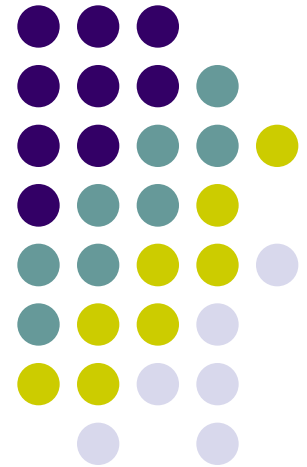


Kako živčna celica obdeluje informacije?

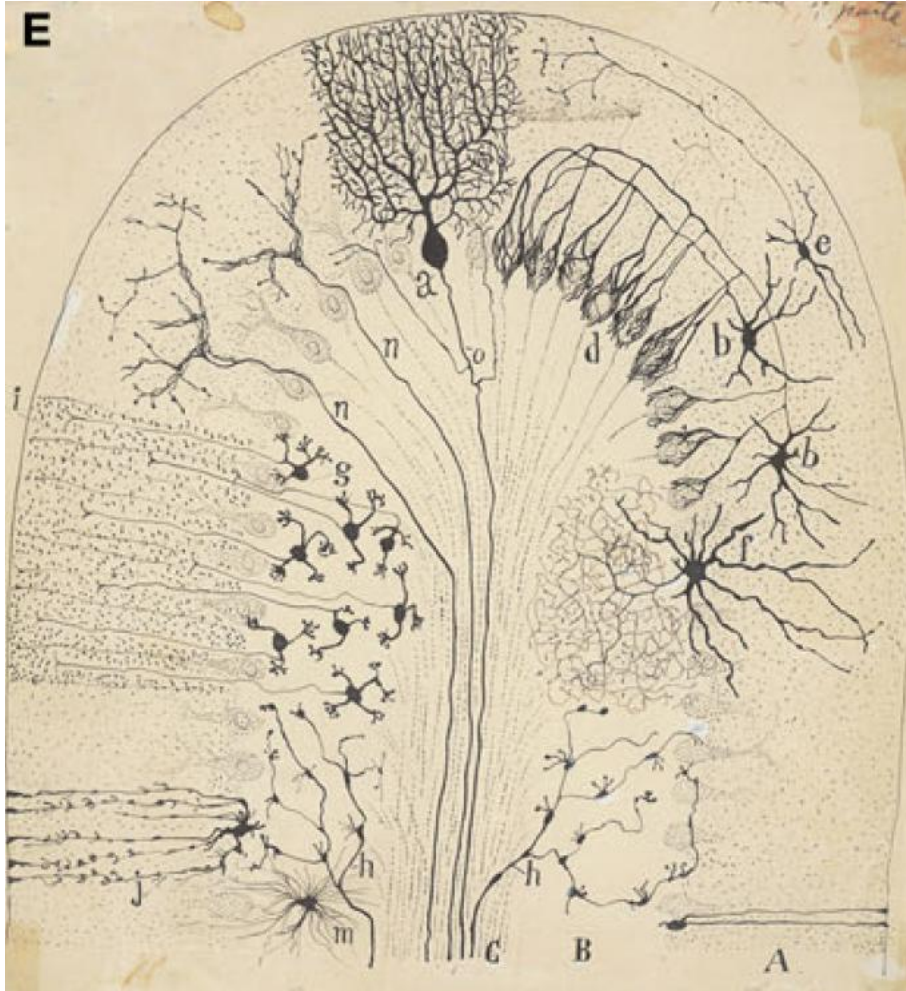
How does a nerve cell
process information?

Gregor Zupančič

UL BF Oddelek za biologijo
Katedra za nevrobiologijo,
fiziologijo in etologijo



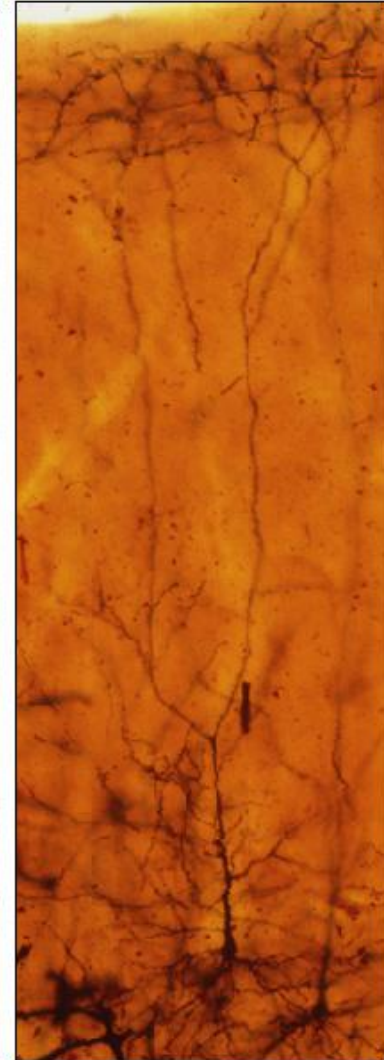
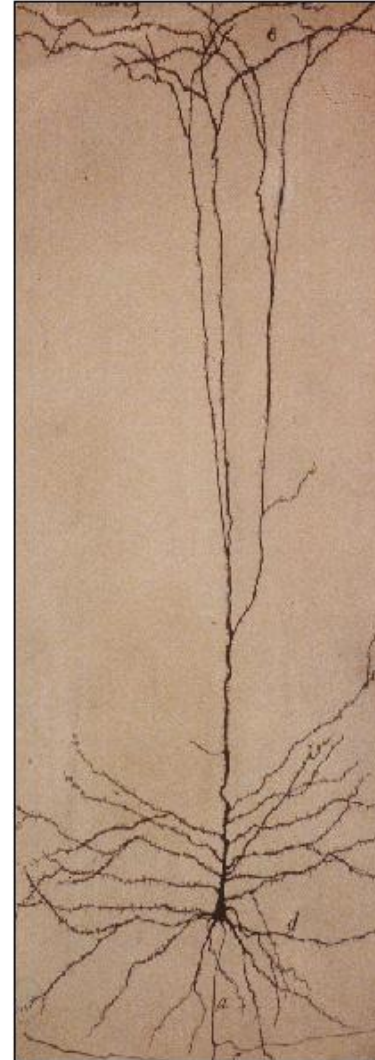
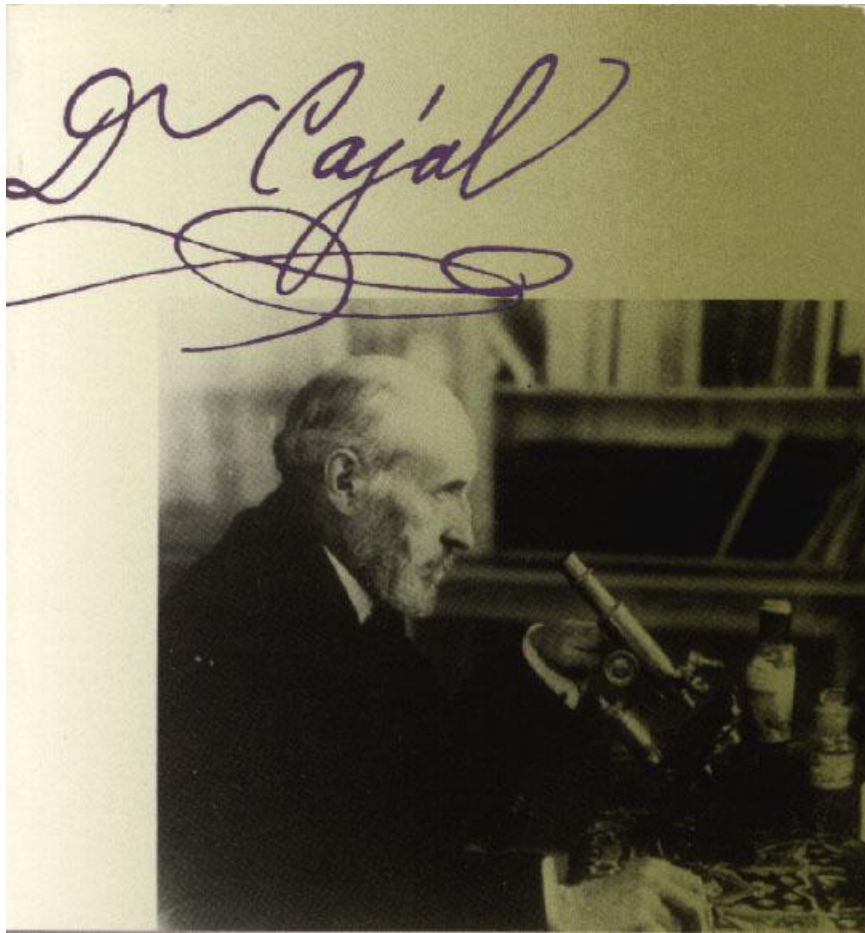
Živčna celica ali nevron



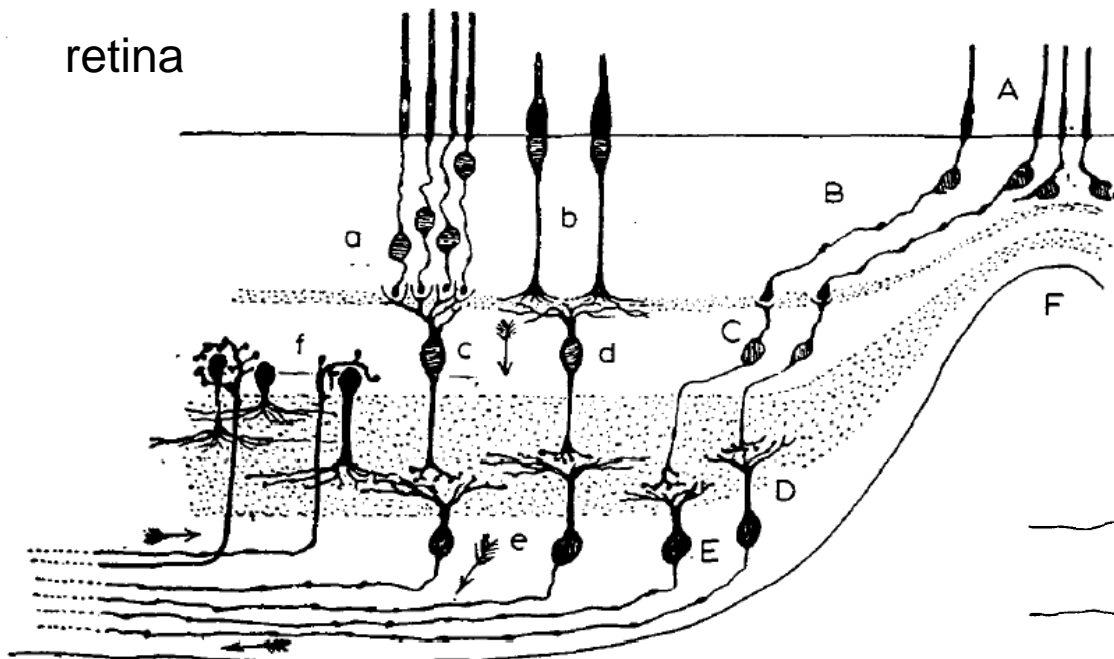
- V čem se živčne celice razlikujejo od ostalih celic?
- Kakšno vlogo igra oblika pri delovanju živčni celic?
- Kakšno je razmerje med živčno celico in omrežjem živčnih celic z vidika obdelave informacij?



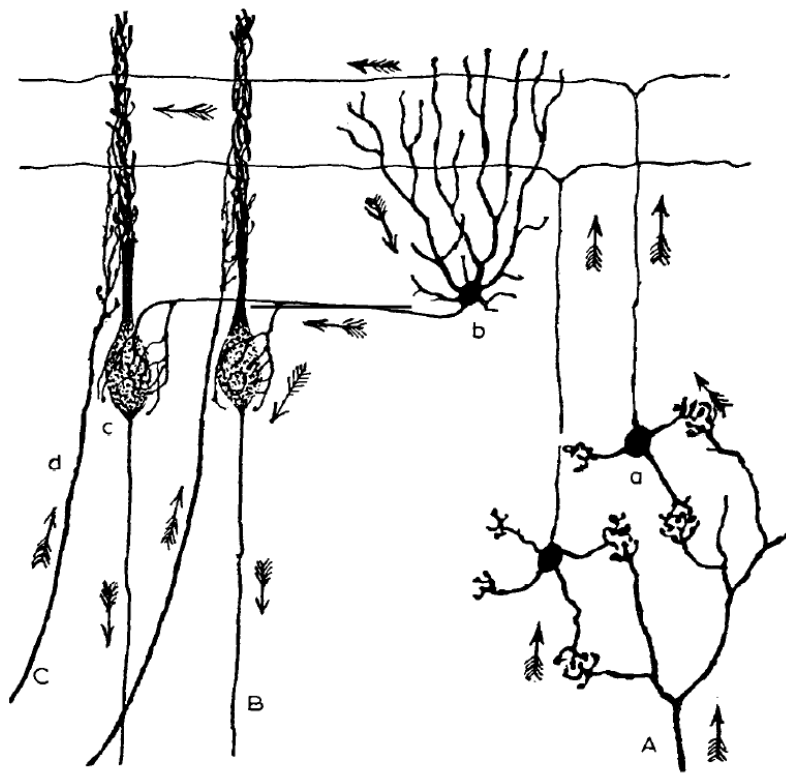
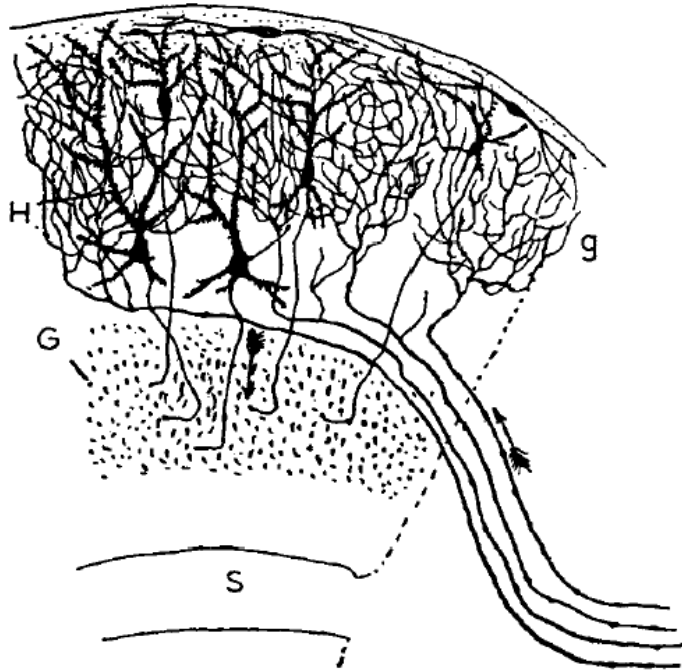
Santiago Ramon y Cajal



retina

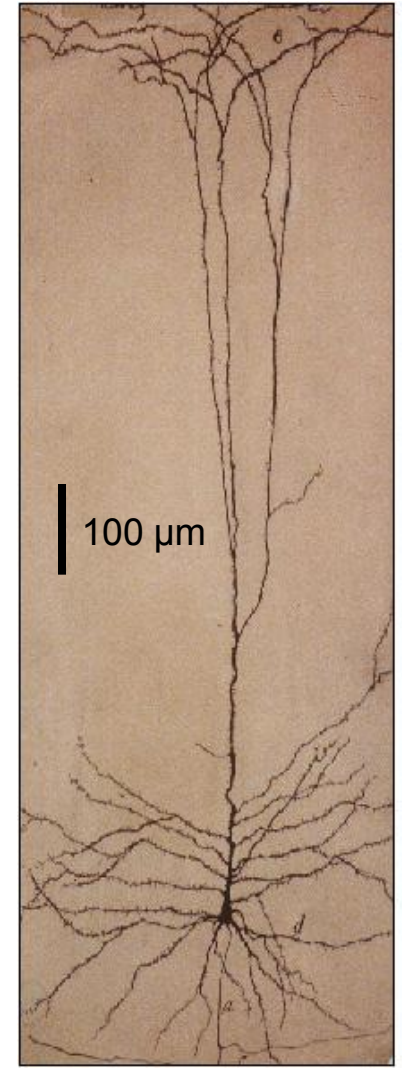
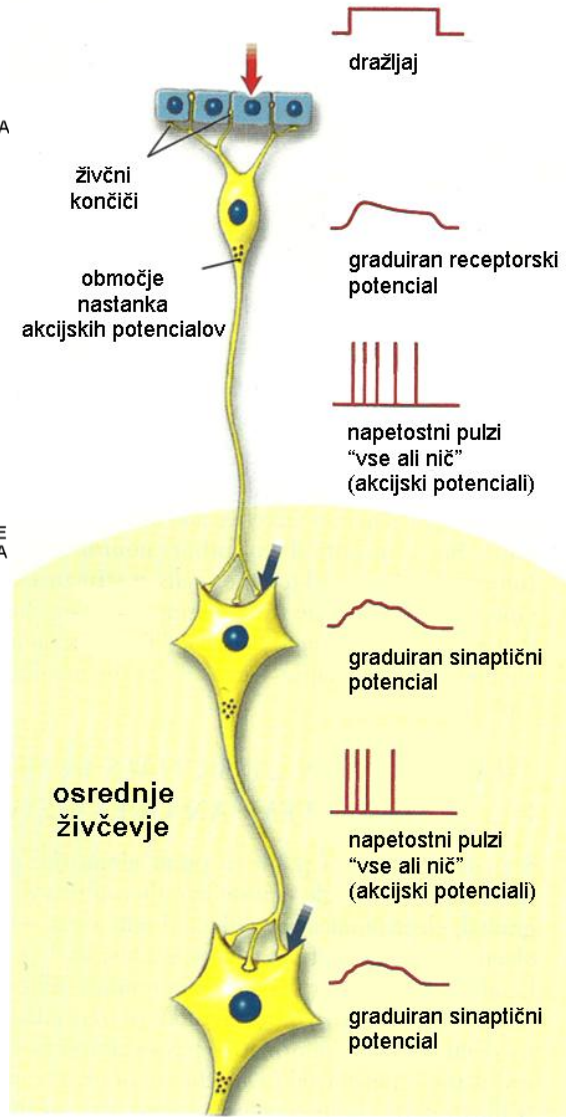
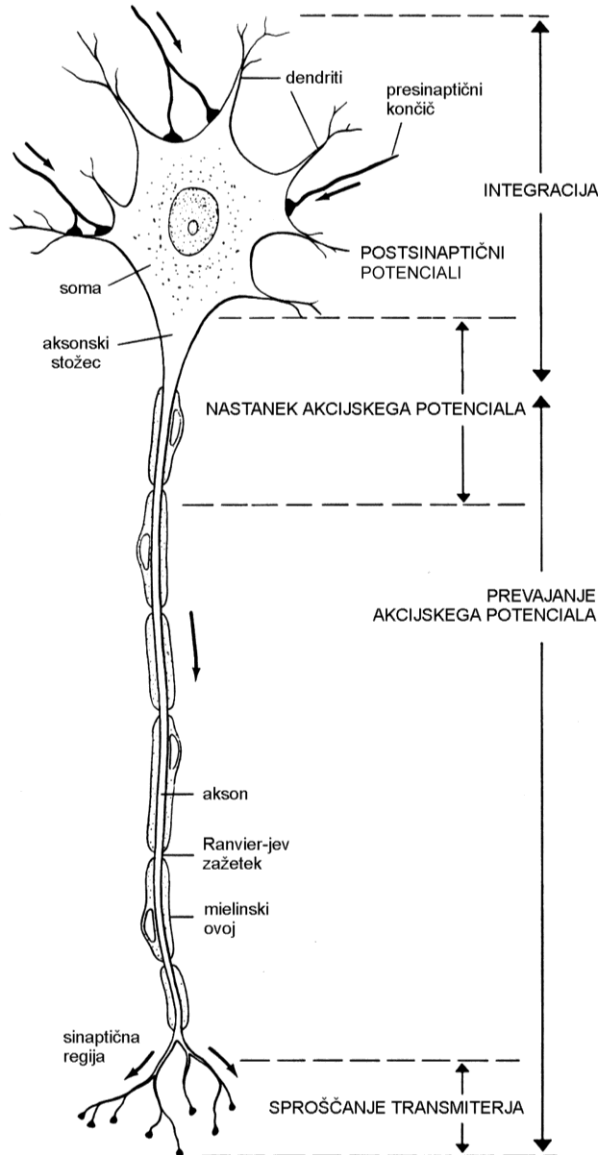


Lateralno genikulatno jedro

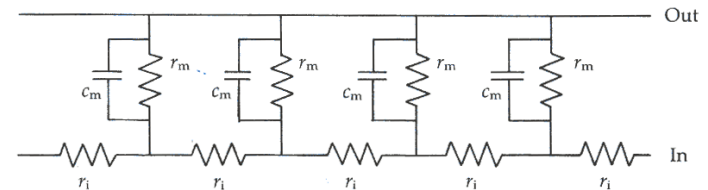
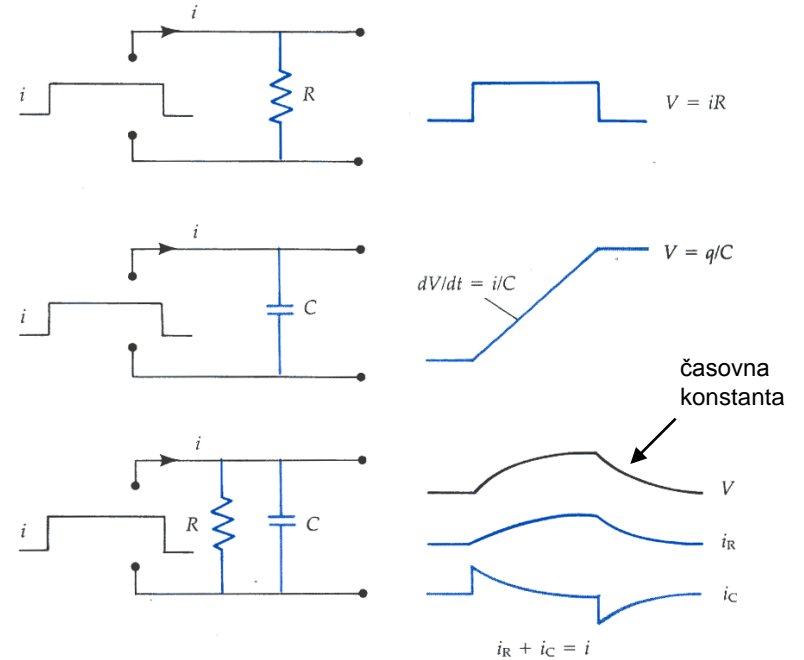
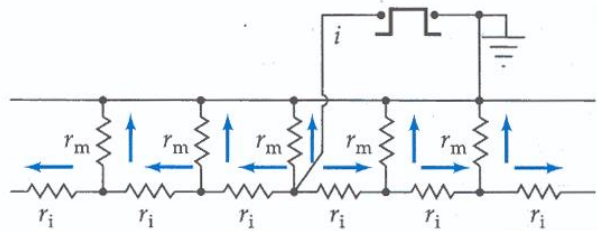
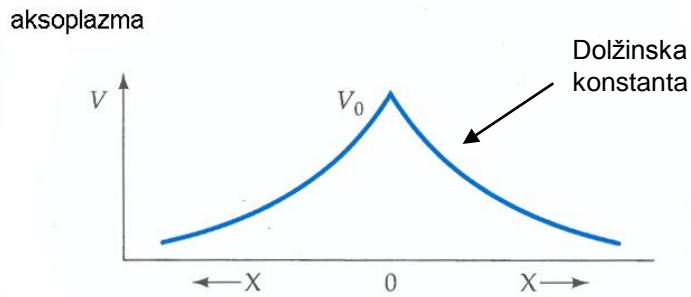
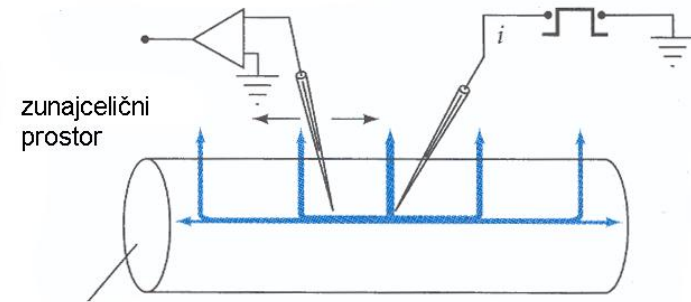


skorja malih možganov

Funkcionalna polarizacija nevrona



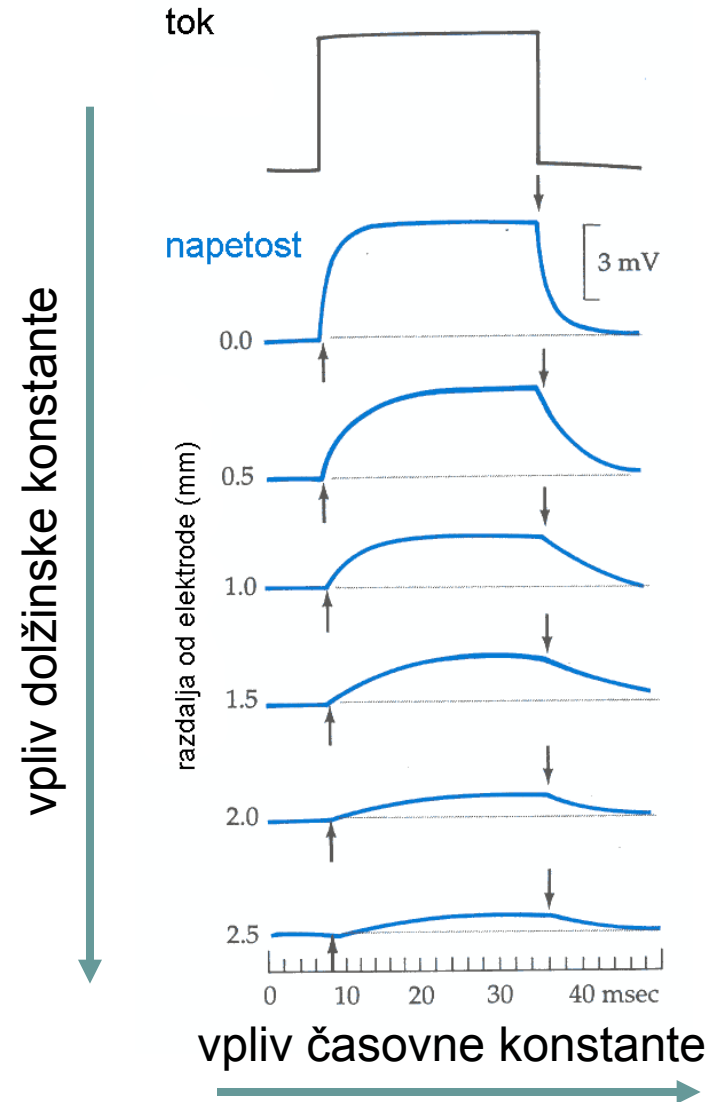
Pasivne lastnosti živčnega vlakna



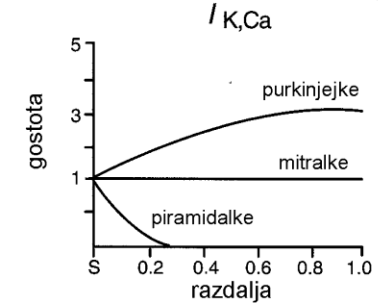
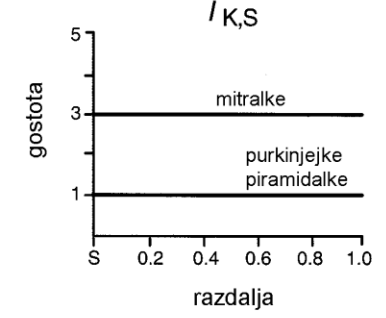
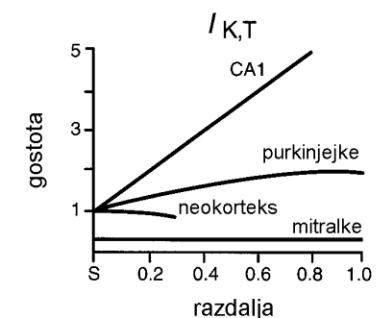
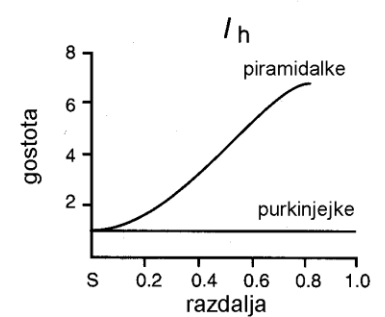
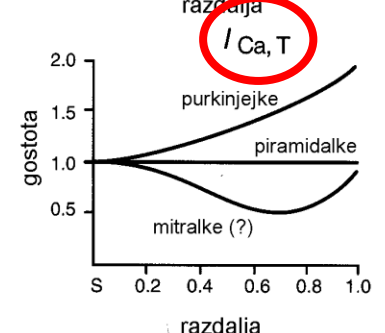
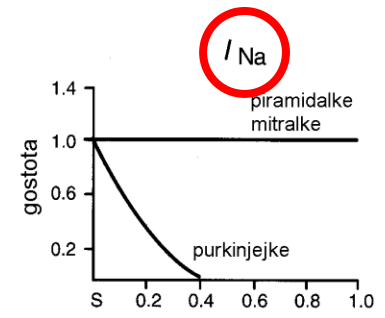
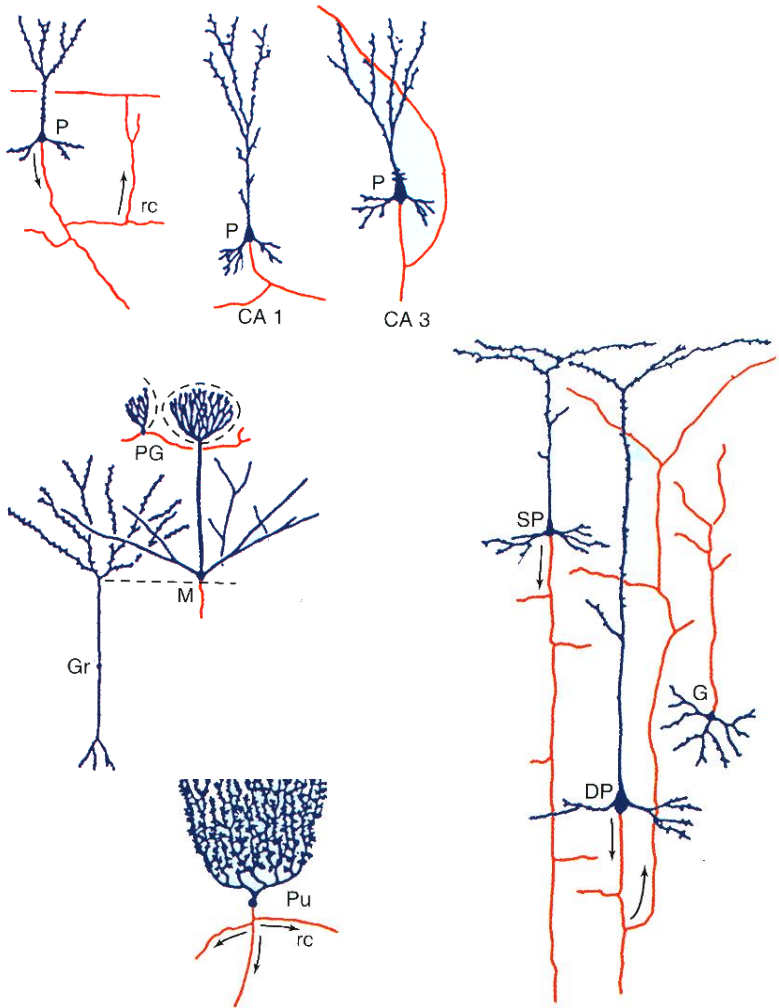
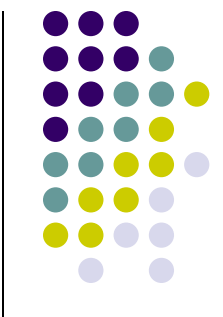


Pasivne lastnosti živčnih celic

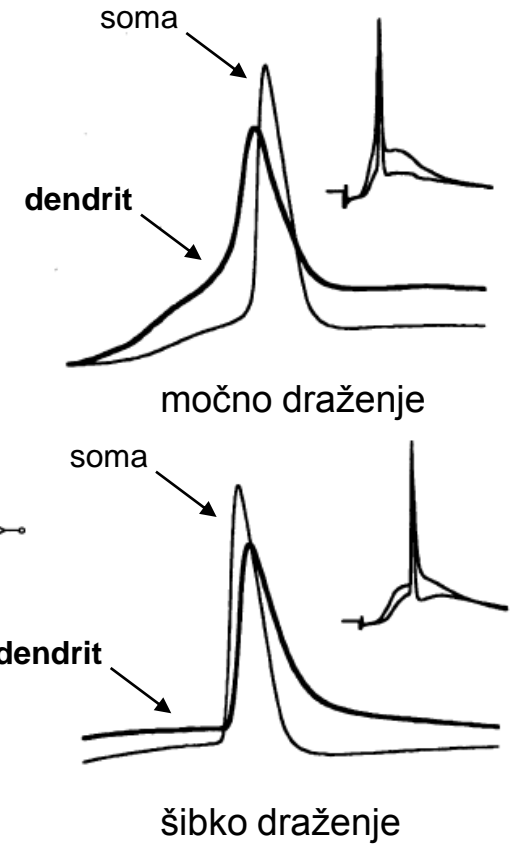
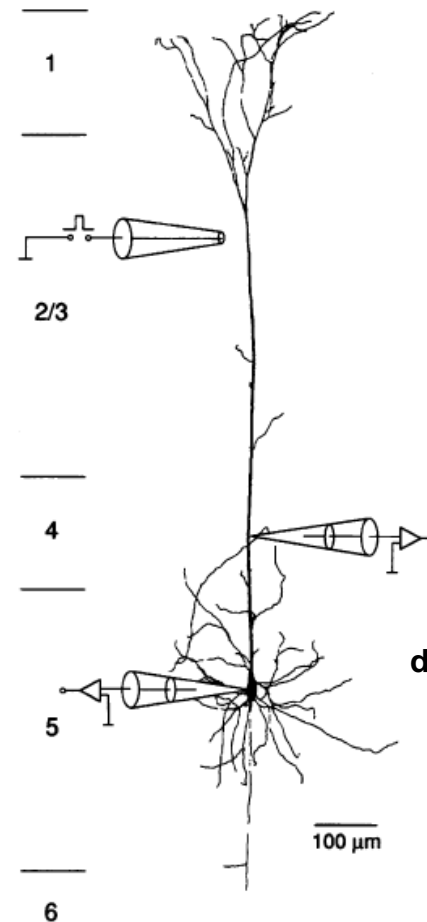
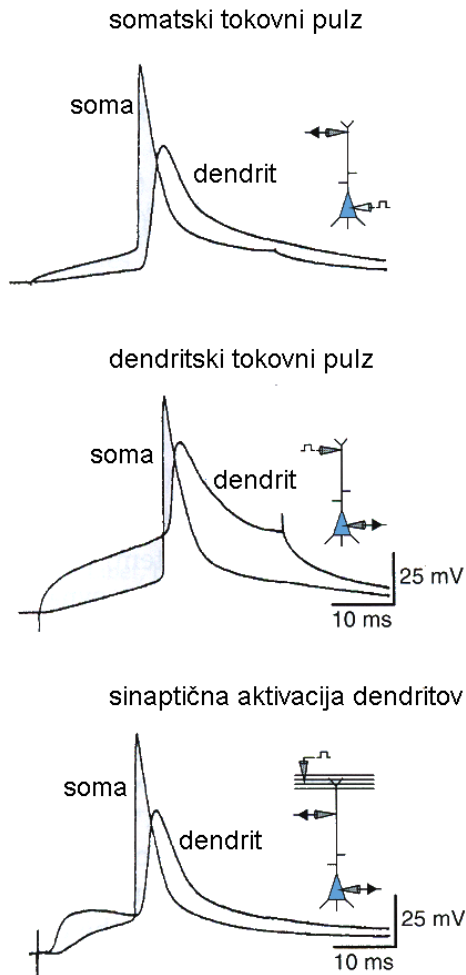
- Razširjanje napetostnih sprememb po živčni celici sreča dve omejitvi
- z večanjem razdalje od vira je:
 - sprememba napetosti vedno manjša
 - sprememba napetosti vedno počasnejša



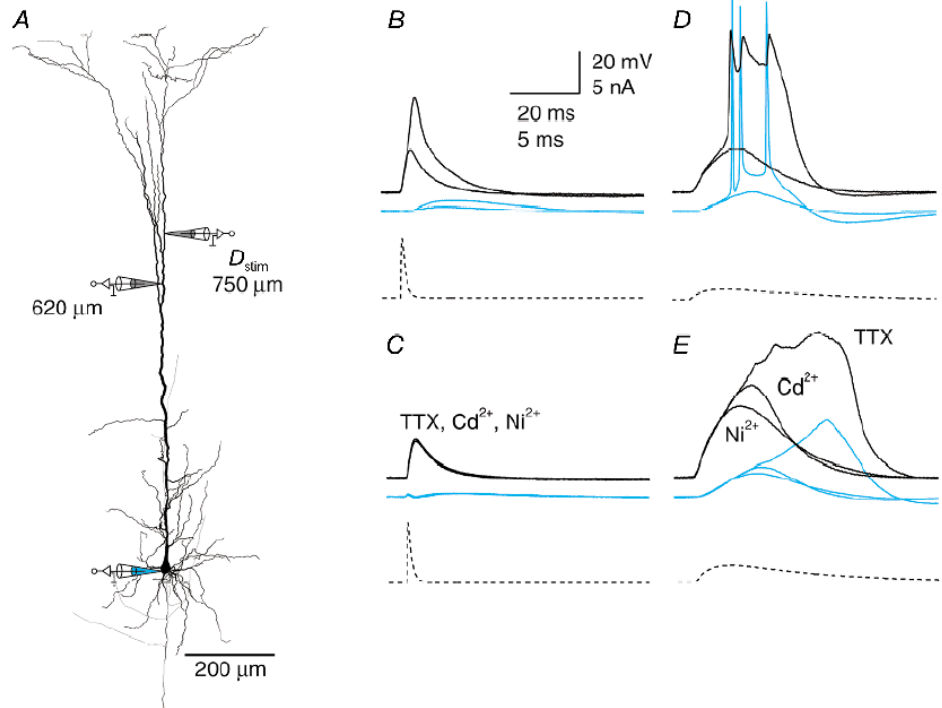
Napetostno občutljivi kanali v dendritskem drevesu



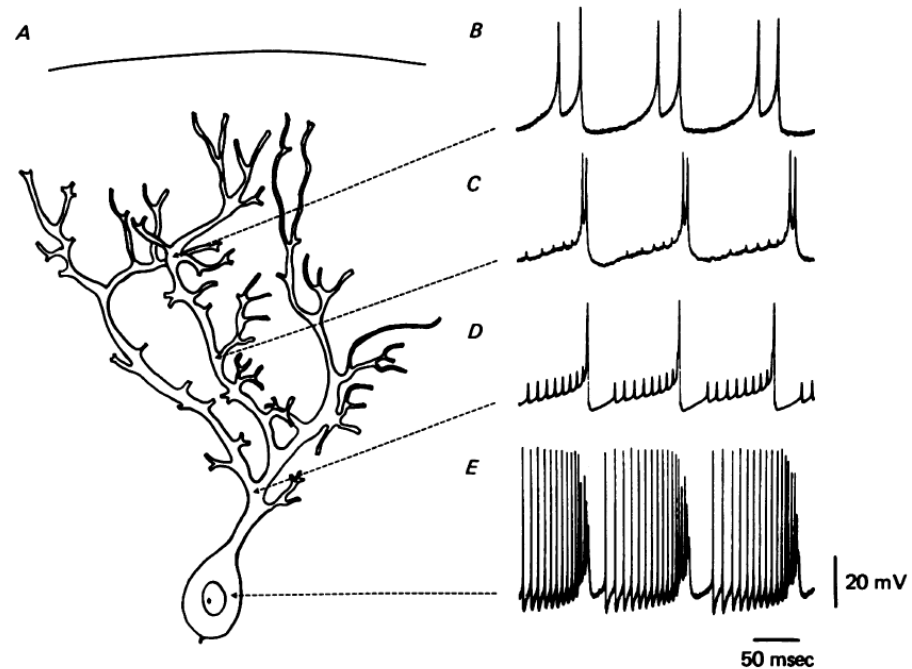
Kaj se dogaja v dendritskem drevesu?



Akcijski potenciali v dendritskem drevesu so (pogosto) kalcijevi



Larkum, Zhu & Sakmann, 2001; J. Physiology 533: 447-466



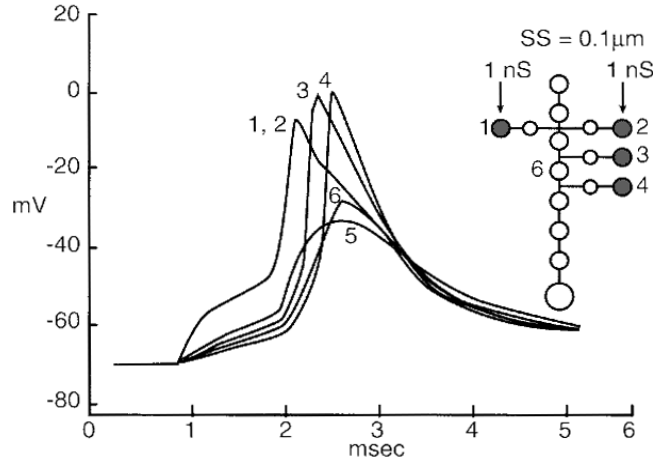
Llinás & Sugimori, 1980; J. Physiology 305: 197-213

Primeri računalniških modelov

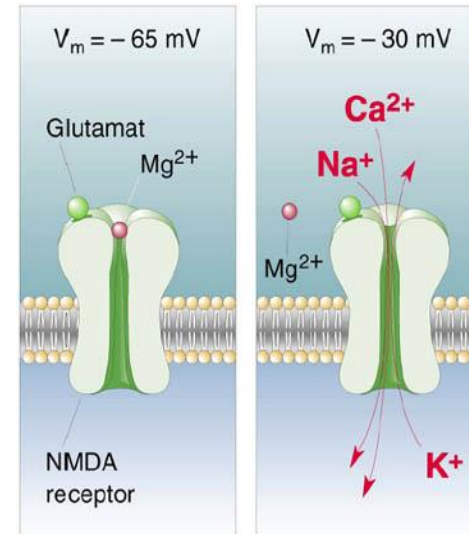


- [CA1 piramidalni nevron](#) – vzvratno širjenje AP
- [CA3 piramidalni nevron](#) – vzvratno širjenje vlaka AP
- [CA1 piramidalni nevron](#) – spremembe aktivnih parametrov (gostote Na⁺ in K⁺ kanalov)

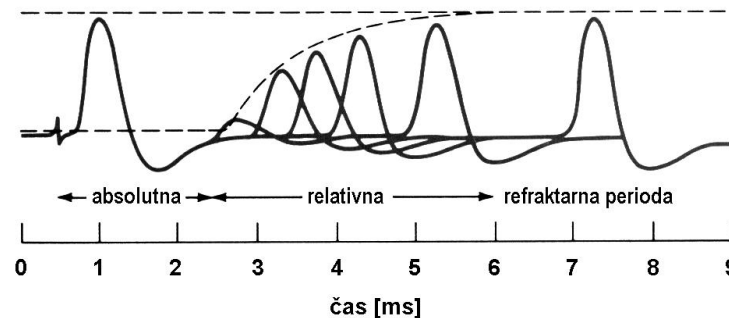
In kaj vse to pomeni za funkcijo nevronov



možno je psevdosaltatorično prevajanje

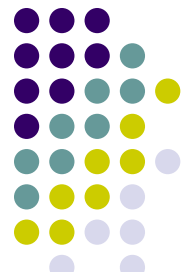


večji vpliv na NMDA receptorje in vzpostavljanje asociativnih povezav

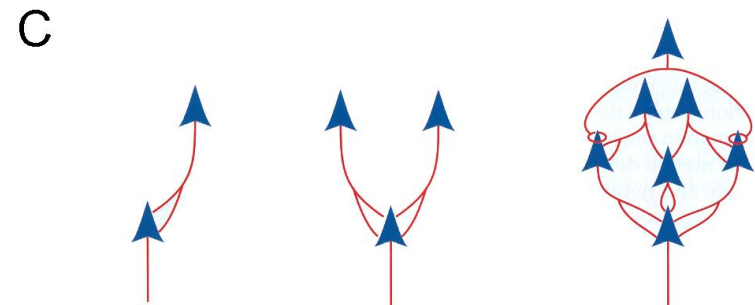
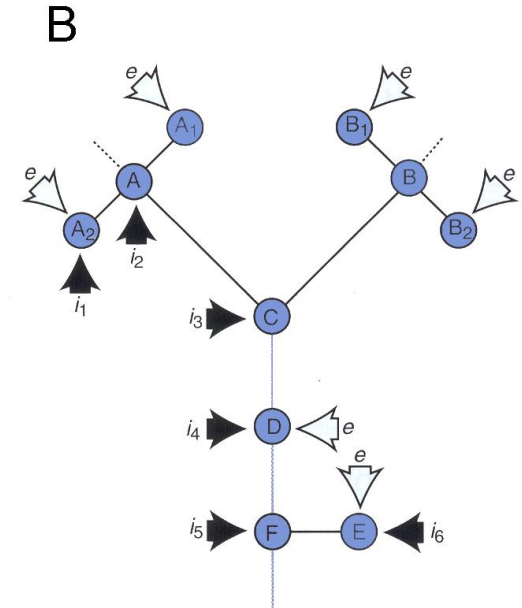
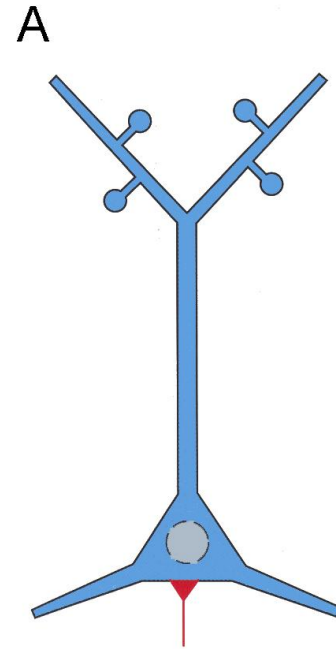


refraktarnost močno vpliva na asociativnost

Pogledi na nevronske procesiranje informacij



- A. “Kanonična” shema piramidalnega nevrona
- B. Piramidalni nevron kot razvejan sistem vozlišč in logičnih operatorjev
- C. Predstava o nevronih kot prepoenostavljenih logičnih operatorjih



Kaj torej počnejo nevroni z informacijo, ki jo dobijo?



- Sama živčna celica deluje kot kompleksen procesor.
- Delovanje tega procesorja je odvisno od
 - morfologije in s tem povezanimi pasivnimi lastnostmi,
 - razporeditve aktivnih elementov (napetostno odvisnih kanalov) ter
 - nabora receptorjev ter njihove modulacije (npr. NMDA receptorjev)