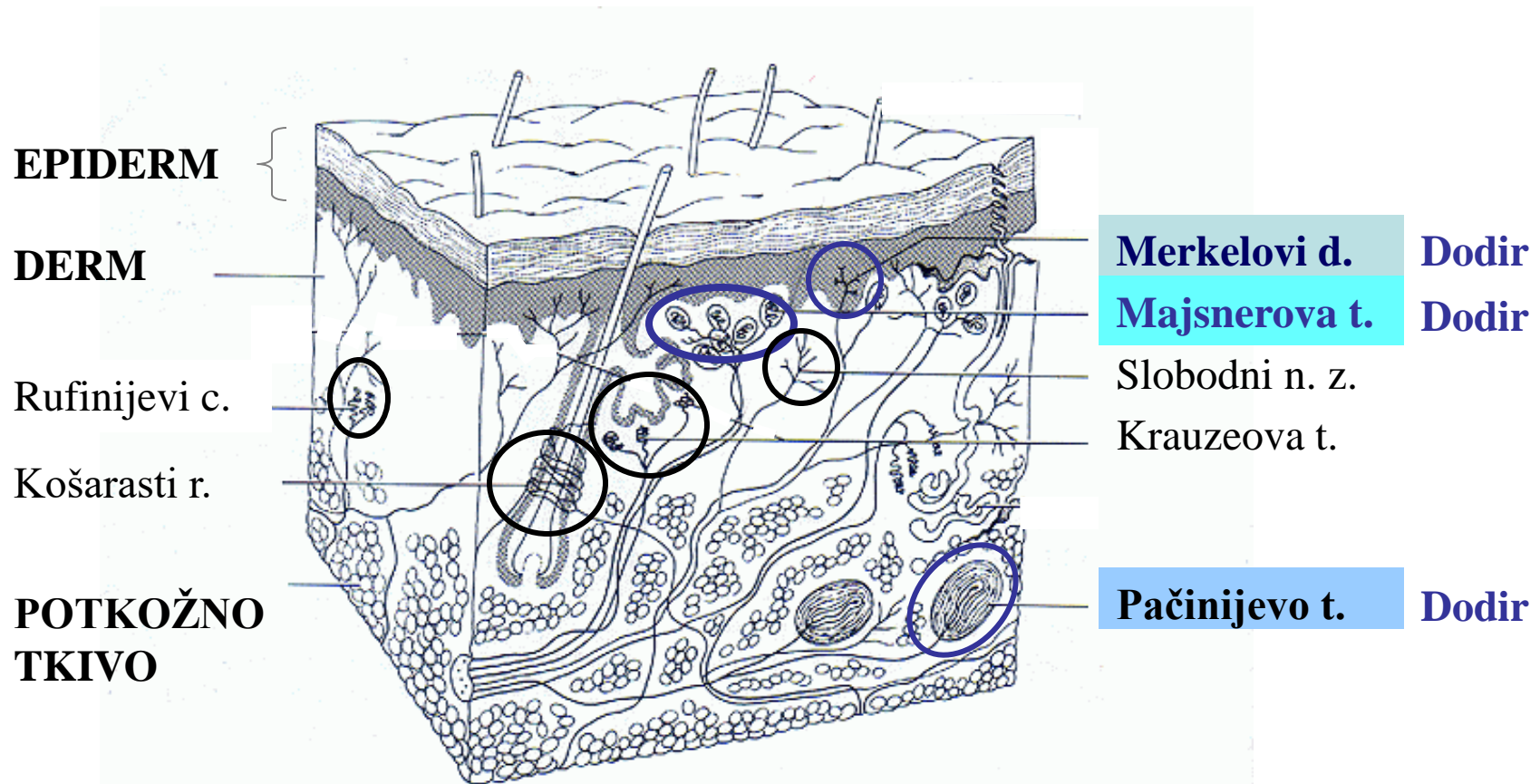
RECEPTORI

T. specifične energije (*von Frey*)



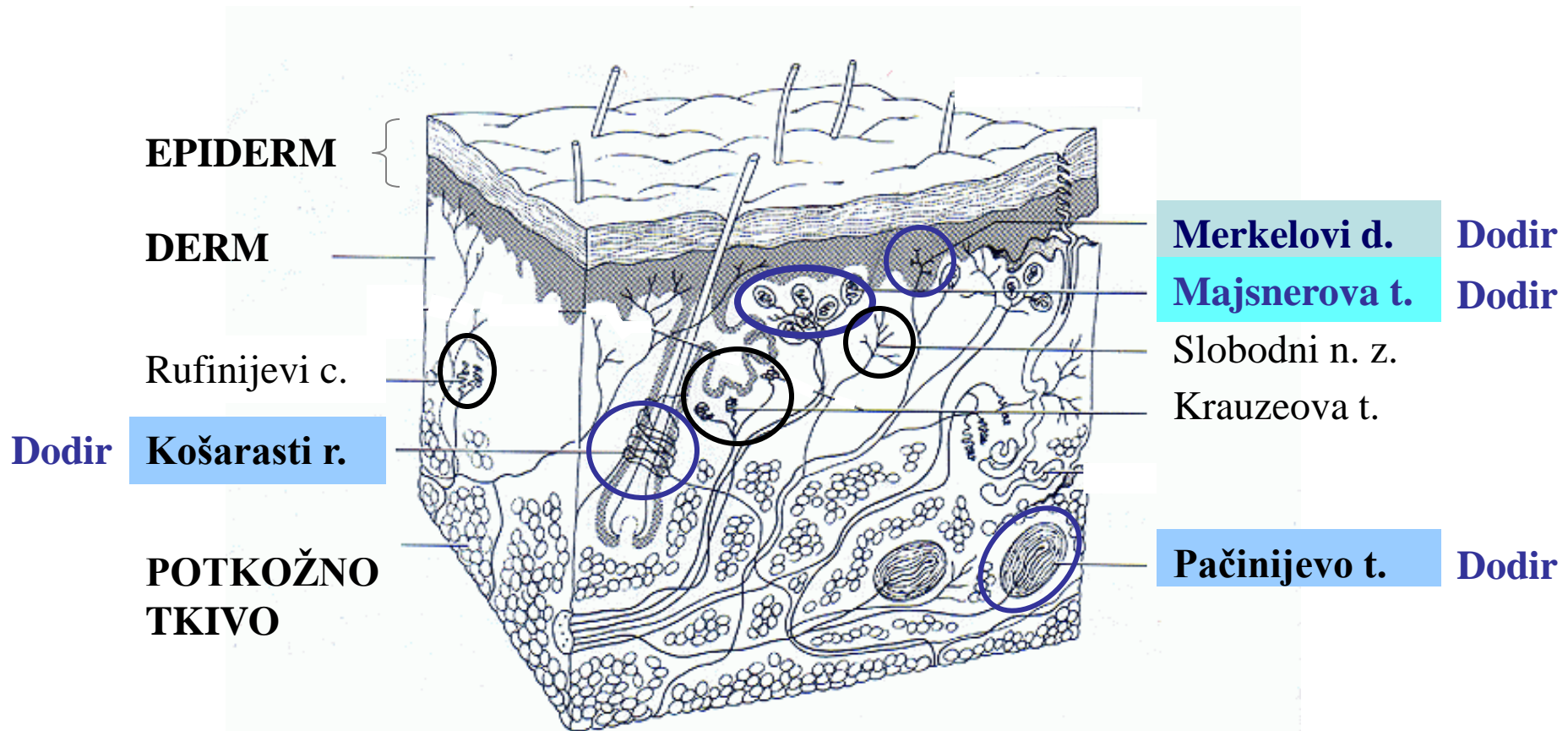
RECEPTORI

T. specifične energije (*von Frey*)



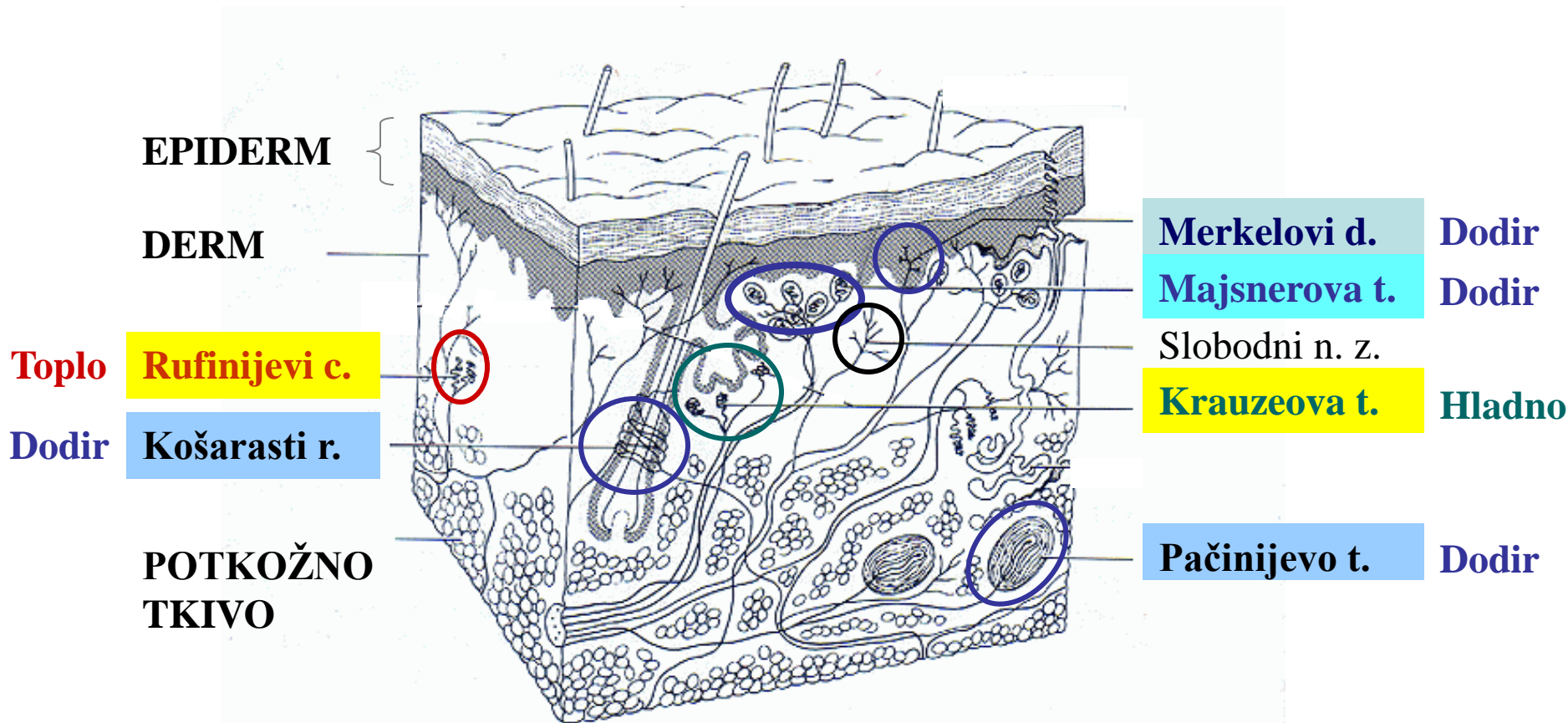
RECEPTORI

T. specifične energije (*von Frey*)



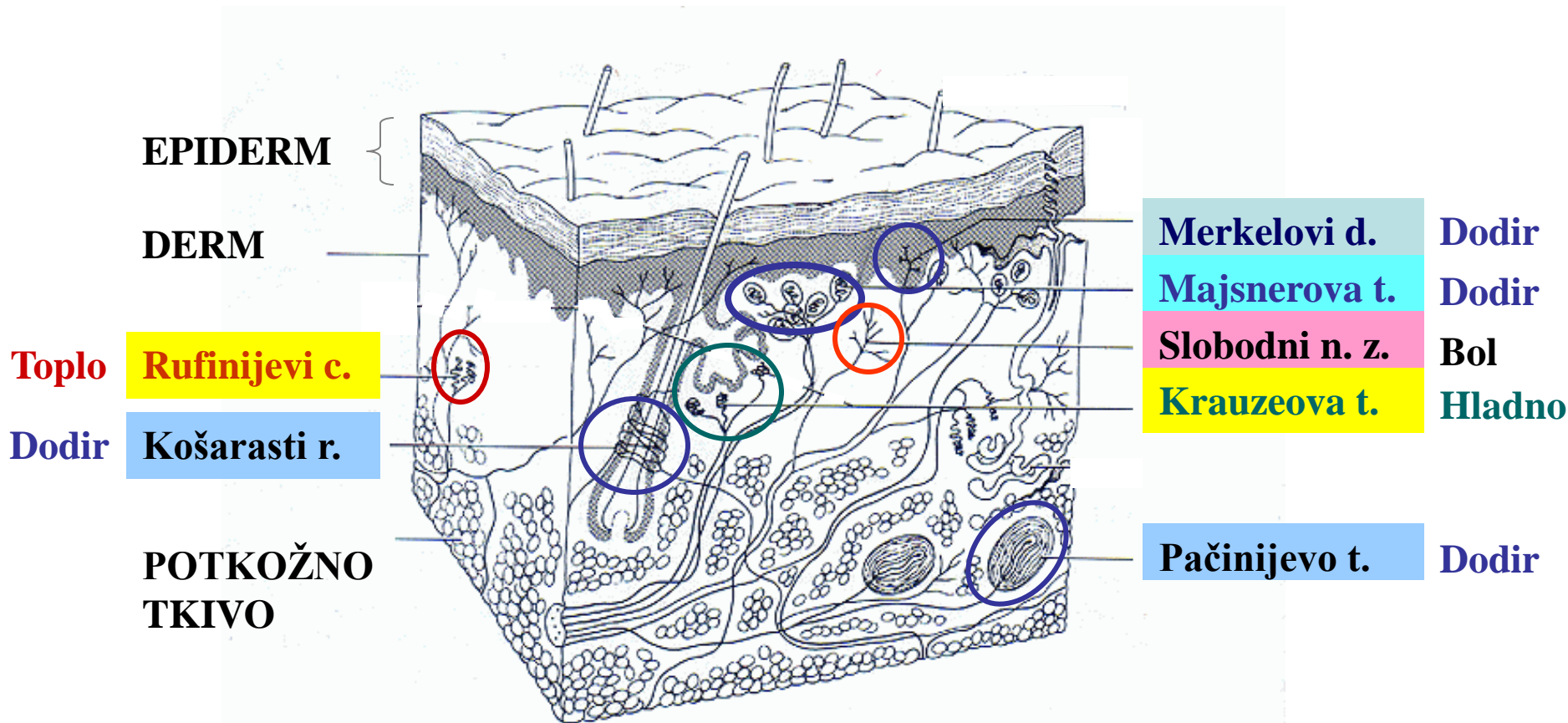
RECEPTORI

T. specifične energije (*von Frey*)



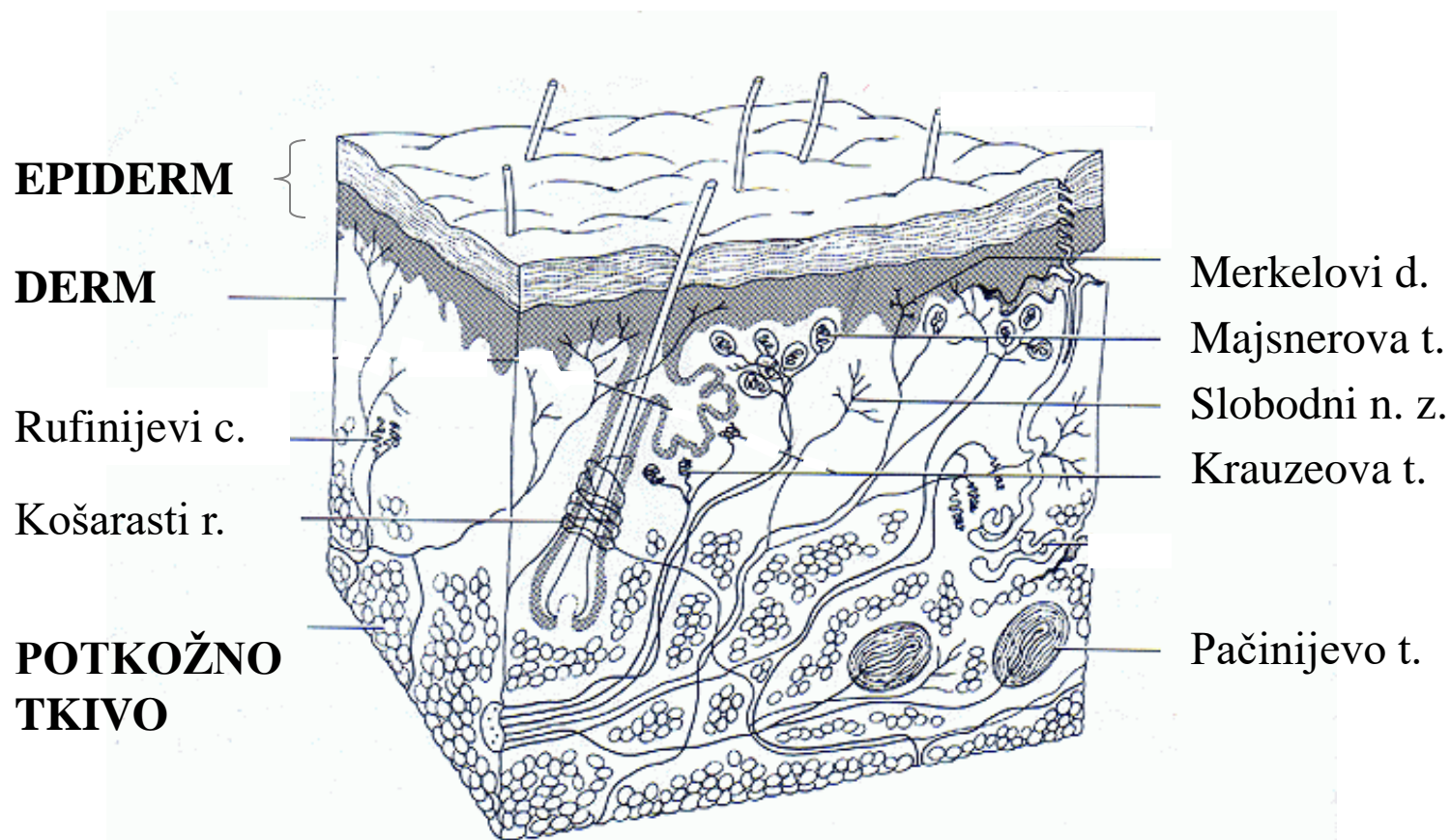
RECEPTORI

T. specifične energije (*von Frey*)



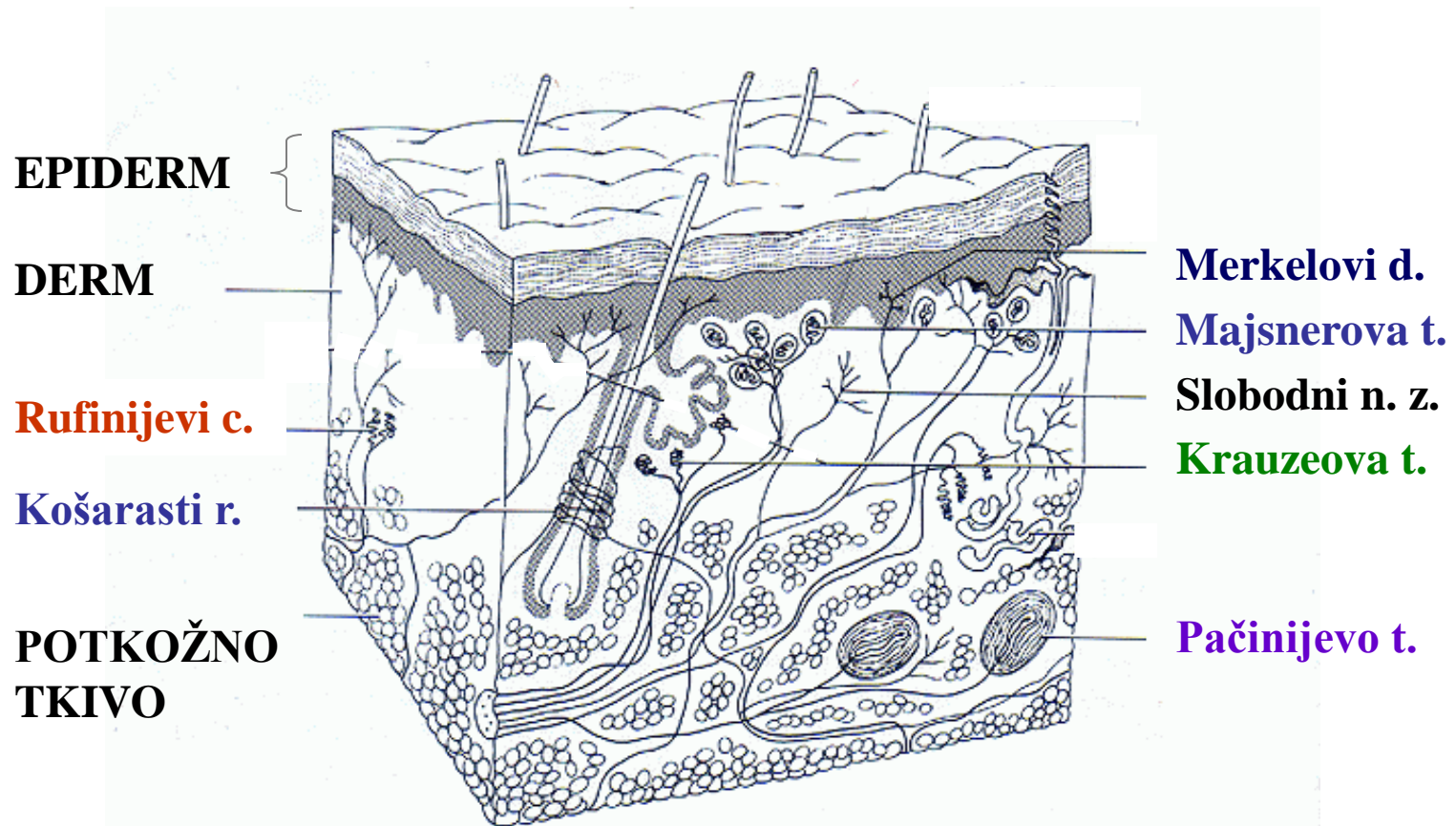
RECEPTORI

T. složaja (*Woolard, Sinclair, Weddel*)



RECEPTORI

Kombinovana t. (*Melzack, Wall*)



RECEPTORI

Evolucionarna t. (*Head*)

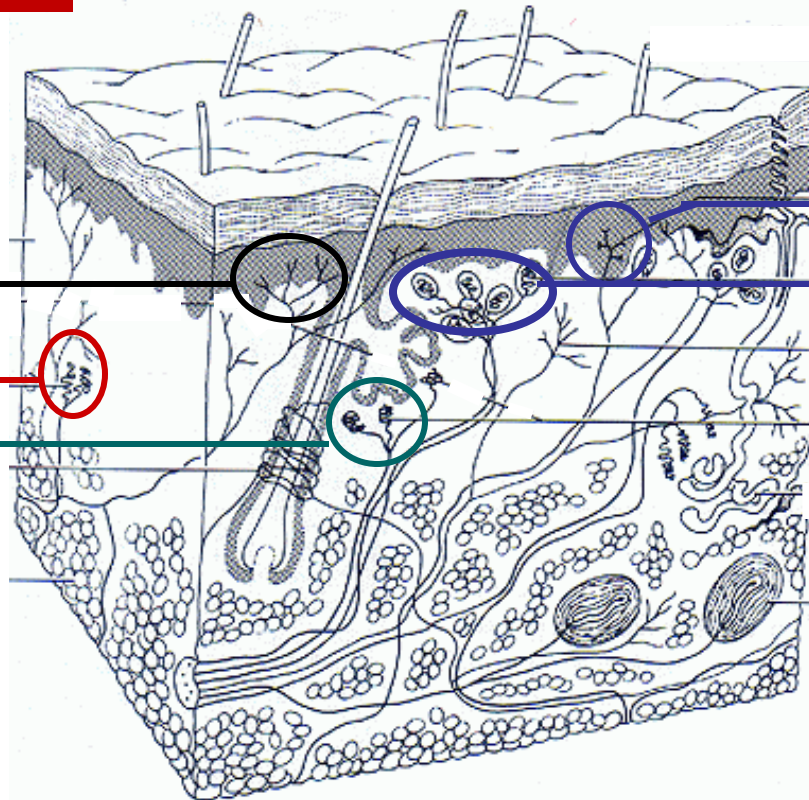
Protopatička os.

starija

Bol

Toplo

Hladno



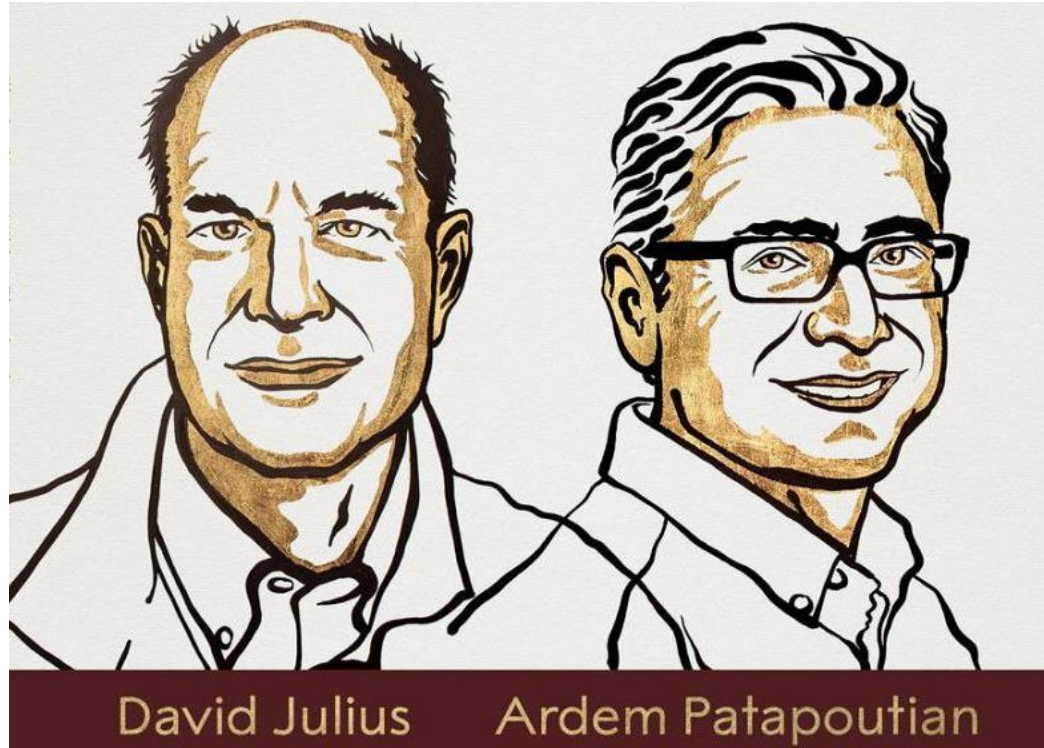
Merkelovi d.

Majsnerova t.

Epikritička os.

mlađa

RECEPTORI

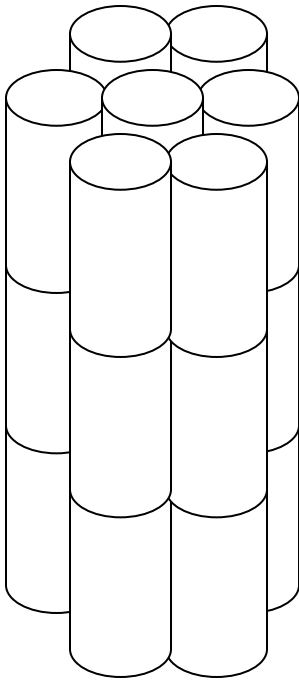


Dobitnici Nobelove nagrade u oblasti fiziologije i medicine 2021.
za otkriće molekularnih mehanizama termoreceptora i mehanoreceptora.

PUTEVI

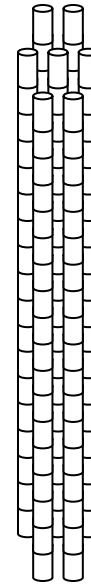
A vlakna

- veća (4μ)
- brža (50 m/s)



C vlakna

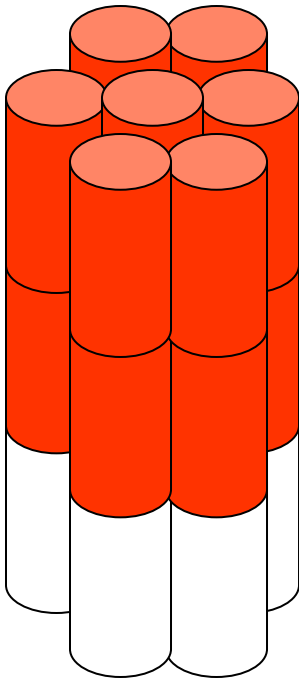
- manja ($0,8 \mu$)
- sporija (1 m/s)



PUTEVI

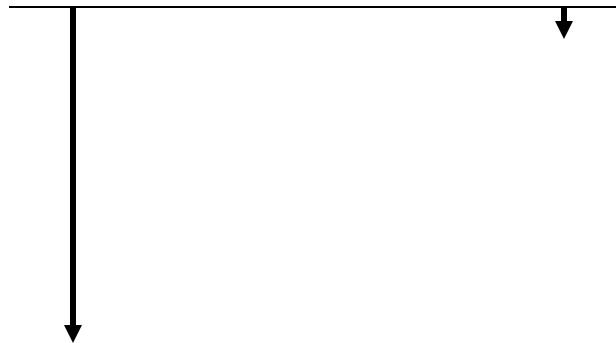
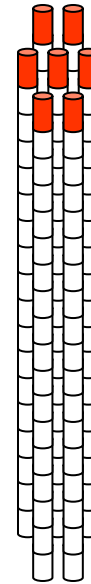
A vlakna

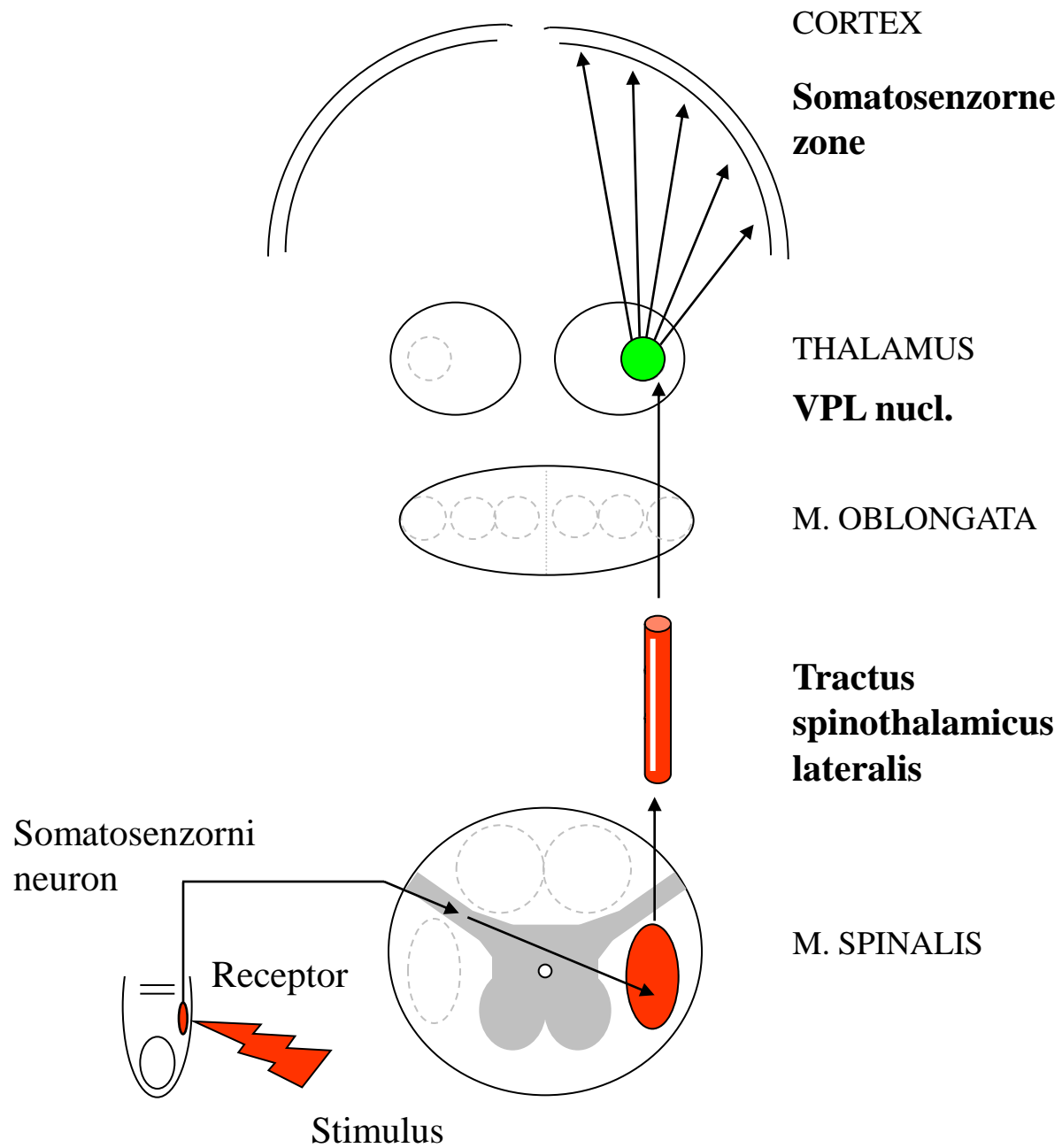
- veća ($4\ \mu$)
- brža ($50\ \text{m/s}$)

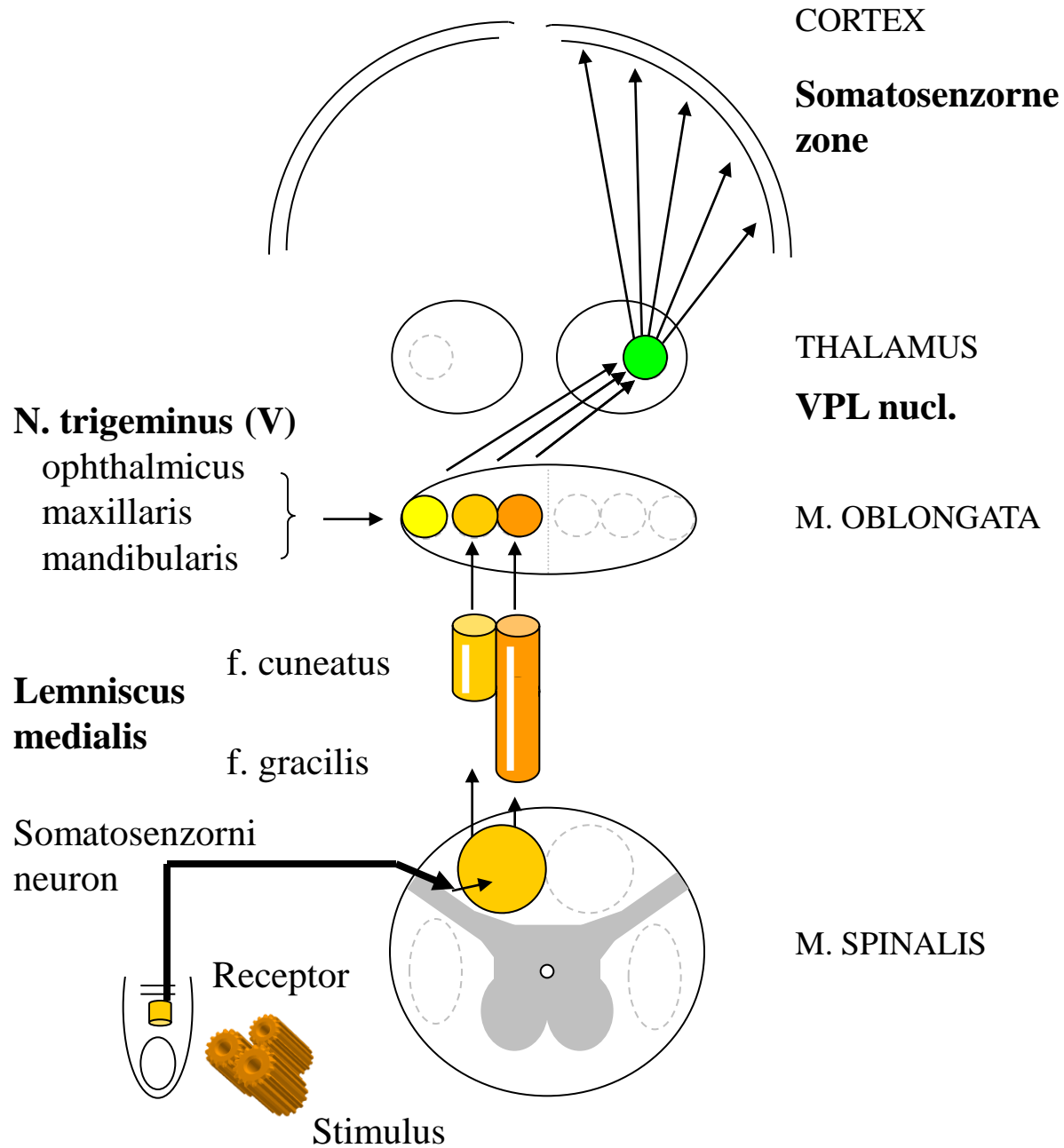
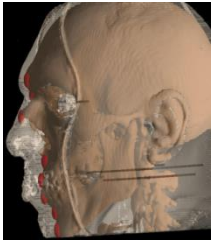


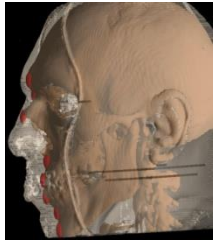
C vlakna

- manja ($0,8\ \mu$)
- sporija ($1\ \text{m/s}$)

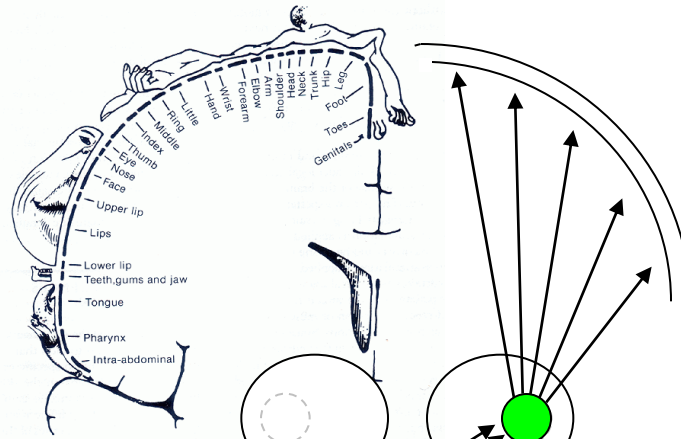








N. trigeminus (V)
ophthalmicus
maxillaris
mandibularis



CORTEX
Somatosenzorne zone

THALAMUS
VPL nucl.

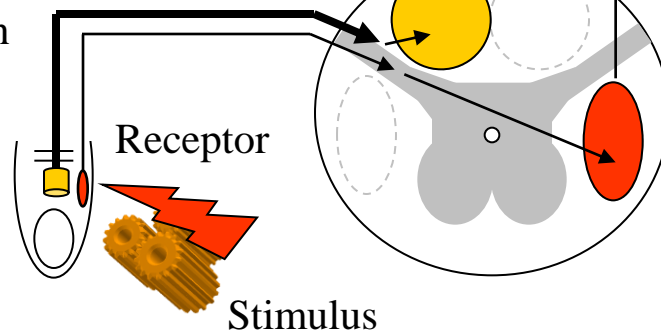
M. OBLONGATA

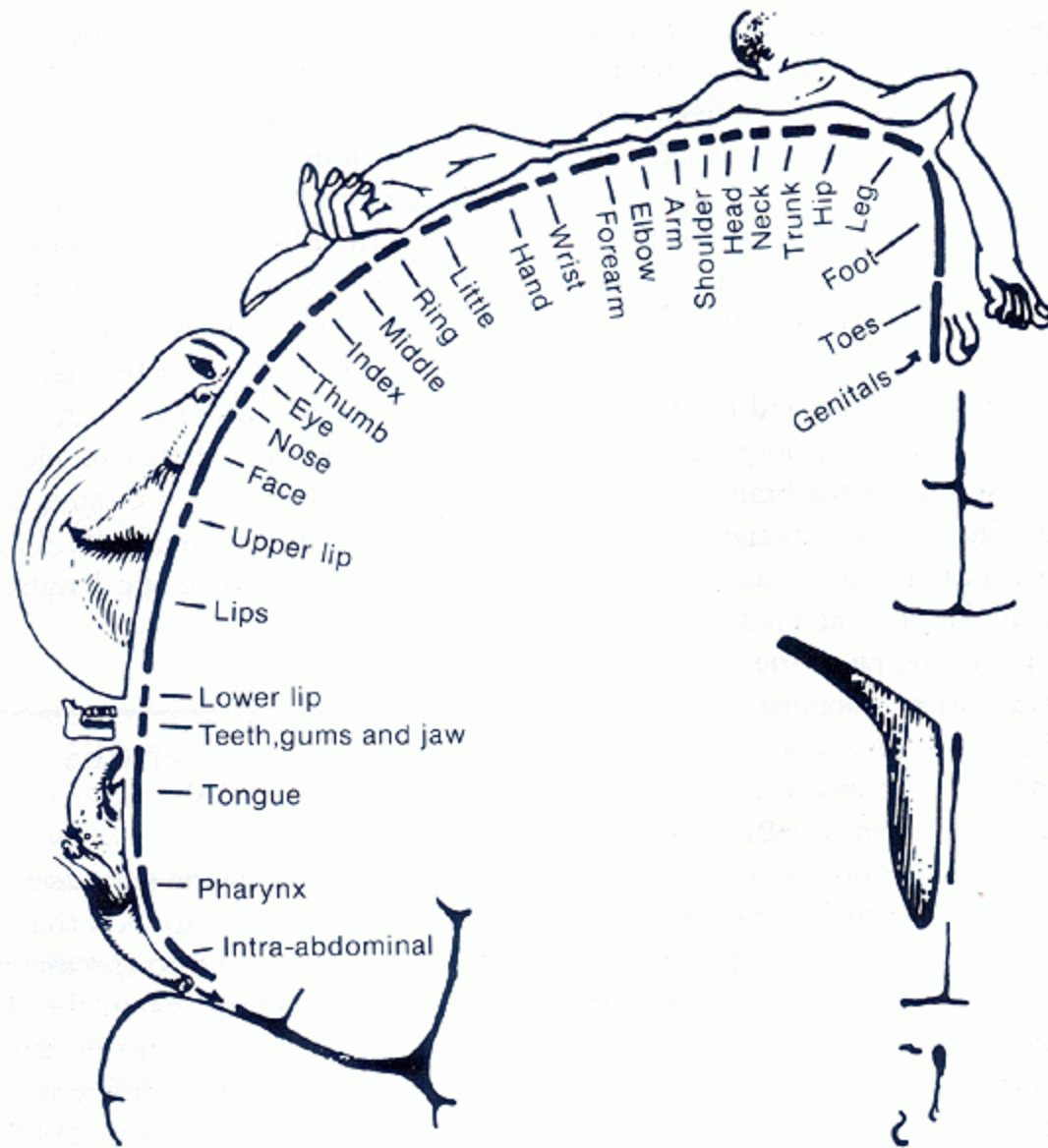
Lemniscus medialis
f. cuneatus
f. gracilis

Tractus spinothalamicus lateralis

Somatosenzorni neuron

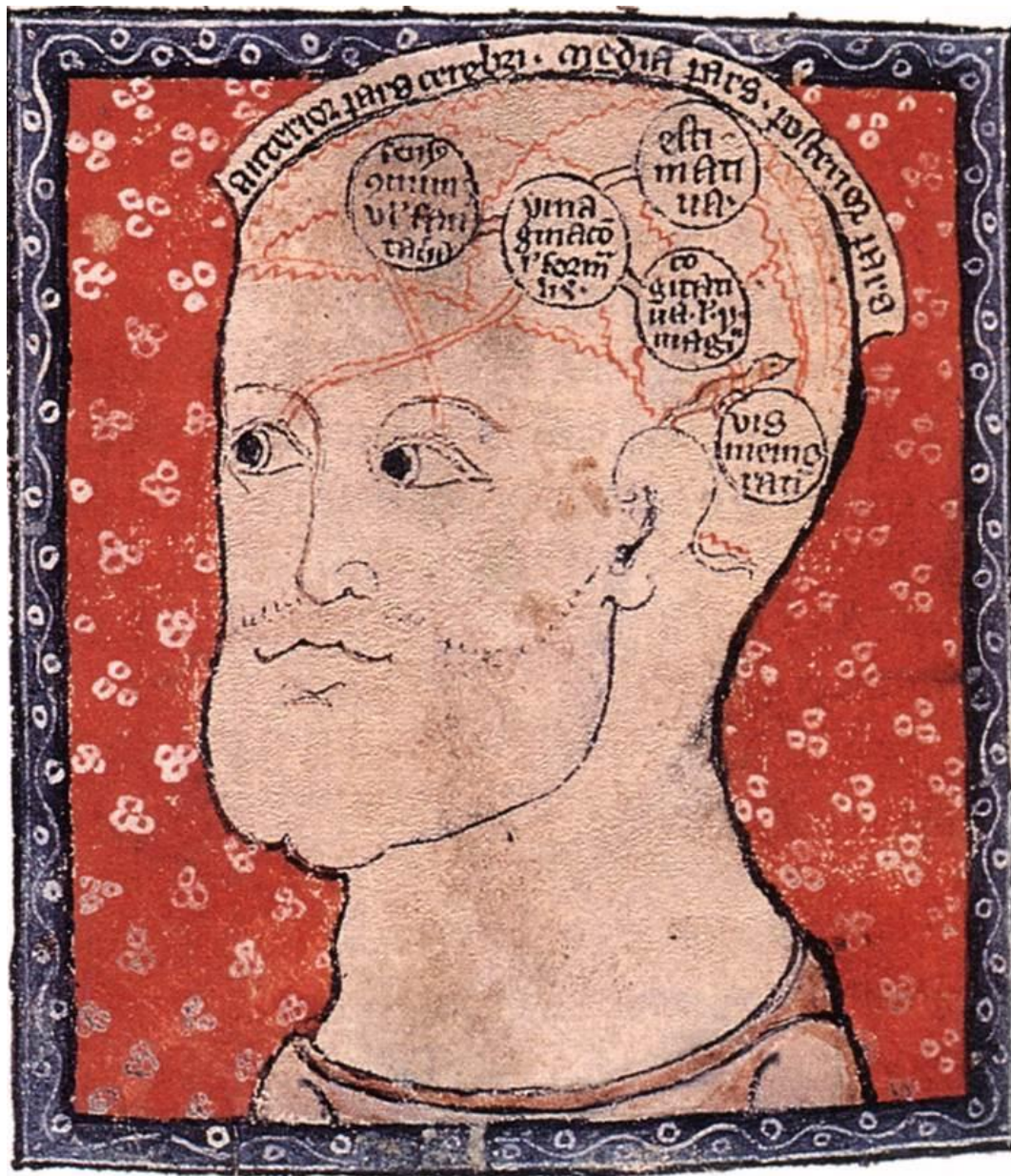
M. SPINALIS

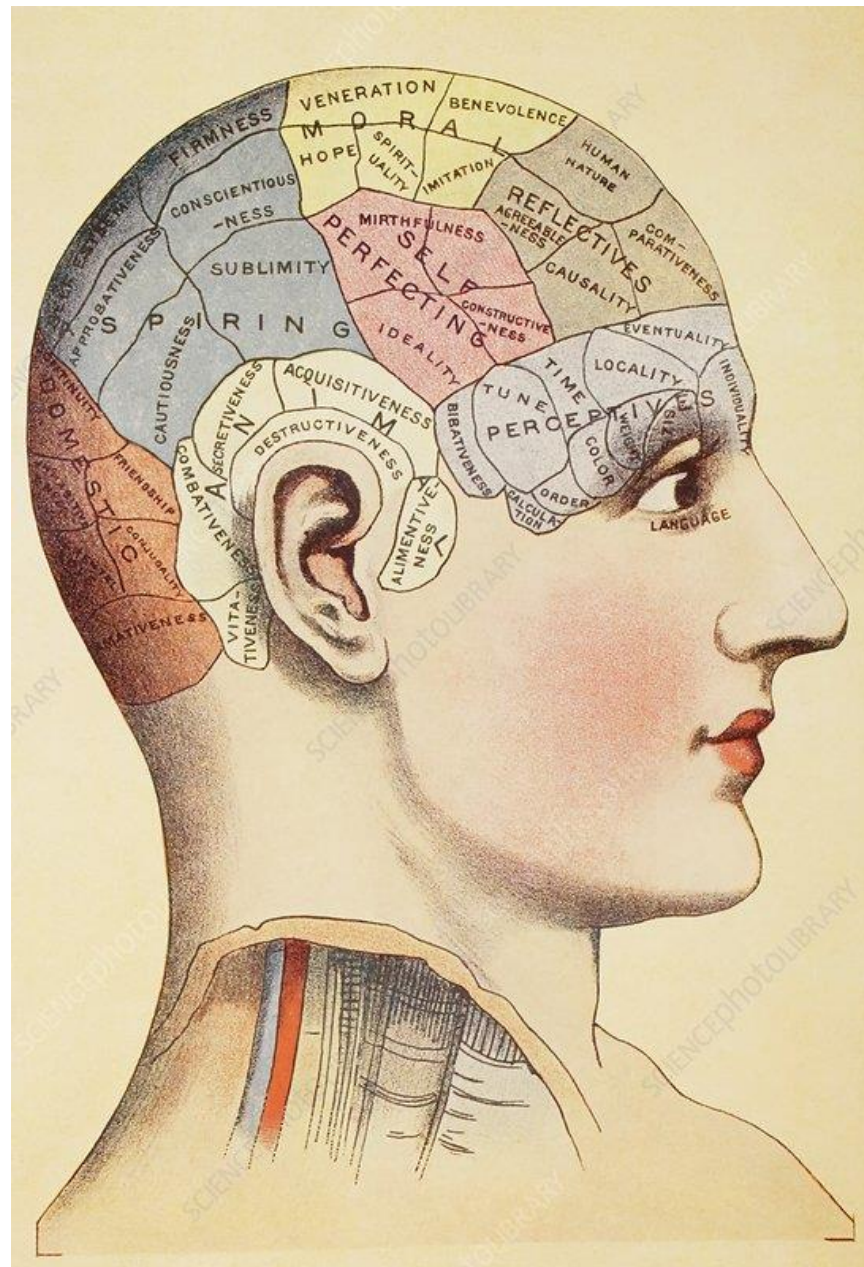




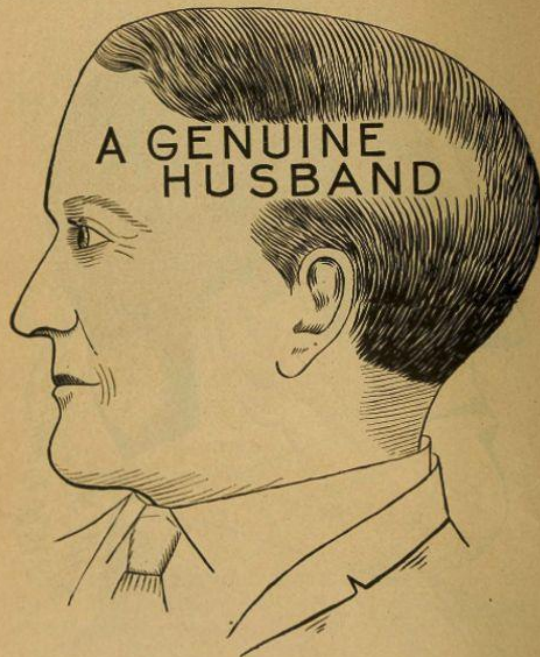
Homunculus







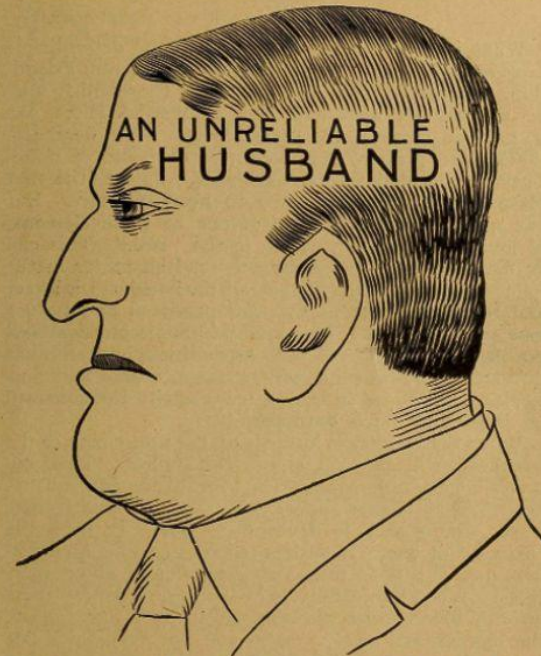
F. J. Gall (1796)
Frenologija



Young ladies, indelibly fix this shape of head in your memories. Any man who will make a natural, kind and true husband will have a head in outline from a side view like this.

PREJUDICE.

Prejudice is composed of Friendship, Parental Love, Conjugality, Inhabitiveness, Approbativeness, Veneration and Destructiveness. These elements when in the lead will give one a strong feeling for something or somebody and against the opposite.



The reason this man is an unreliable husband is because he is very weak in Conjugality and Parental Love and exceedingly strong in Amativeness. Young ladies, beware of such men as husbands.

BIGAMY.

Bigamy comes directly from Amativeness. Conscientiousness is weak and Secretiveness large.

POLYGAMY.

Polygamy is an amalgamation of Amativeness, Spirituality and Veneration. Strange, but perfectly true.

BOL



FUNKCIJE

Zaštita



Trenutne reakcije: alimentarni refleksi

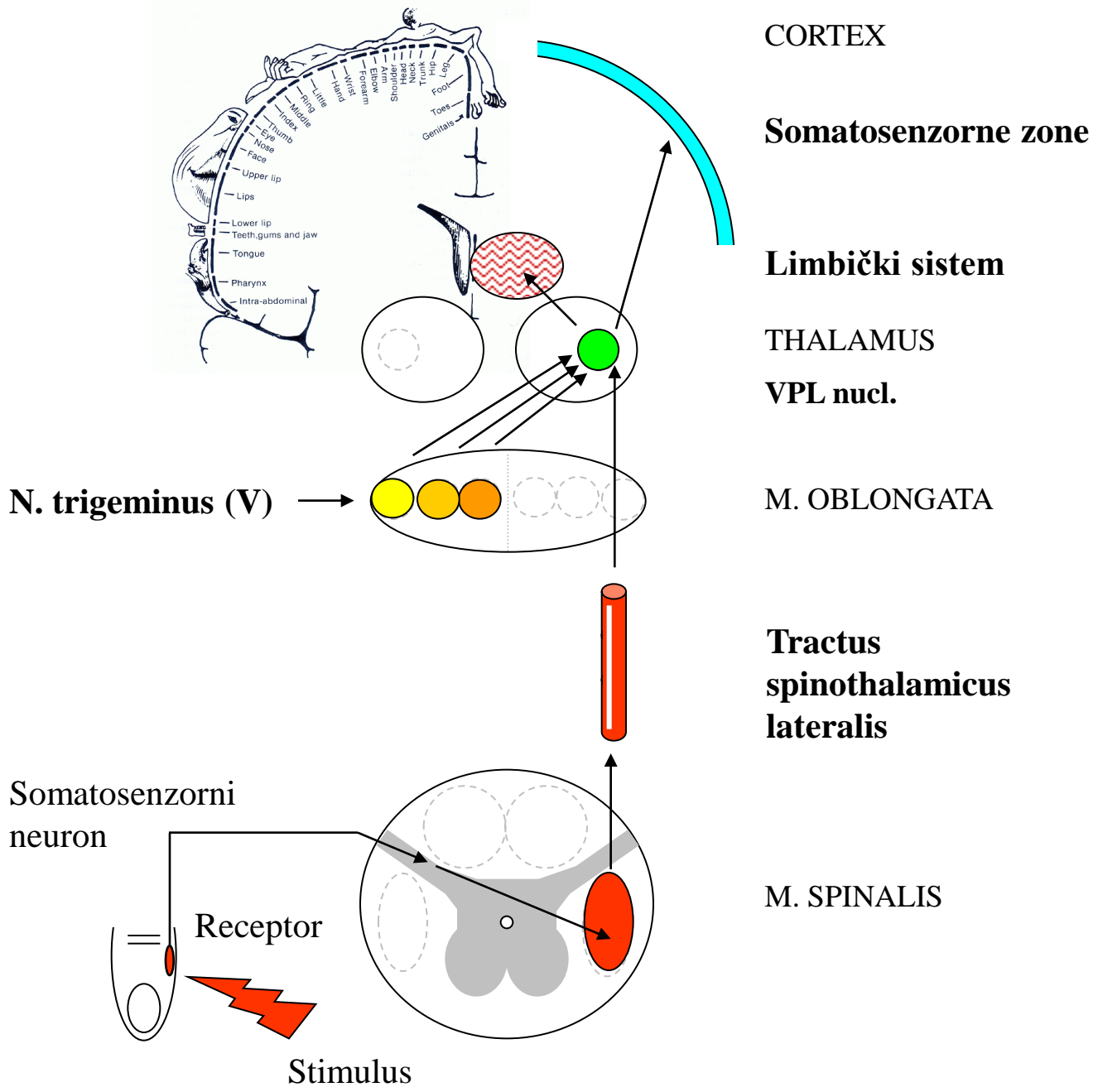
Učenje: izbegavanje ugrožavajućih objekata

DRAŽ

Prejako draženje?

Povreda tkiva?

RECEPTORI → PUTEVI → CENTRI



CORTEX

Somatosenzorne zone

Limbički sistem

THALAMUS

VPL nucl.

M. OBLONGATA

**Tractus
spinothalamicus
lateralis**

M. SPINALIS

N. trigeminus (V)

Somatosenzorni
neuron

Receptor

Stimulus

RECEPTORI → PUTEVI → CENTRI

Nociceptori

Spinotalamički
trakt

Somatosenzorni
korteks

N. trigeminus

**KOGNITIVNA
KOMPONENTA**

Limbički korteks

**AFEKTIVNA
KOMPONENTA**

INTENZITET

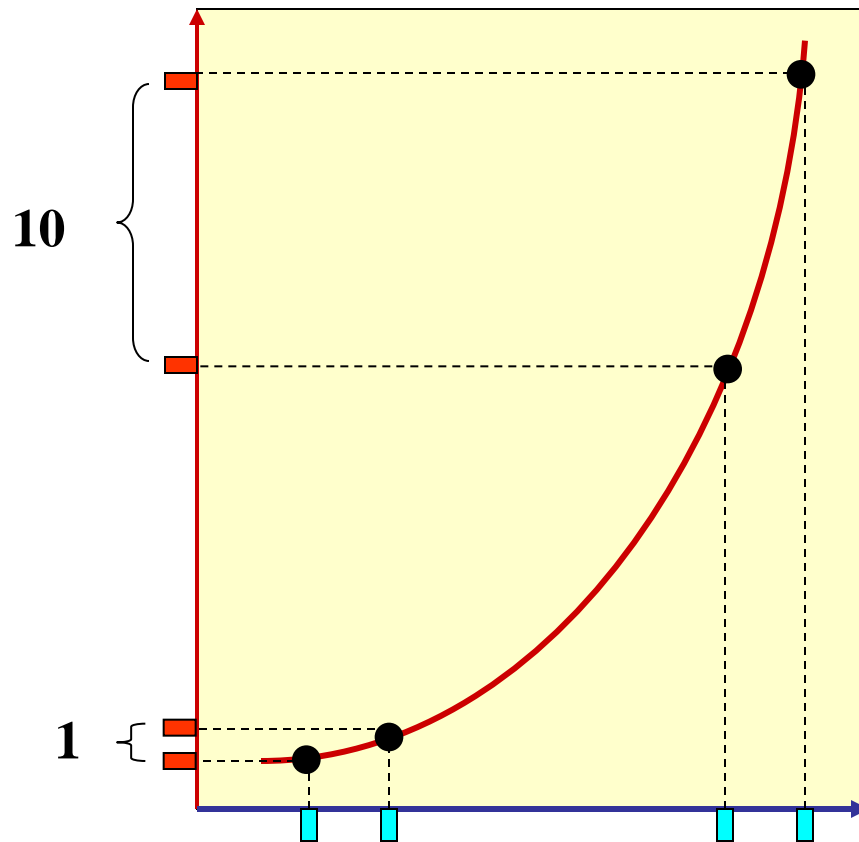
Instrumenti: **algezimetri, dolorimetri**

Subjektivna jedinica: **dolor**

INTENZITET

Ψ - Φ funkcija

DOLOR Ψ



Φ PRITISAK

ADAPTACIJA

Slaba!

ANALGETICI

Prirodni: **endorfin, enkefalin**

Veštački: **morfin, kokain**

SENZITIZACIJA

Fantomski ud!

KVALITET

Tup, dugotrajan bol

Tr. paleo-spinothalamicus

C vlakna (sporija): 0,5 - 1,2 m/s

Duža latencija



Nestaje pri delovanju **kokaina**

Oštar, kratkotrajan bol

Tr. neo-spinothalamicus

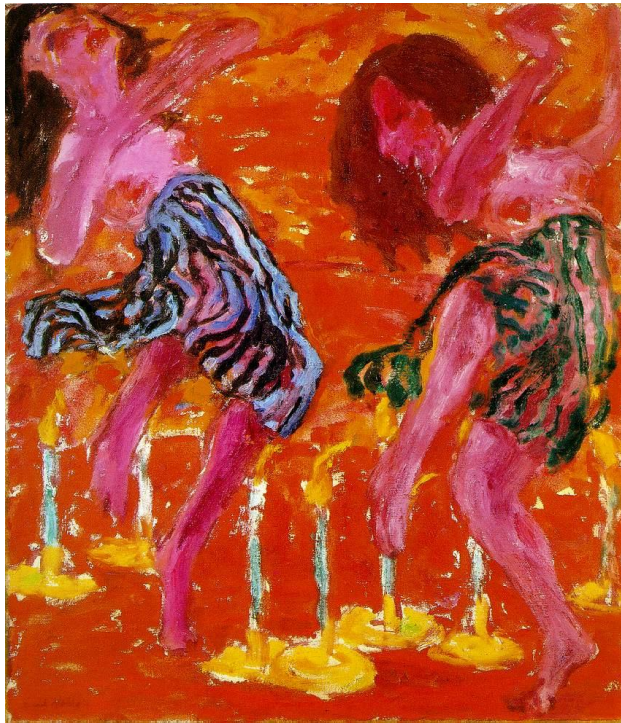
A δ vlakna (brža): 12 - 36 m/s

Kraća latencija

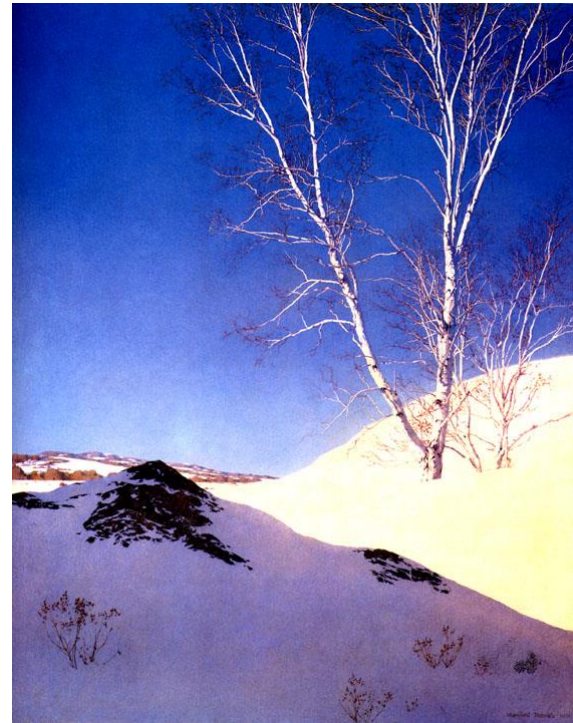


Nestaje pri **ishemiji**

TOPLO



HLADNO



FUNKCIJA

Svesna komponenta sistema termoregulacije

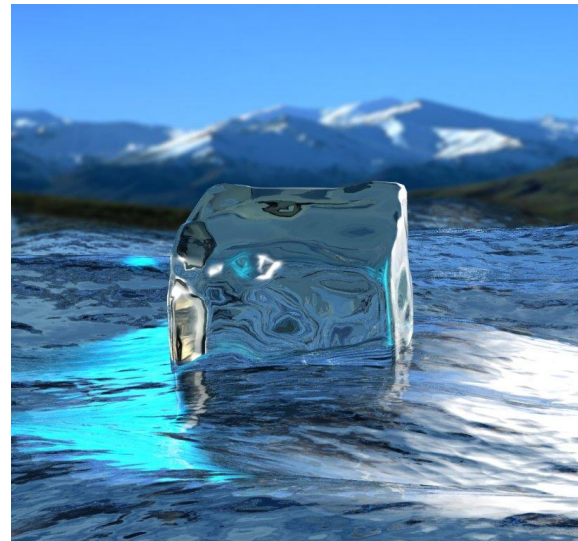
DRAŽ

Toplotna energija

TOPLO

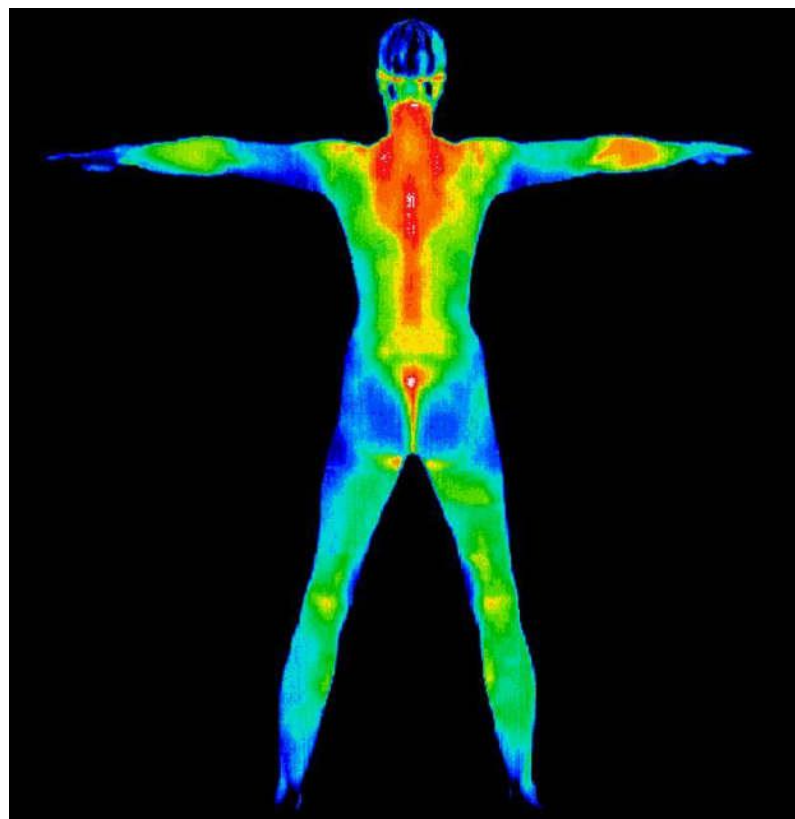


HLADNO



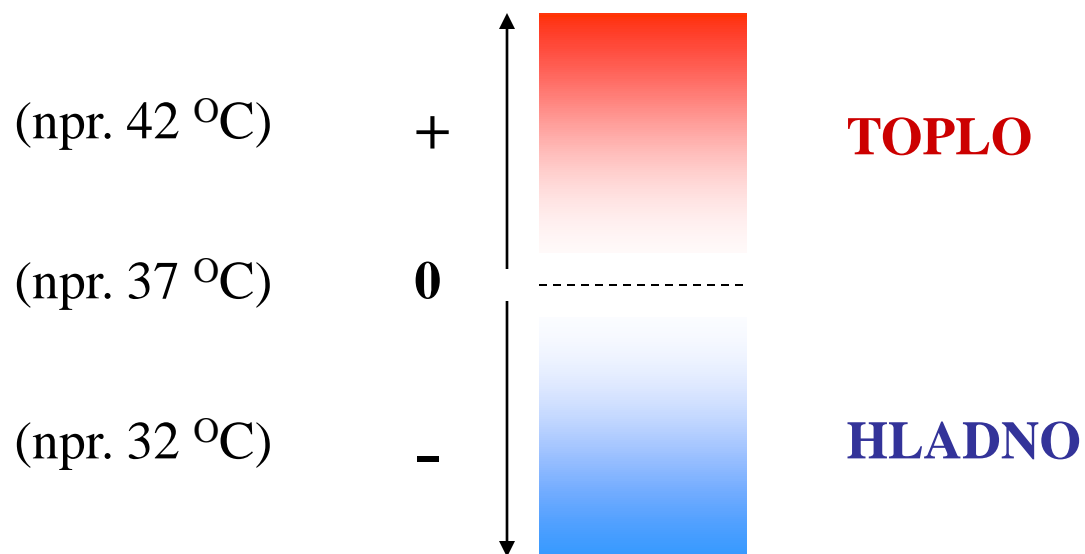
DRAŽ

Fiziološka nula



DRAŽ

Fiziološka nula



RECEPTORI

Termoreceptori

T. SPECIFIČNE ENERGIJE (*von Frey*)

Specijalizovani inkapsulirani receptori

Rufinijevi cilindri => **Toplo**

Krauzeova telašca => **Hladno**

RECEPTORI

Termoreceptori

VASKULARNA T. (*Nafe & Wagoner, 1936*)

Slobodni nervni završeci u krvnim sudovima

Vazodilatacija => **Toplo**

Vazokonstrikcija => **Hladno**

RECEPTORI

Termoreceptori

VASKULARNA T. (*Nafe & Wagoner, 1936*)

Slobodni nervni završeci u krvnim sudovima

ali

1. *Jenkins*: Nejednak broj tačaka za **TOPLO** (1-2) i **HLADNO** (10)
2. Veštačka vazomotorika => nema termorecepcije

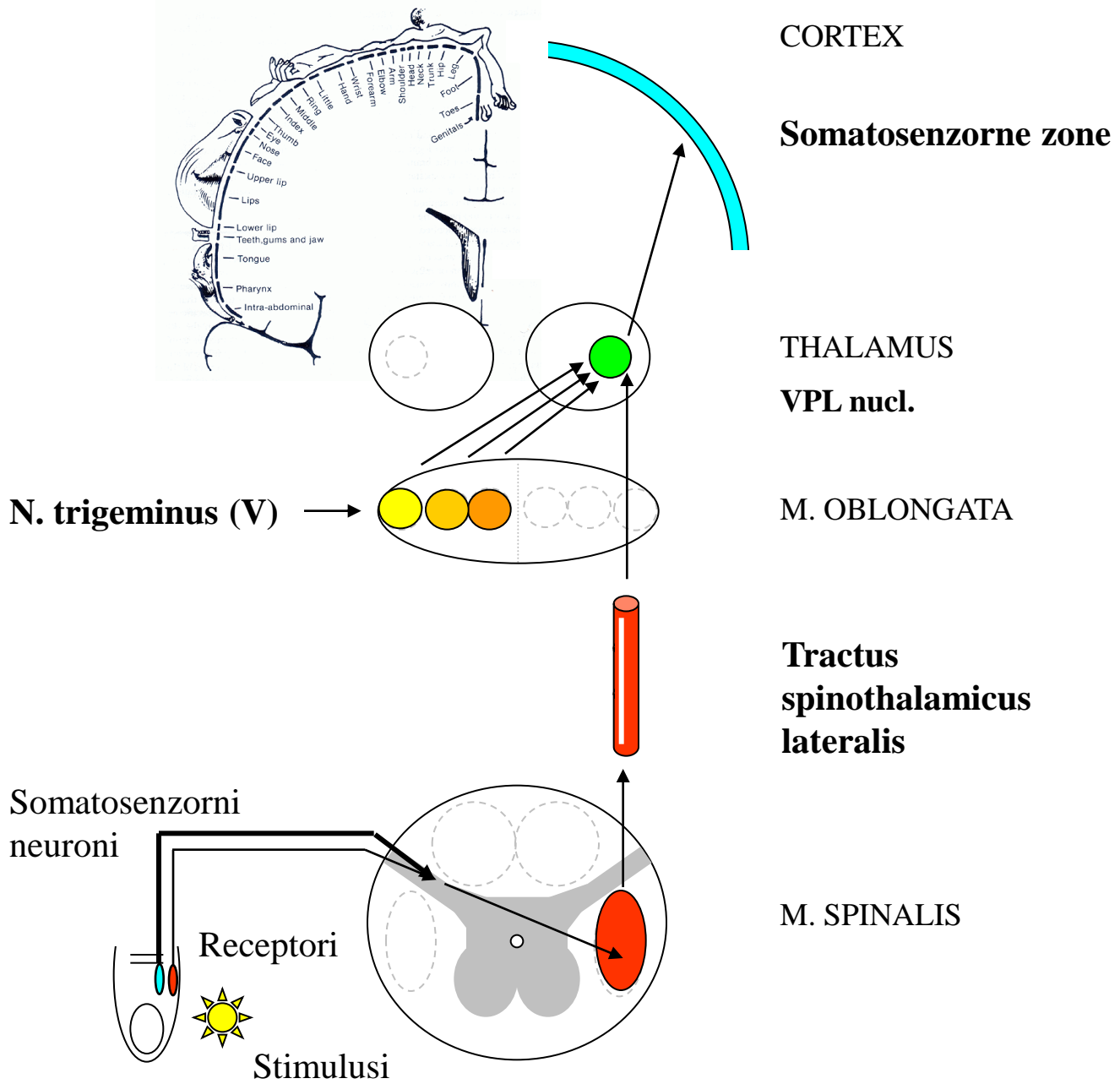
PUTEVI

TOPLO

C vlakna (sporija): 0,5 – 1,2 m/s

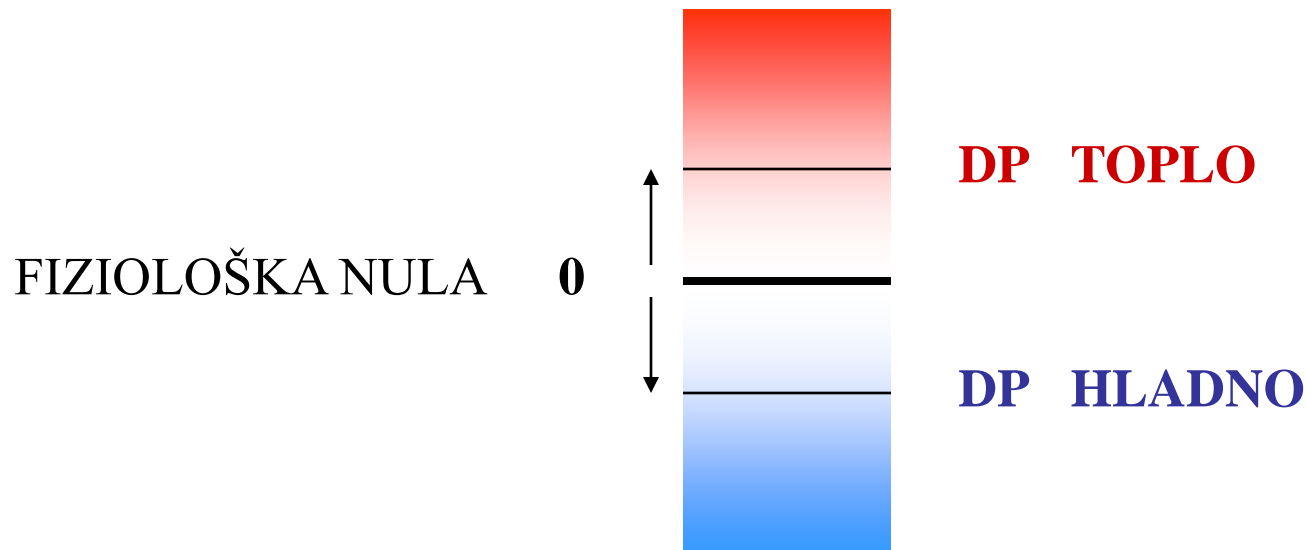
HLADNO

A δ vlakna (brža): 12 – 36 m/s



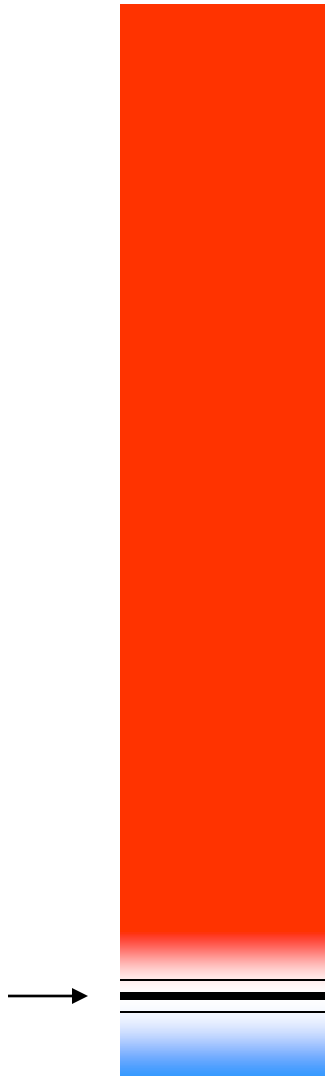
INTENZITET

DP zavisi od fiziološke nule



°C

50
49
48
47
46
45
44
43
44
43
42
41
40
39
38
37
36



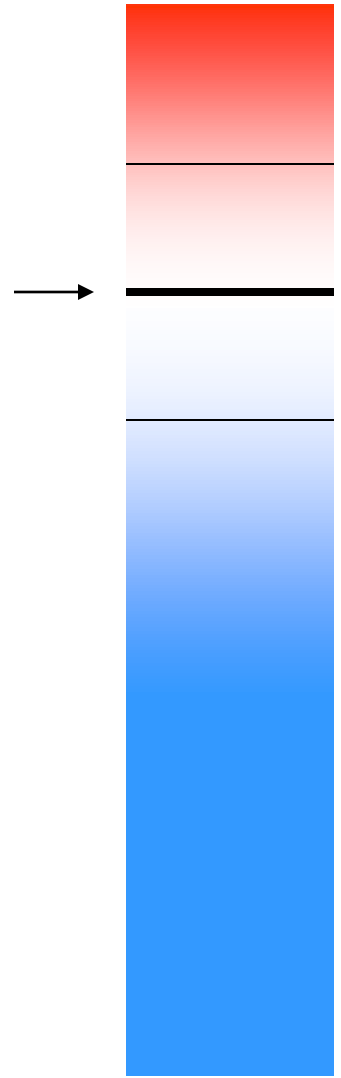
°C

50
49
48
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37
36



°C

50
49
48
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38
37
36



INTENZITET

Paradoksalni osećaj hladnog

TOPAO STIMULUS

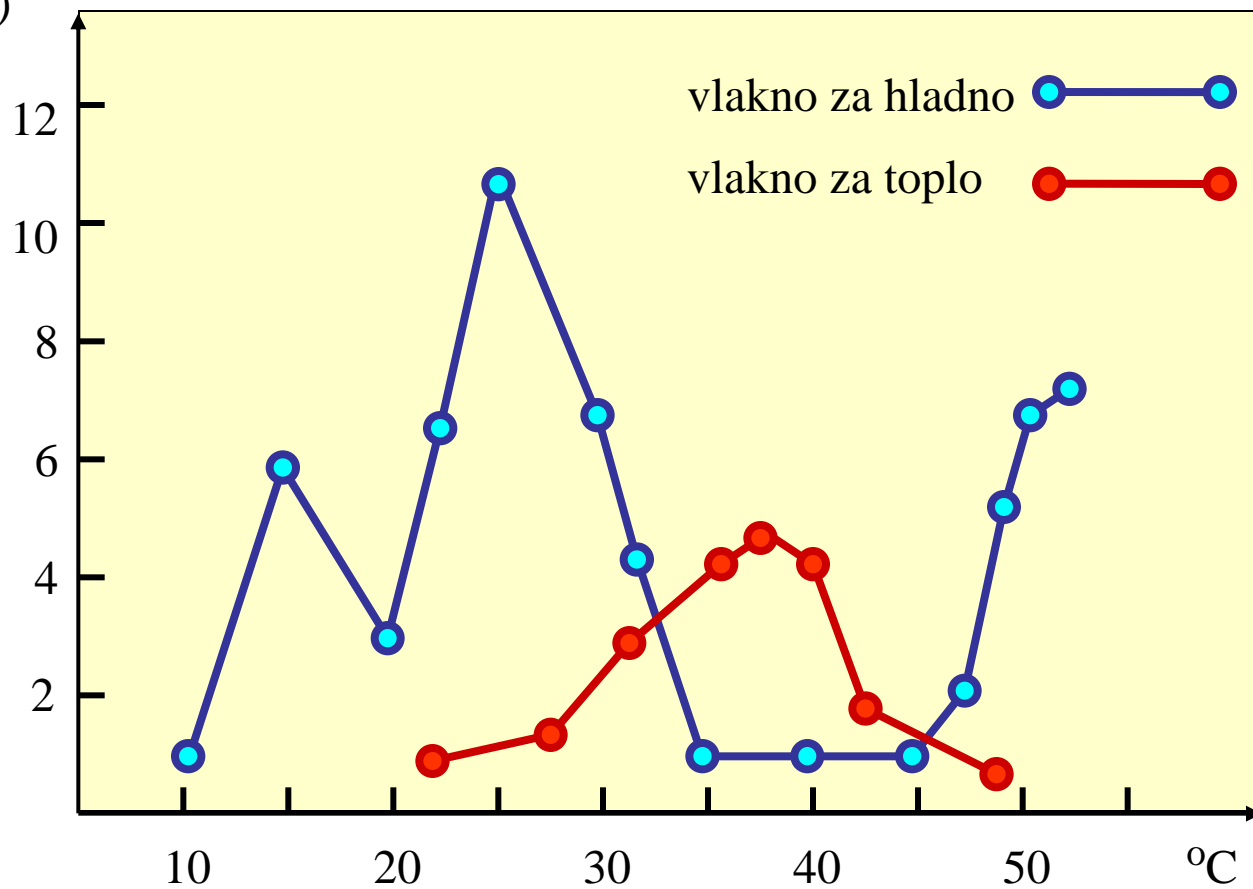


OSET HLADNOG

INTENZITET

Zotterman, 1953

N. impulsi (Hz)

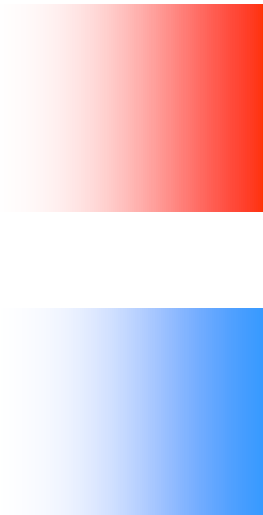


ADAPTACIJA

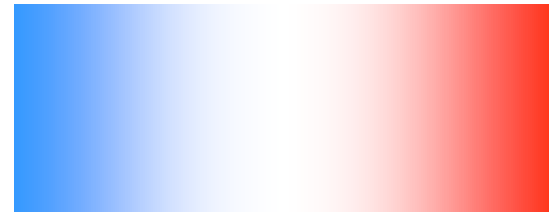
Najjača na temperaturu oko fiz. nule

KVALITET

Dve dimenzije



Jedna bipolarna dimenzija



DODIR



FUNKCIJE

Eksploracija objekata

Socijalni kontakti

DRAŽ

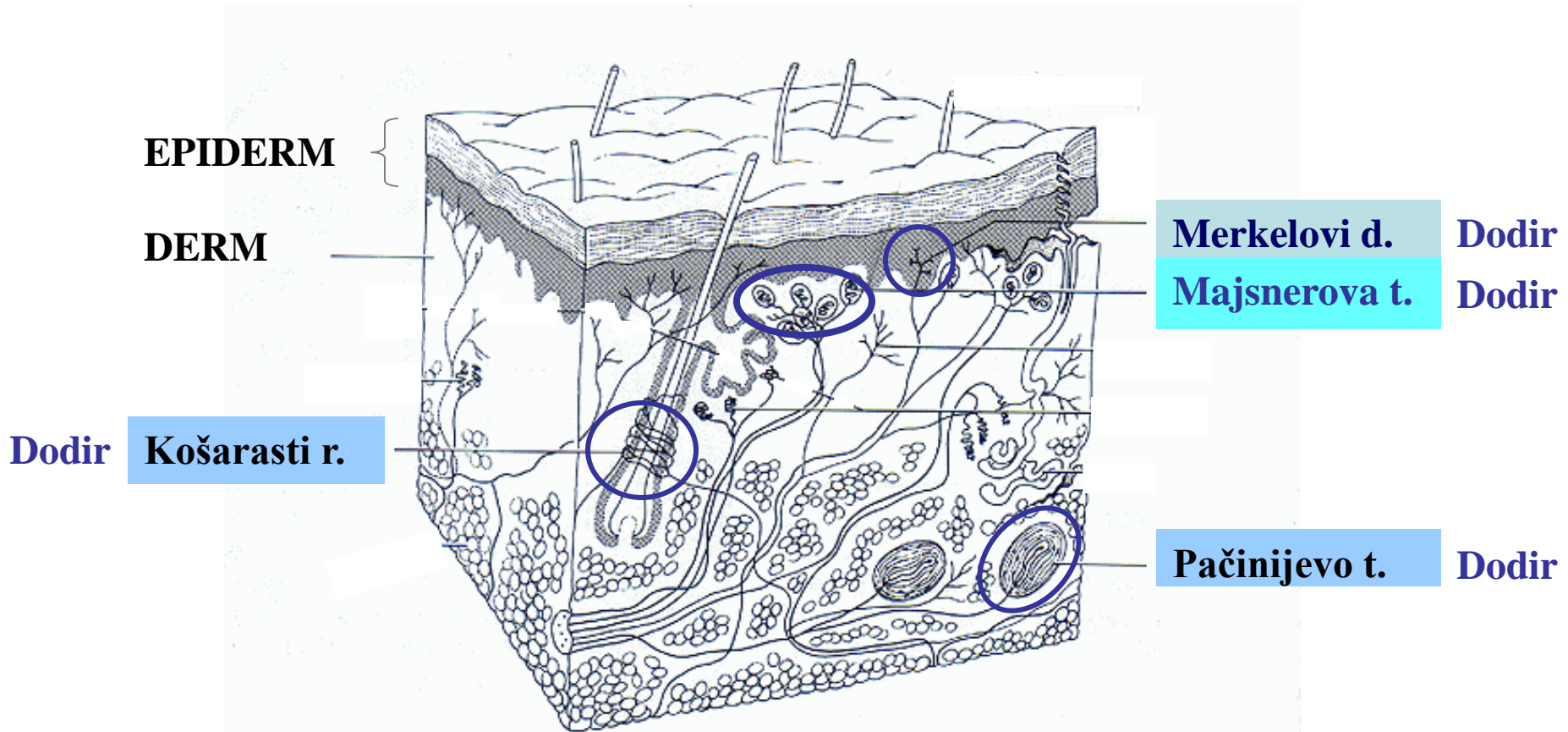
Mehanička deformacija kože

- Veličina d.
- Brzina d.
- Gradijent d.

(Majsnerov opit)

RECEPTORI

Mehanoreceptori



RECEPTORI → PUTEVI → CENTRI

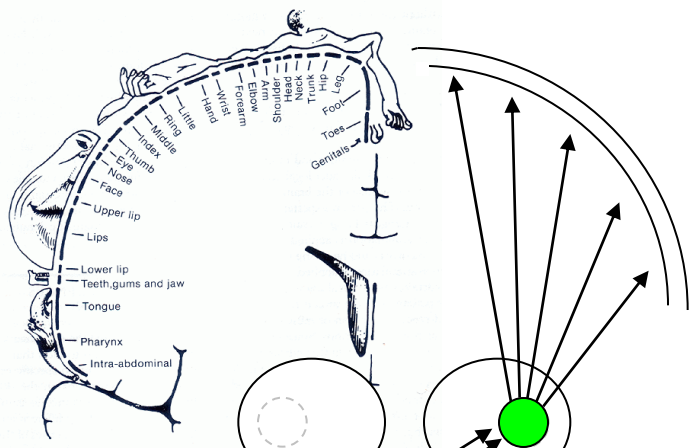
Mehanoreceptori

Medijalni
lemniskus

Somatosenzorni
korteks

N. trigeminus

A β vlakna: 42-72 m/s

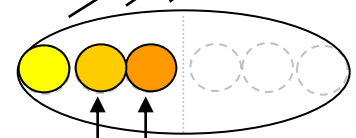


CORTEX
Somatosenzorne zone

THALAMUS
VPL nucl.

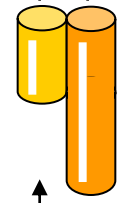
M. OBLONGATA

N. trigeminus (V)
 ophthalmicus
 maxillaris
 mandibularis

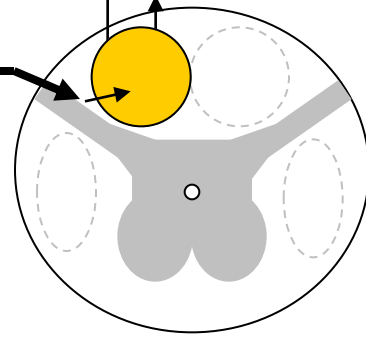


Lemniscus medialis

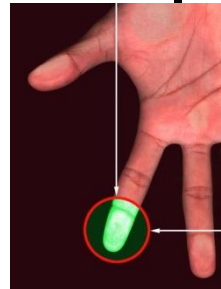
f. cuneatus
 f. gracilis



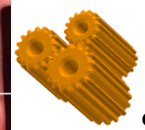
Somatosenzorni neuron



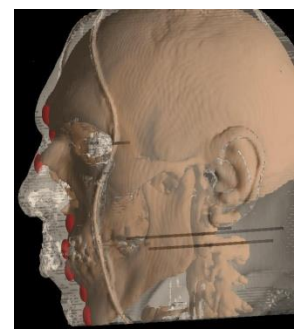
M. SPINALIS



Receptor



Stimulus



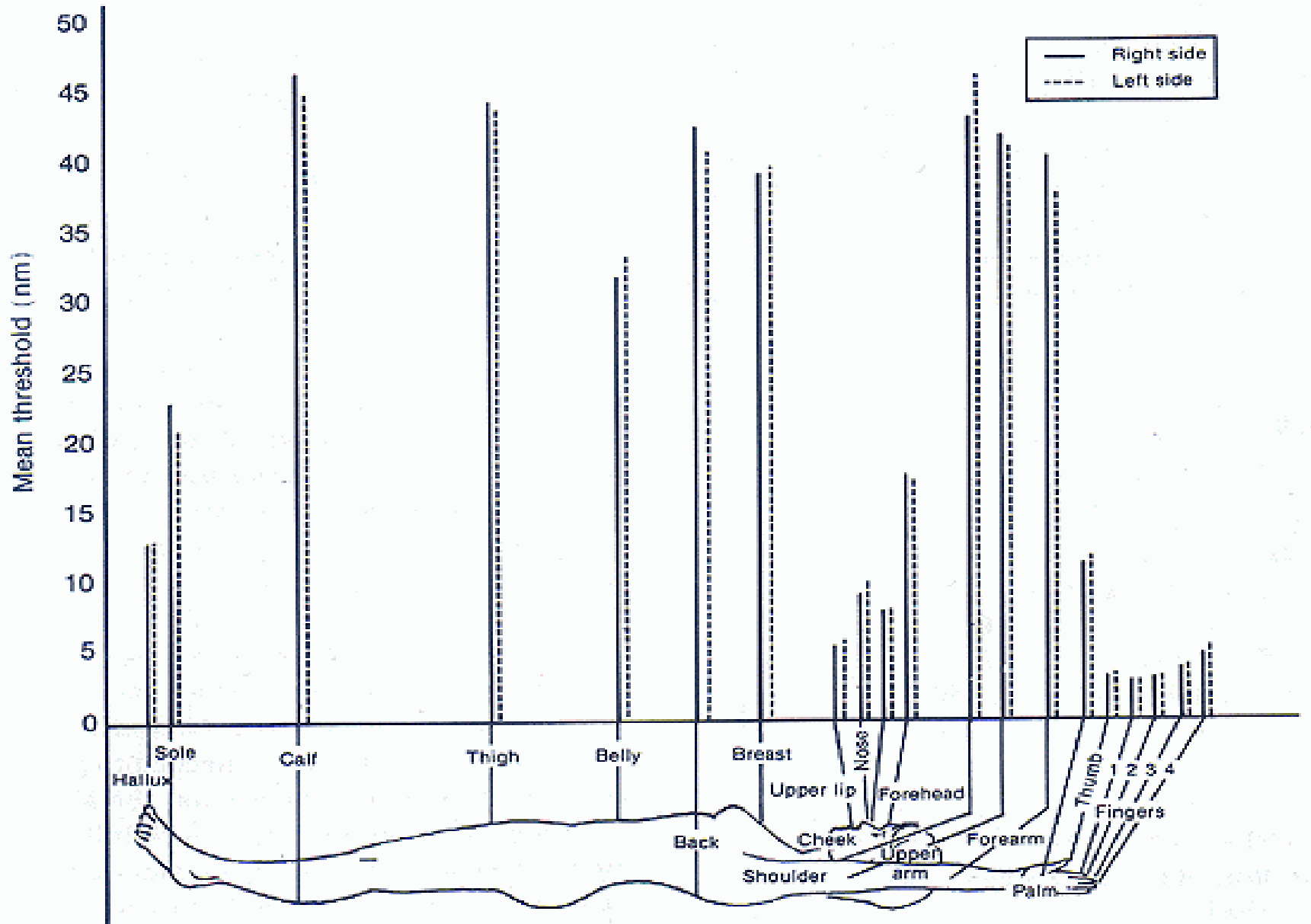
INTENZITET

Donji prag

Diferencijalni prag

Prostorni prag

Lokalizacija



INTENZITET

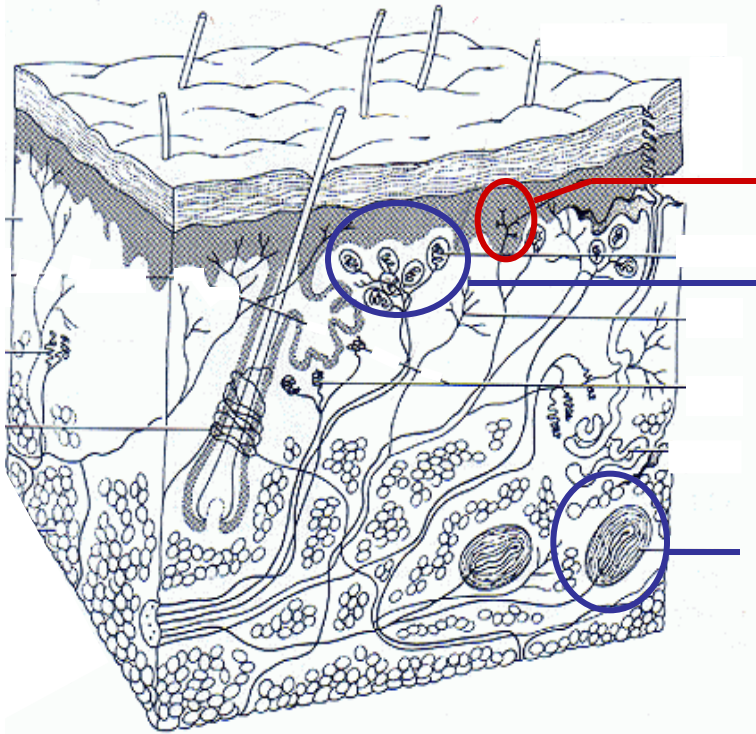
Donji prag: faktori

- Mesto na koži
- Temperatura: Hladno \Rightarrow viši prag
- Kontaktna površina: Veća p. \Rightarrow viši prag

ADAPTACIJA

RECEPTORI

ADAPTACIJA



Merkel

spora

Majsner

brza

Pačini

brza

KVALITET

Glatko, hrapavo ...

Različite *senzacije* ili različiti *percepti*?

EKSPLORATORNE AKTIVNOSTI

Pipanje, hvatanje, manipulacija ...



HAPTIČKA PERCEPCIJA

Aktivna eksploracija objekata



HAPTIČKA PERCEPCIJA

Pasivni i **aktivni** dodir



KOŽA



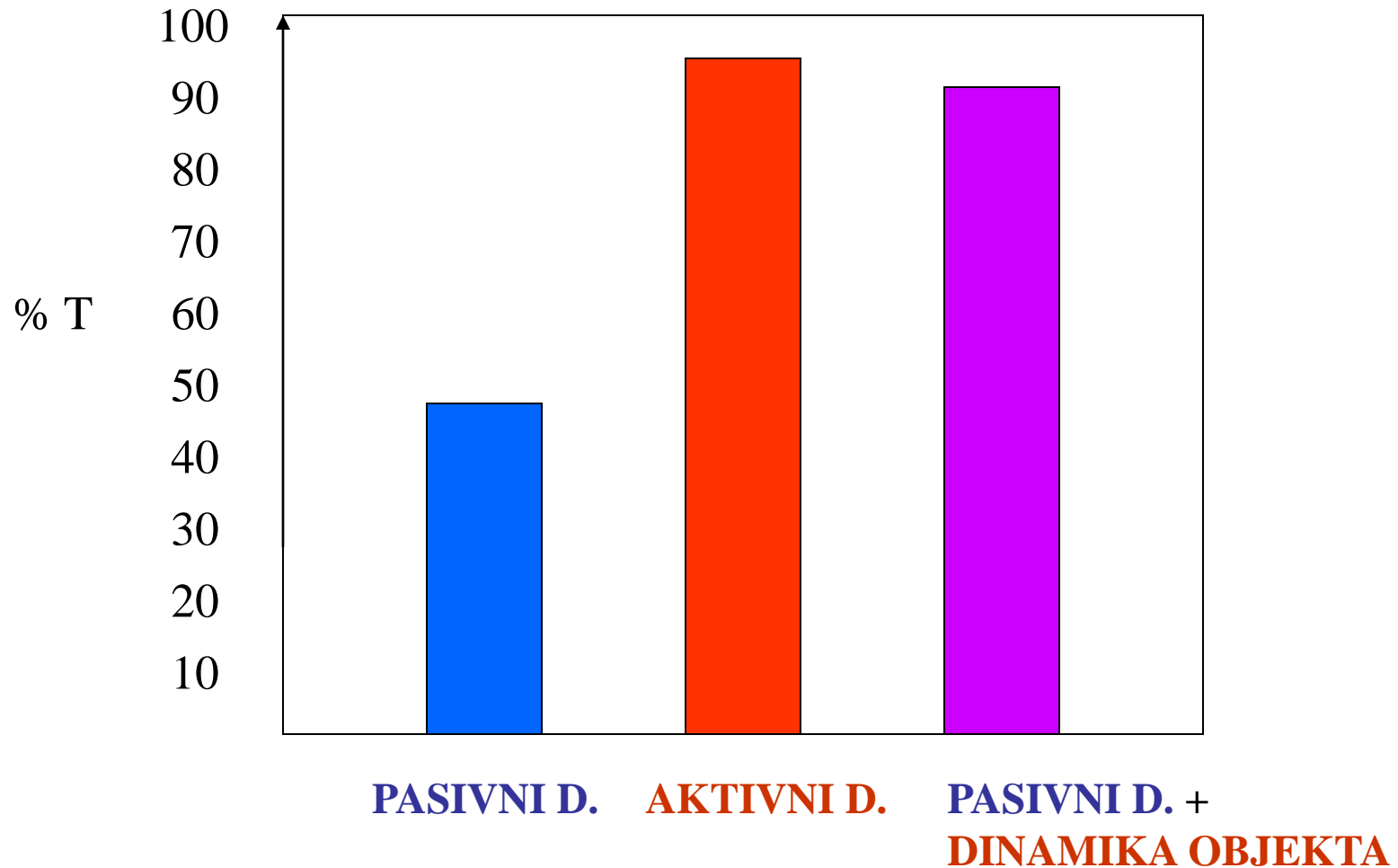
KOŽA

KINESTEZIJA

- Zglobovi
- Mišići

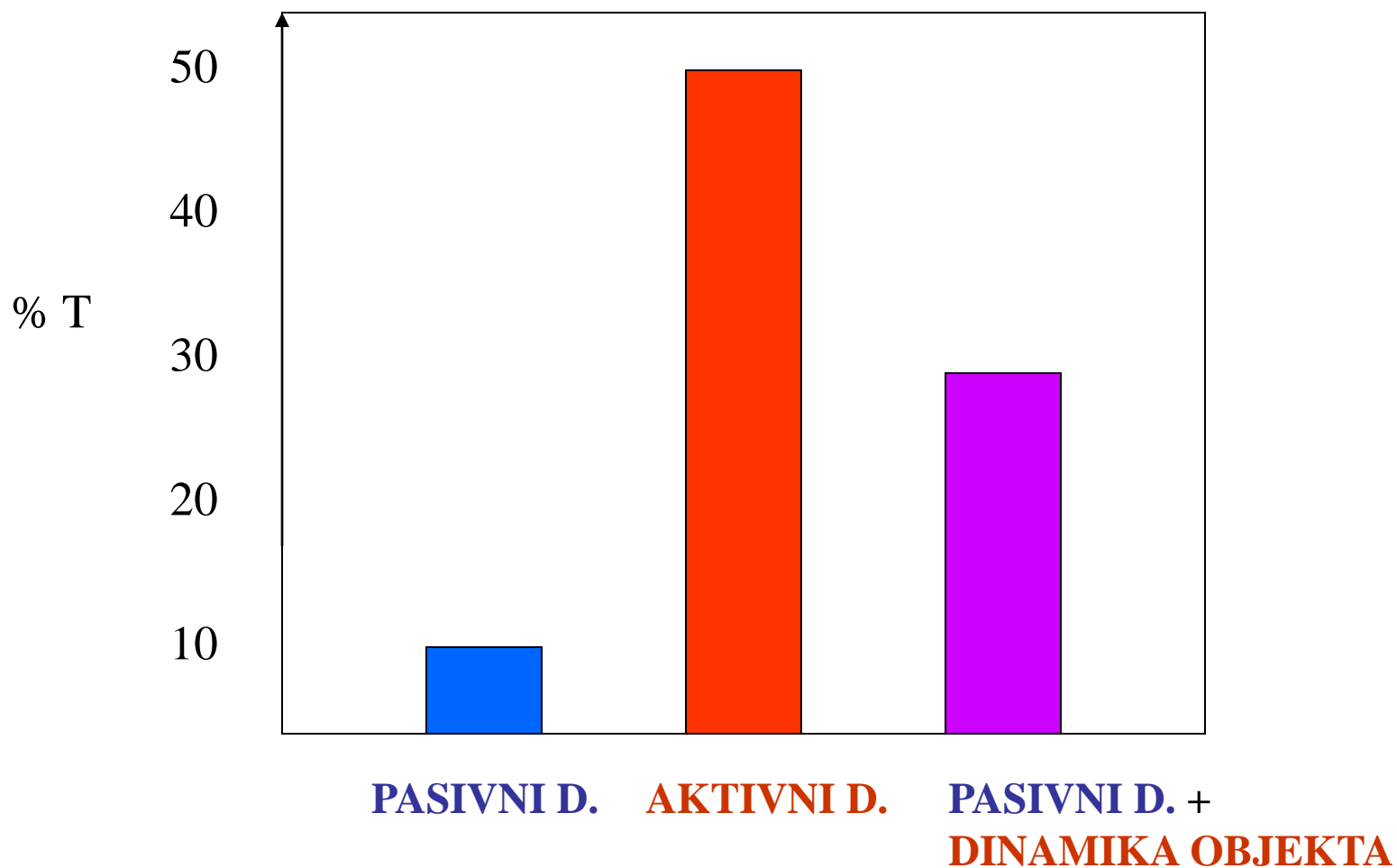
HAPTIČKA PERCEPCIJA

J. J. Gibson, 1962: “cookie cutters”



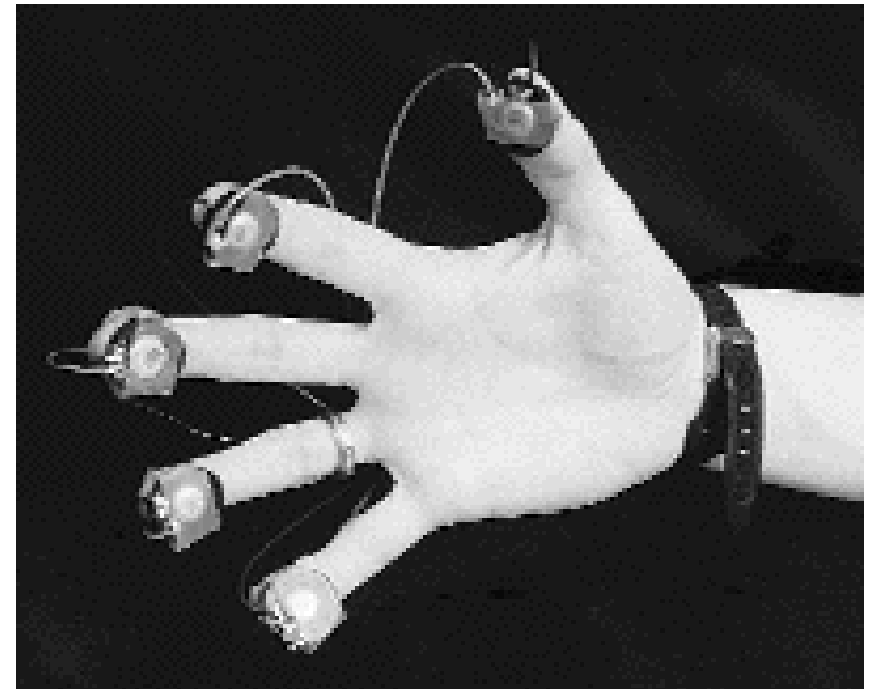
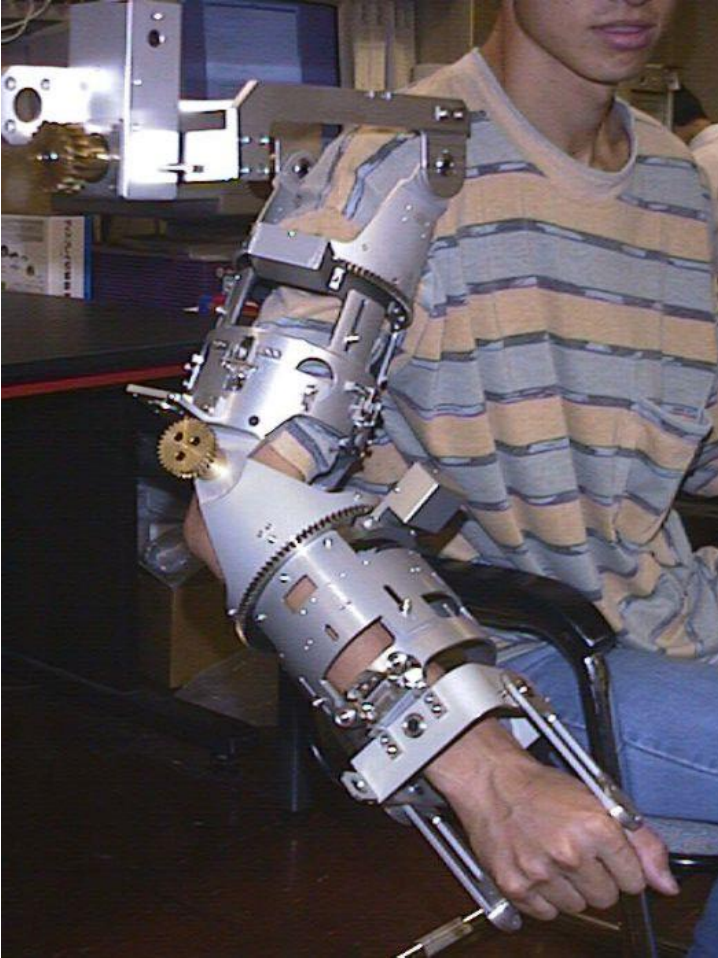
HAPTIČKA PERCEPCIJA

M. Heller, 1986: Brajova (Braille) azbuka

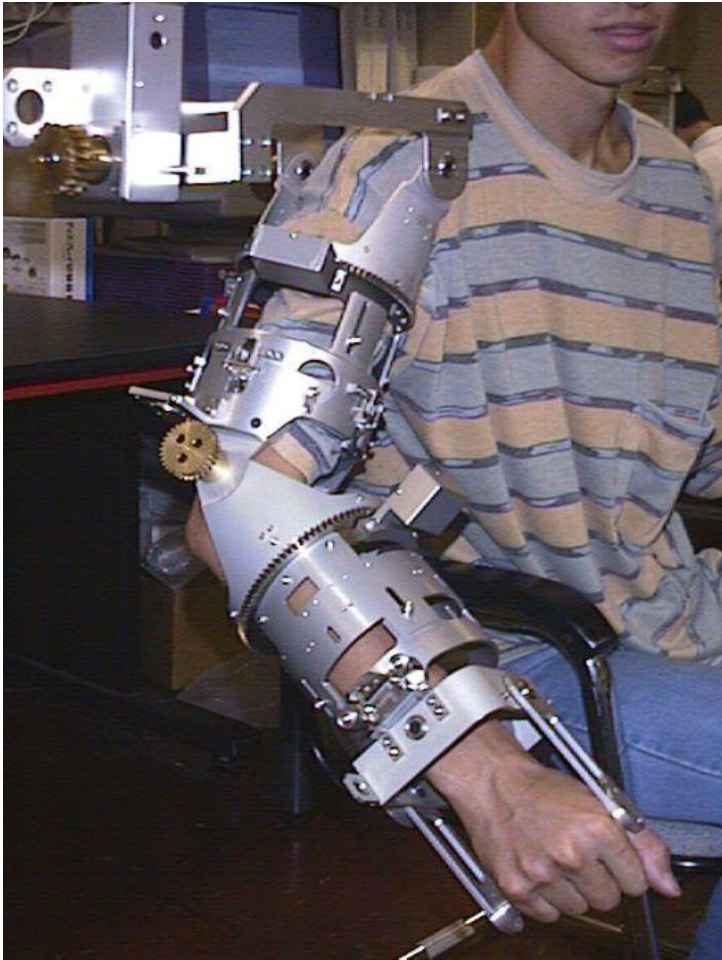


HAPTIČKA PERCEPCIJA

Instrumenti



HAPTIČKA PERCEPCIJA



Instrumenti

