

# Neurology Review

Prepared for the Upper Cervical Diplomate Program, Nov, 2002

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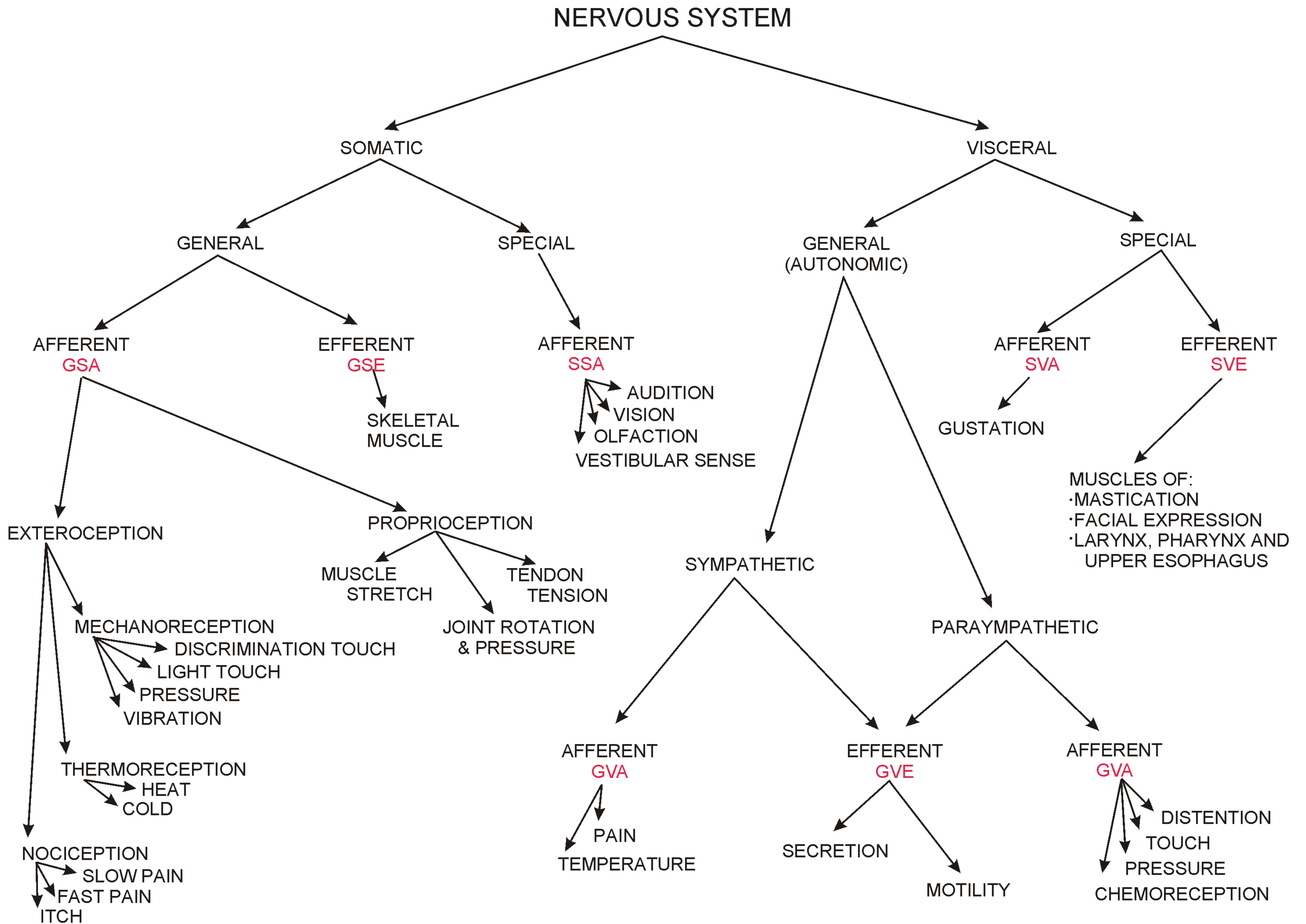


Fig. 1 - Classification of the Nervous System

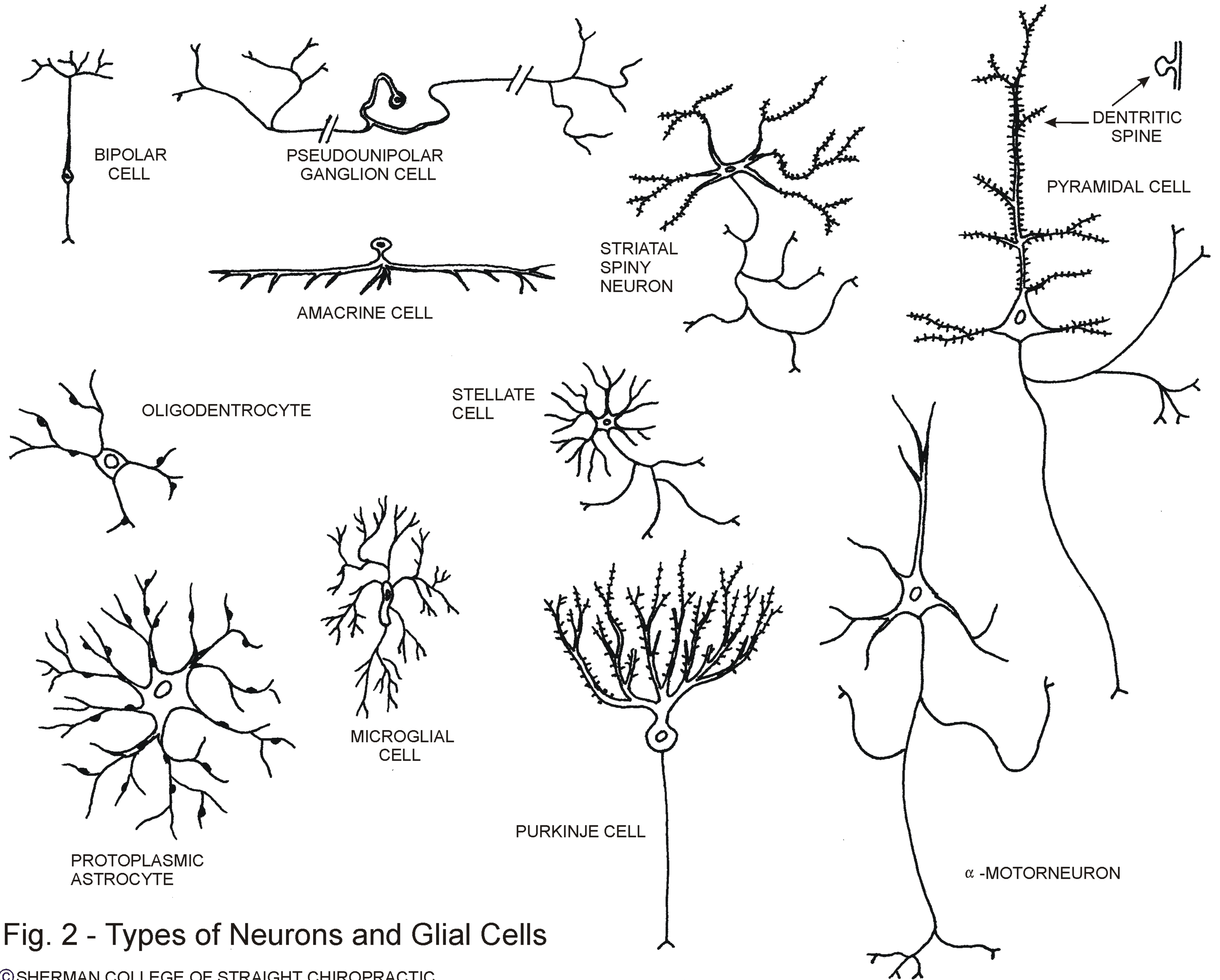


Fig. 2 - Types of Neurons and Glial Cells

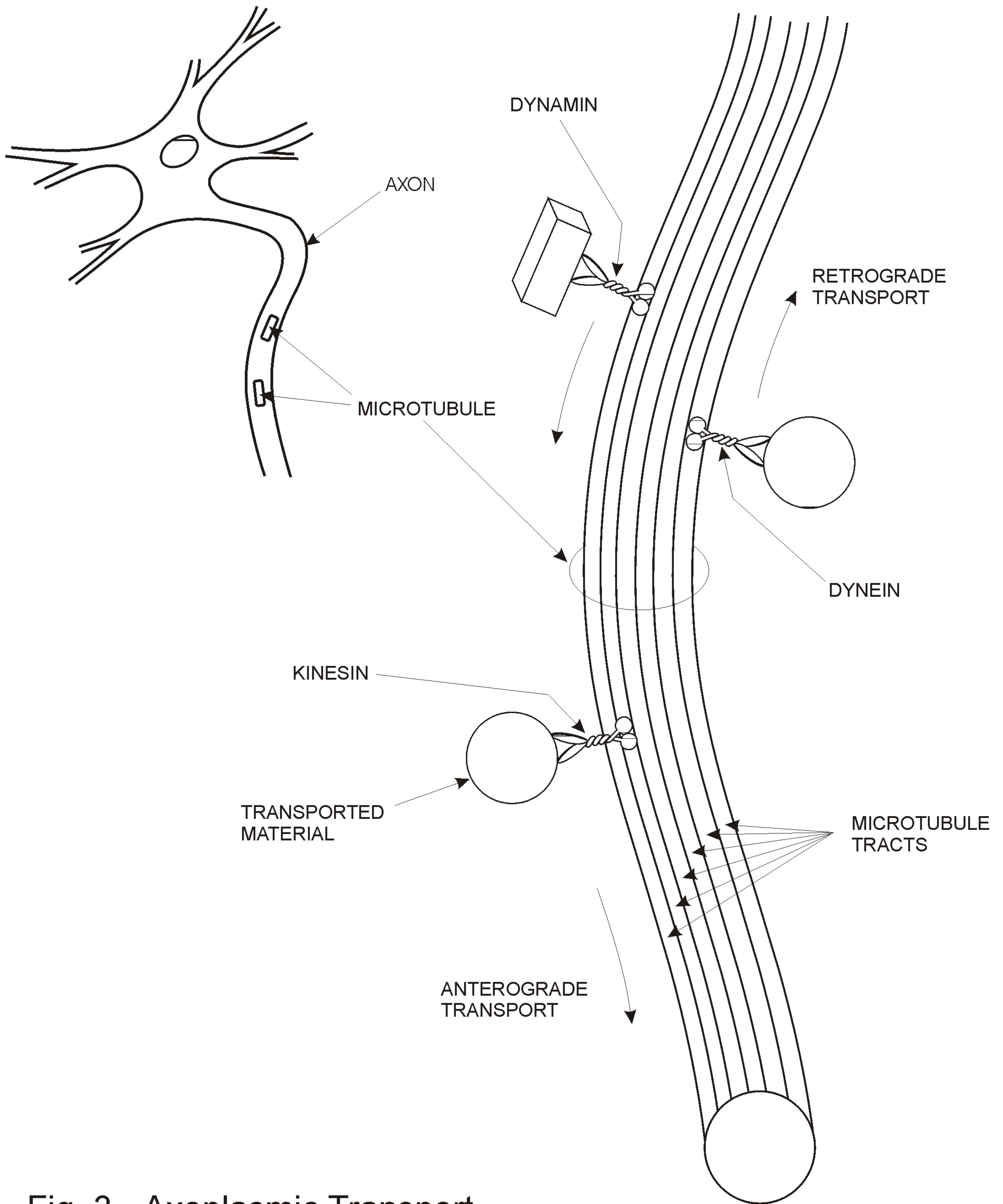


Fig. 3 - Axoplasmic Transport

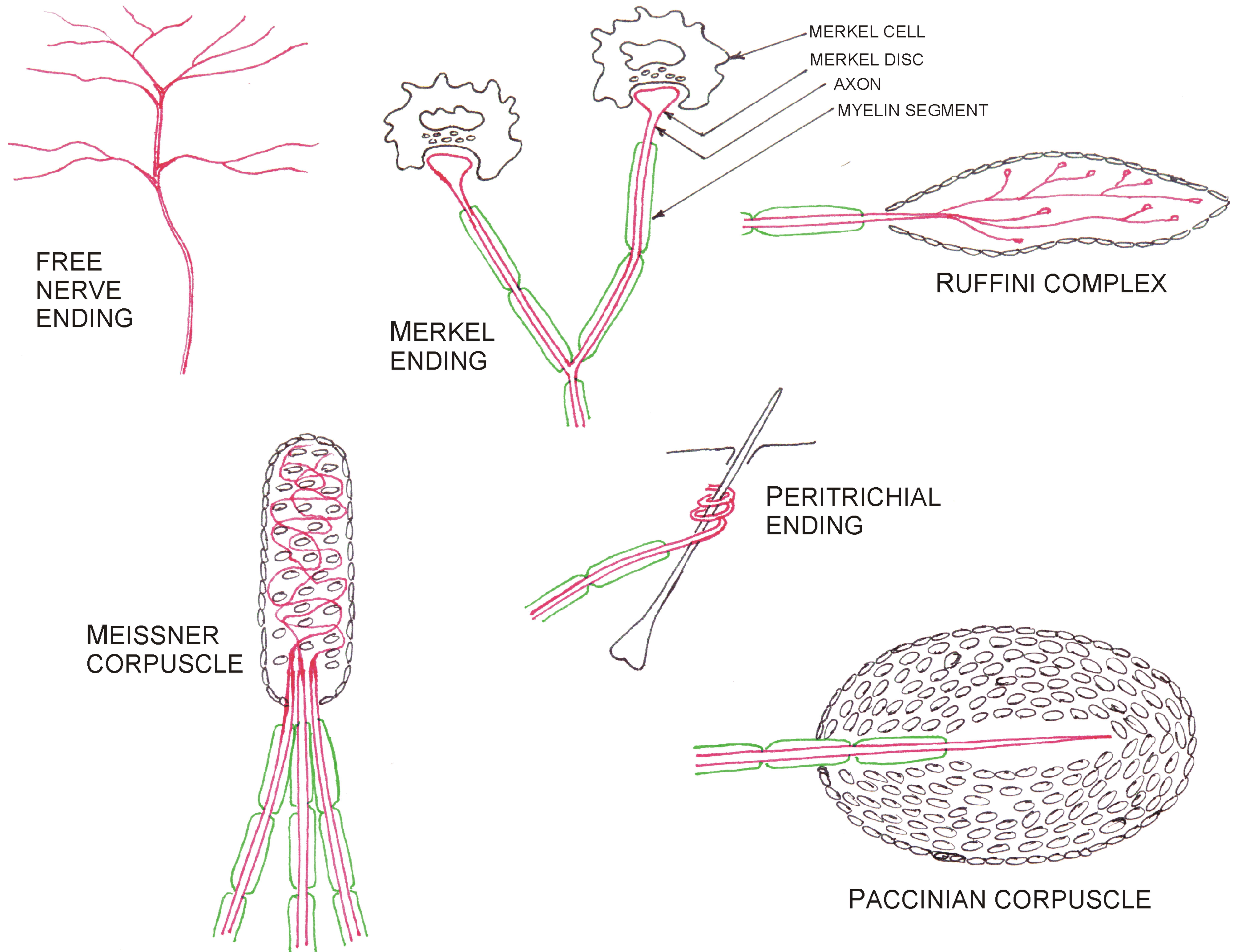


Fig. 4 - Some General Sensory Receptors

	Sensory Receptor	Sensory Modality	Axon Type		Diameter $\mu\text{m}$	Conduction Velocity m/sec	Receptor Field	Threshold	Adaptation
			Letter	Roman Numerical					
Mechanoreception	Meissner corpuscle (encapsulated)	<ul style="list-style-type: none"> <li>discrimination touch</li> <li>vibration 5–40 Hz (fluttering))</li> </ul>	Ab	II	6–12	30–70	small	low	fast
	Paccinian corpuscle (encapsulated)	<ul style="list-style-type: none"> <li>pressure</li> <li>vibration 60–300 Hz</li> </ul>	Ab	II	6–12	30–70	large	low	very fast
	Ruffini Complex (encapsulated)	<ul style="list-style-type: none"> <li>pressure</li> </ul>	Ab	II	6–12	30–70	large	low	slow
	Merkel ending	<ul style="list-style-type: none"> <li>touch</li> <li>pressure</li> </ul>	Ab	II	6–12	30–70	small	low	slow
	Peritrichial ending	<ul style="list-style-type: none"> <li>light touch</li> <li>Motion</li> </ul>	Ad	III	1–5	5–30			fast
Noci – and Thermo–reception	Free nerve ending	slow pain	C	IV	0.2–1.5	0.5–2.0			slow or none
		fast pain	Ad	III	1–5	5–30			slow or none
		itch	C		0.2–1.5	0.5–2.0		high	fast
		temp. warmth	C	IV	0.2–1.5	0.5–2.0		0.2 °F change	>40° C (45)
		temp. cold	Ad	III	1–5	5–30			<20° C (15)
Proprioception	1° stretch receptor, or annulospiral ending	dynamic stretch		I a	12–20	70–120			slow
	2° stretch receptor or, flower – spray ending	static stretch		II	6–12	30–70			slow
	Golgi tendon organ	tendon tension		Ib	12–20	70–120 (mostly 80)			slow
		<b>Location</b>	<b>Articular type</b>						
	Ruffini Complex	<ul style="list-style-type: none"> <li>joint capsules</li> <li>tendons</li> <li>periarticular ligaments</li> </ul>	I					low	slow
	Paccinian Corpuscle	<ul style="list-style-type: none"> <li>joint capsules</li> <li>intervertebral discs</li> </ul>	II						
	Meissner Corpuscle	<ul style="list-style-type: none"> <li>joint capsule</li> </ul>	I / II					low	fast
Golgi - Mazzoni	<ul style="list-style-type: none"> <li>tendons</li> <li>periarticular ligaments</li> <li>intervertebral discs</li> <li>joint capsules</li> </ul>	III					low	fast	
Free nerve ending	<ul style="list-style-type: none"> <li>intervertebral discs</li> <li>joint capsules</li> </ul>	IV					high	very slow	
Motor neurons	<b>Motor neuron</b>	<b>Axon type</b>	<b>Diameter <math>\mu\text{m}</math></b>	<b>Conduction Velocity m/ sec</b>					
	a- motorneuron	Aa	12–20	70–120					
	y- motorneuron	Ay	2–10	10–50					
	Preganglionic motor neuron	B	1-3	6-18					
	Postganglionic motor neuron	C	0.2–1.5	0.5–2					

Fig. 5 – Receptors and Axons Classification

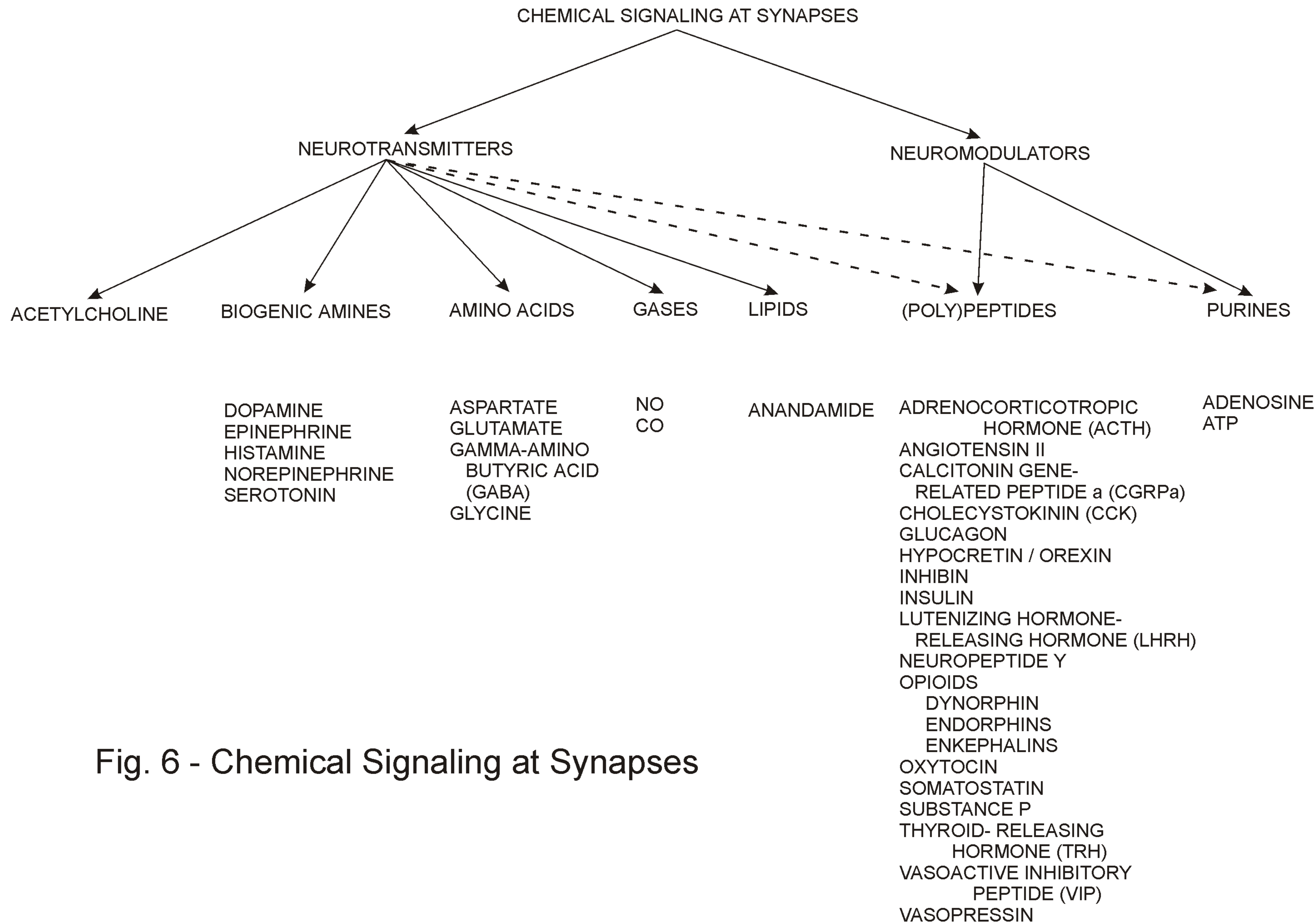
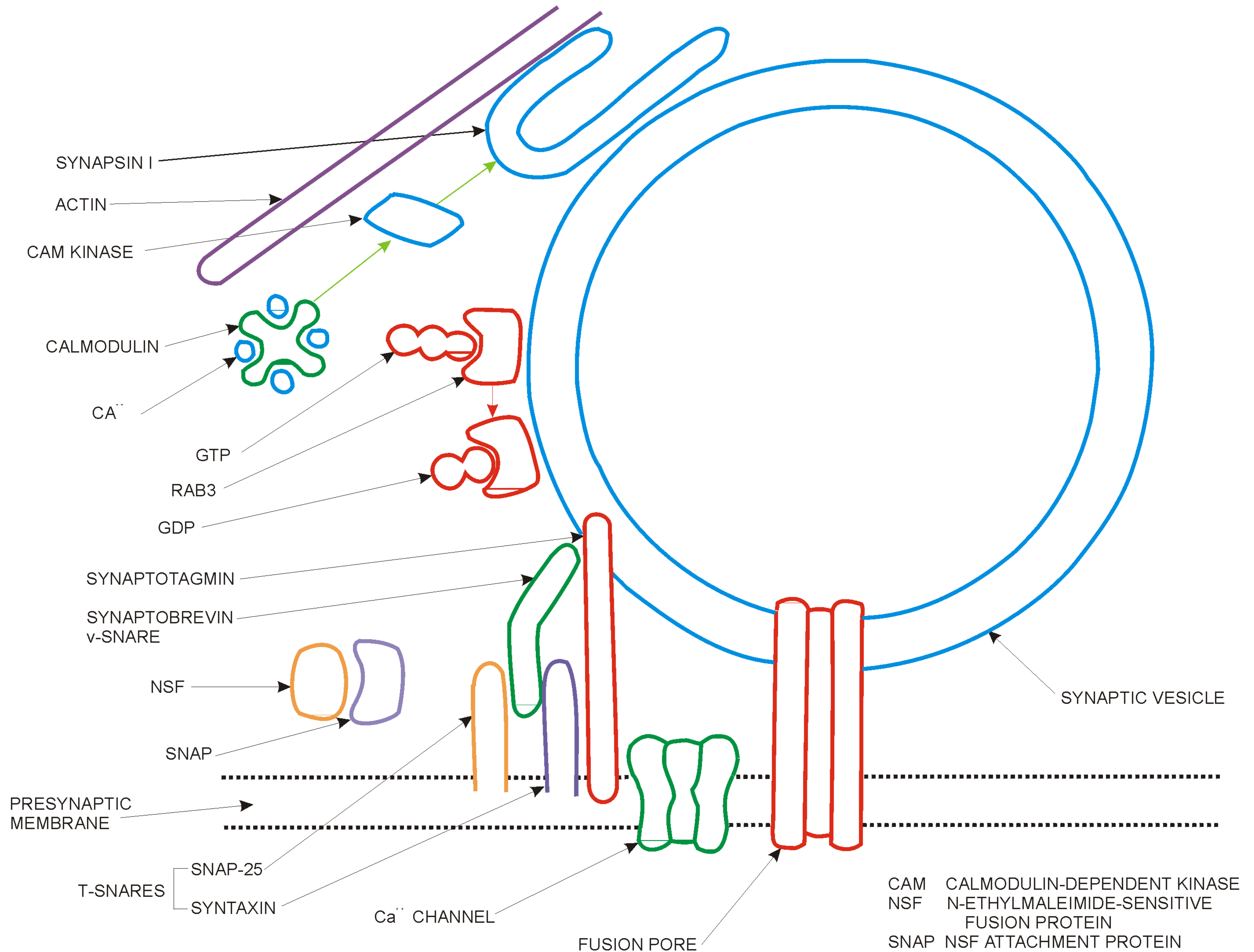


Fig. 6 - Chemical Signaling at Synapses

Fig. 7 - Proposed Sequence of Events in Release of Neurotransmitter





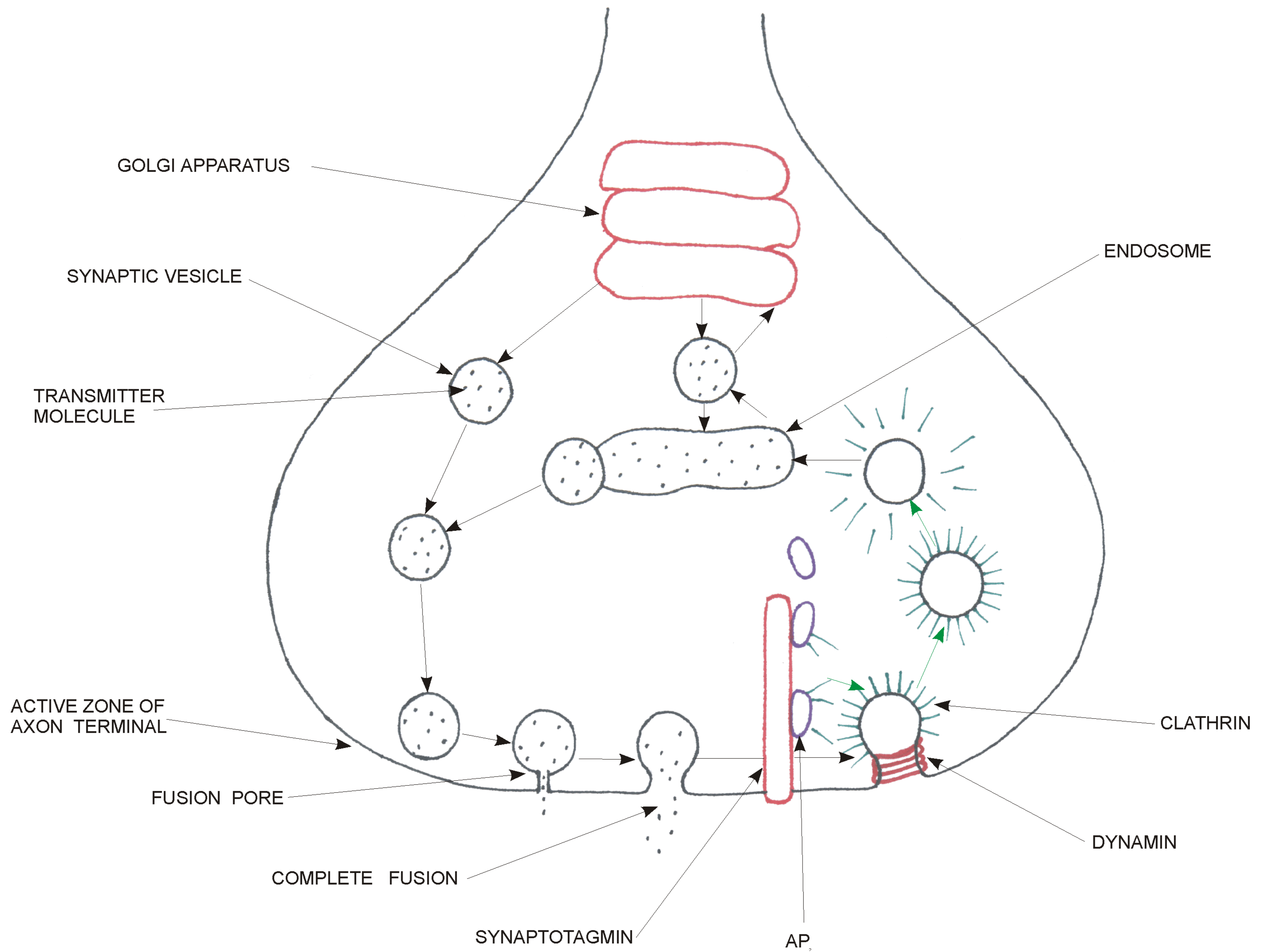


Fig. 8 - Recycling of Synaptic Vesicles

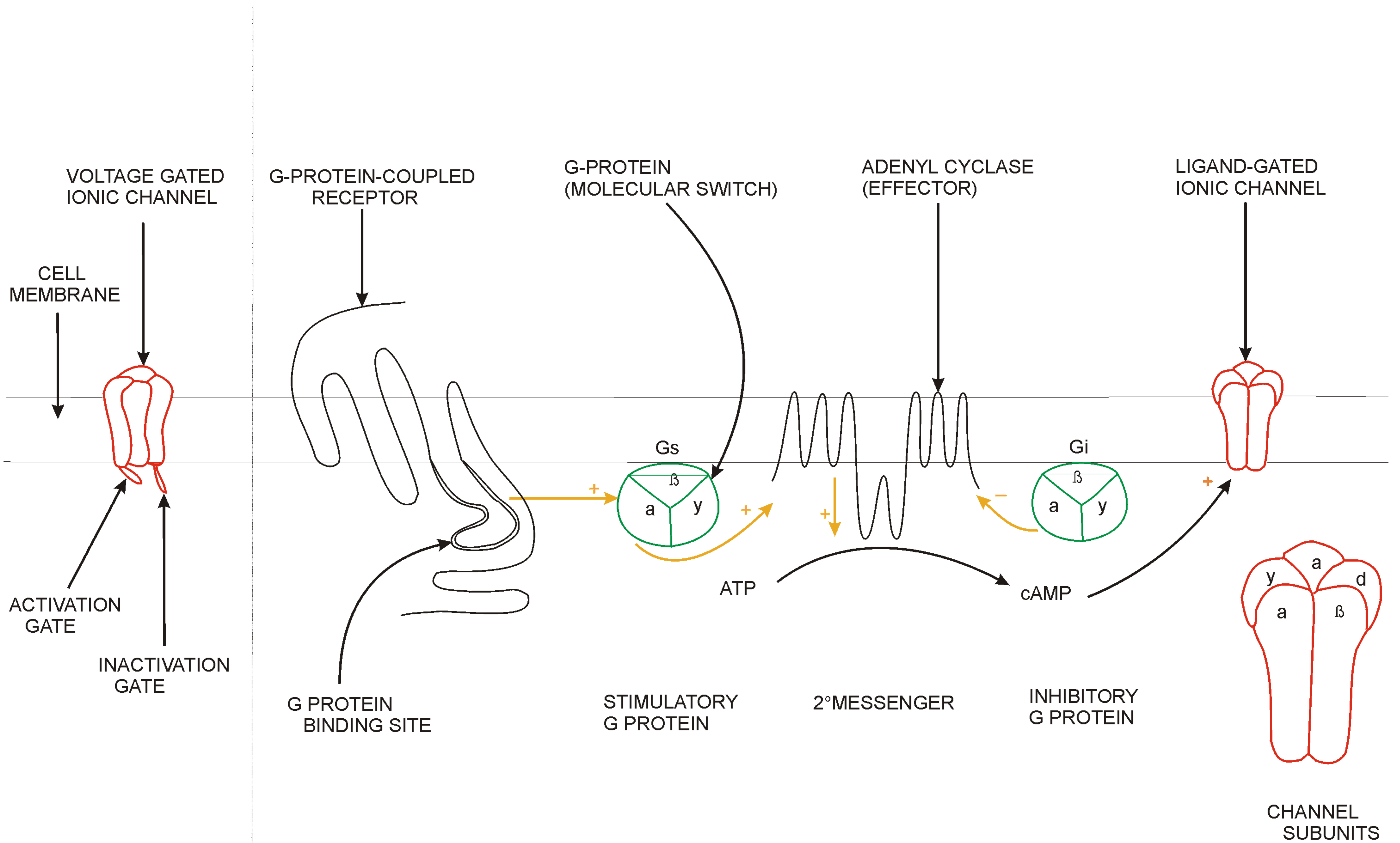
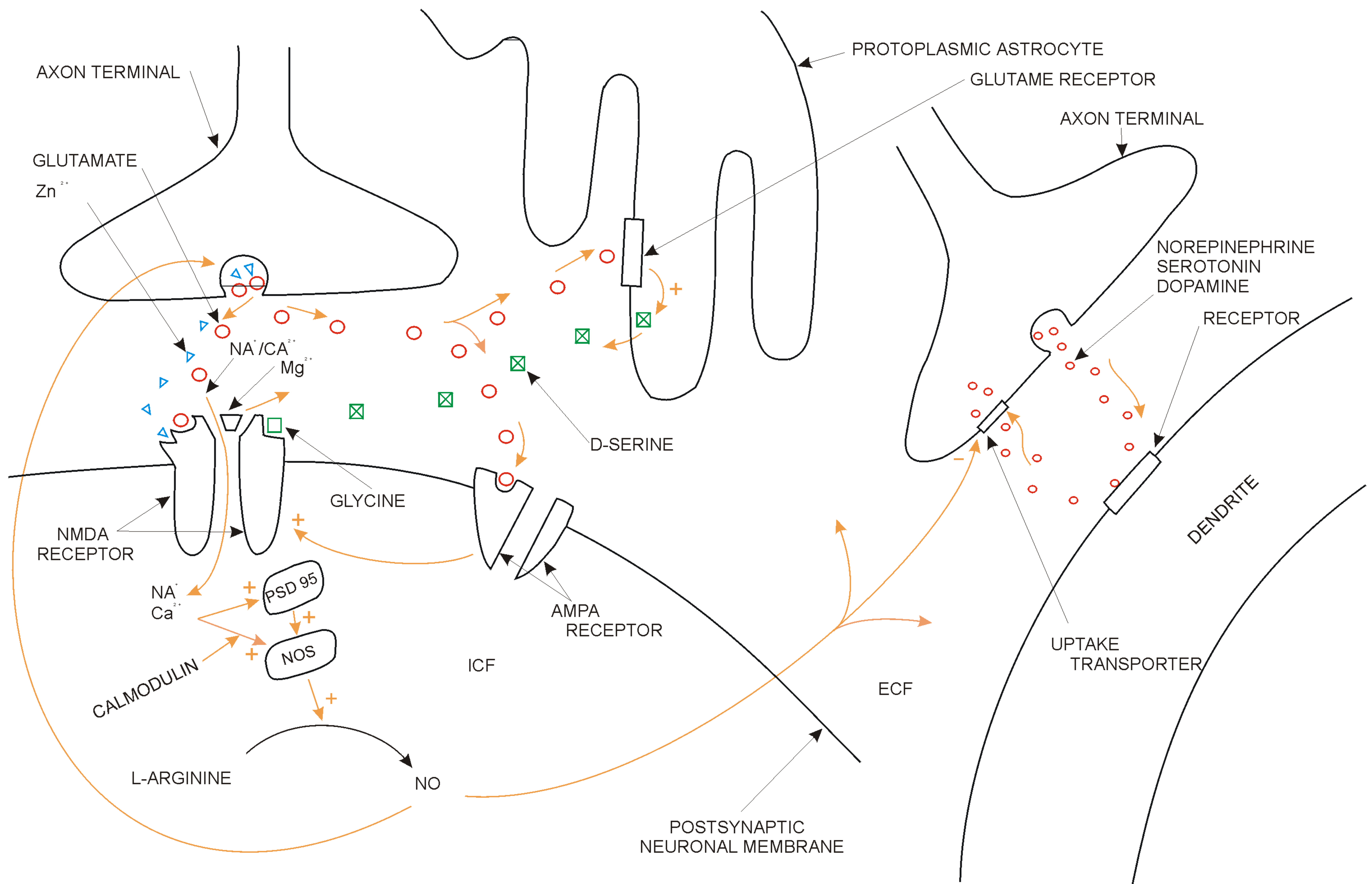


Fig. 9 - Ionic Channel Gating



ECF    EXTRACELLULAR FLUID  
 ICF    INTRACELLULAR FLUID  
 NO    NITRIC OXIDE  
 NOS    NITRIC OXIDE SYNTHASE  
 PSD95    POSTSYNAPTIC DENSITY PROTEIN

Fig. 10 - Mechanisms of Action of Glutamate

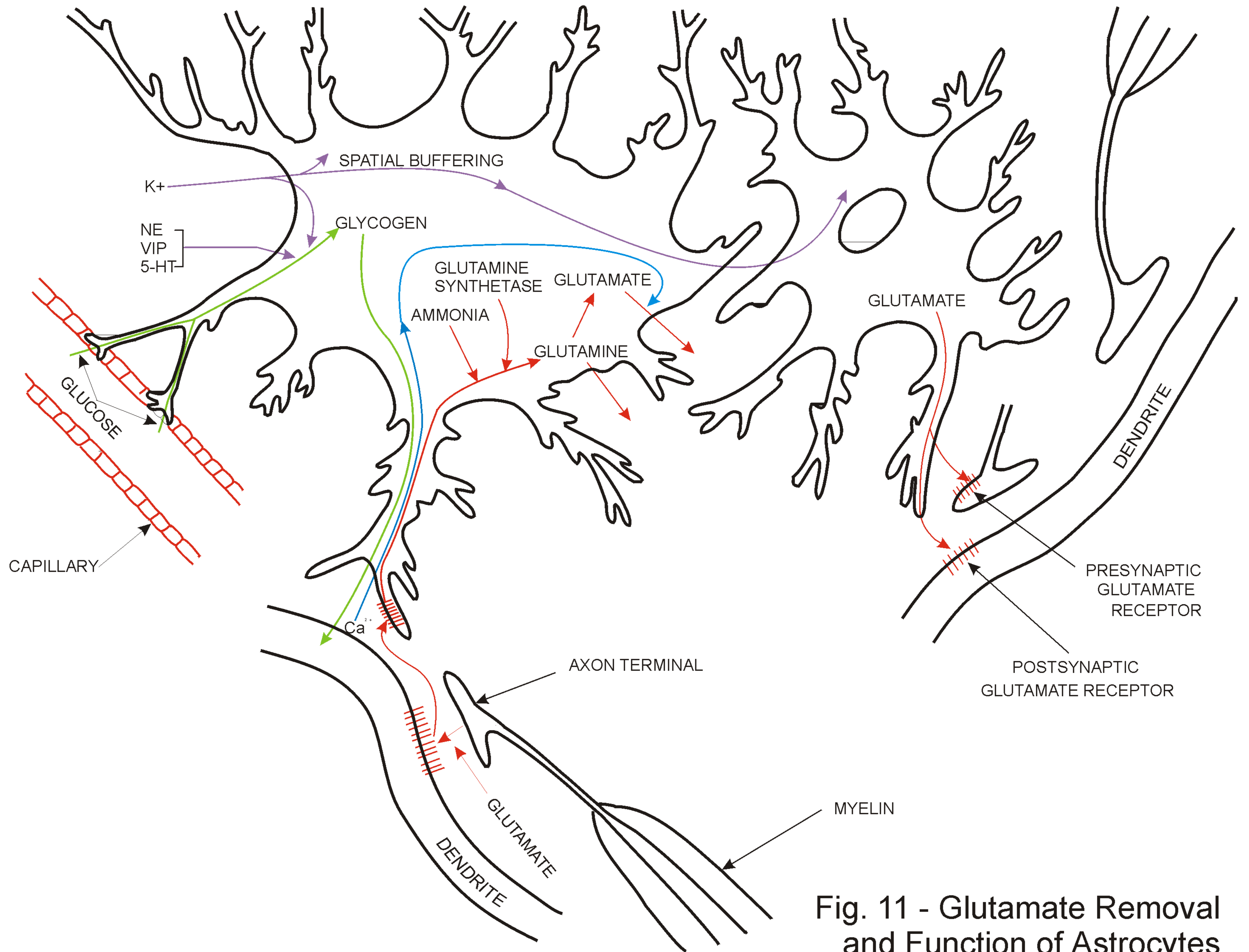


Fig. 11 - Glutamate Removal and Function of Astrocytes

# Fig. 12 - Spinal Cord Topography

(Approx. Level C8)

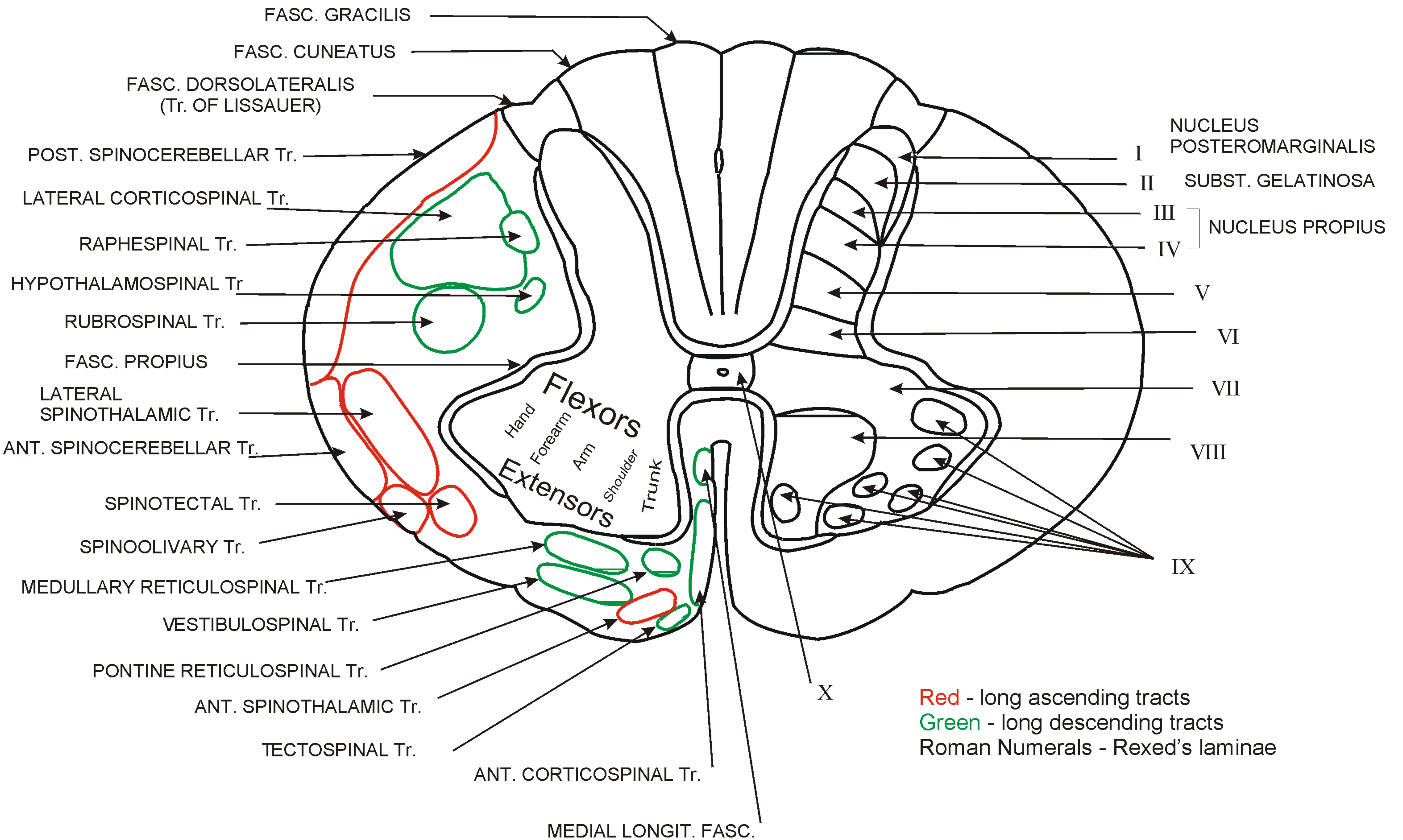
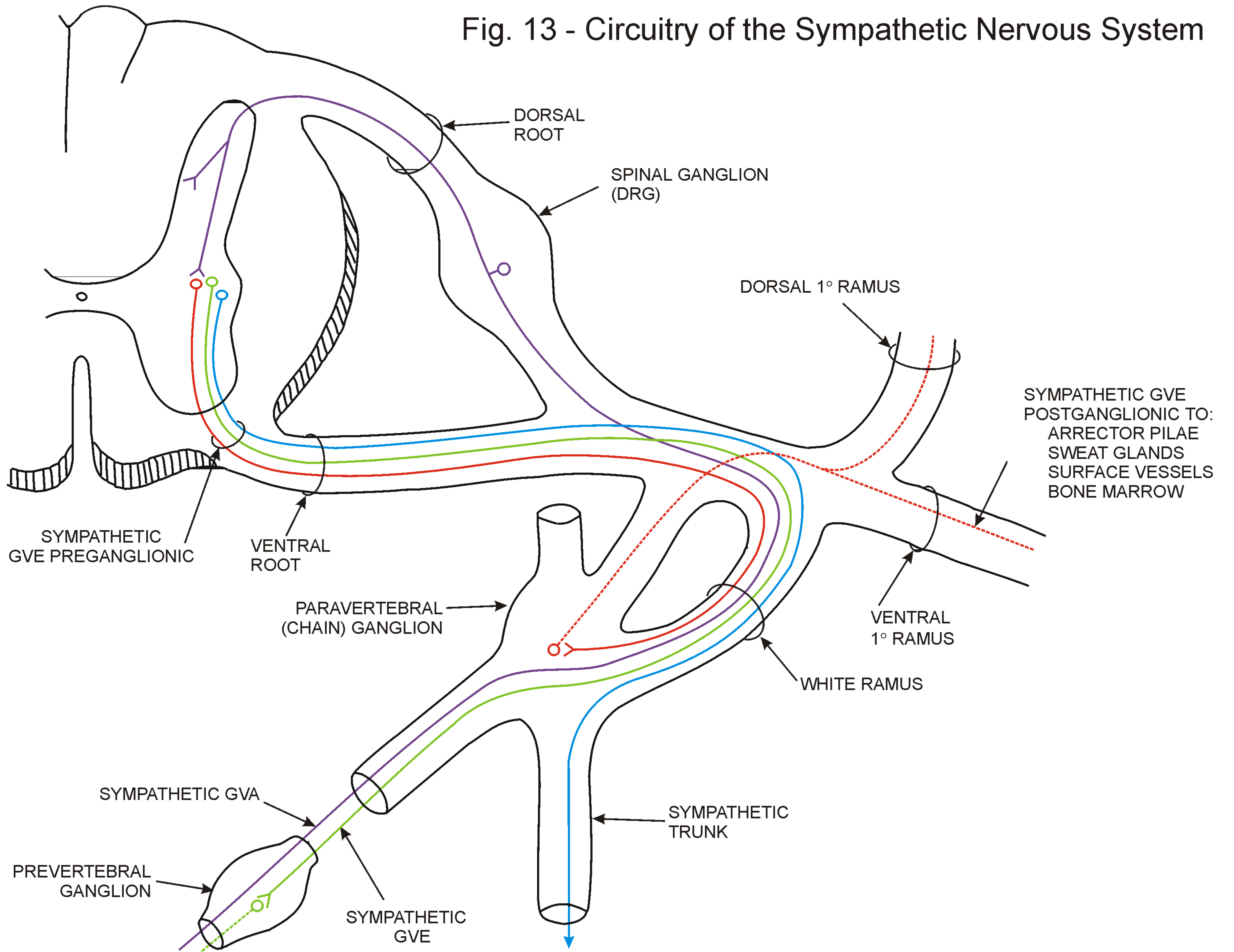


Fig. 13 - Circuitry of the Sympathetic Nervous System



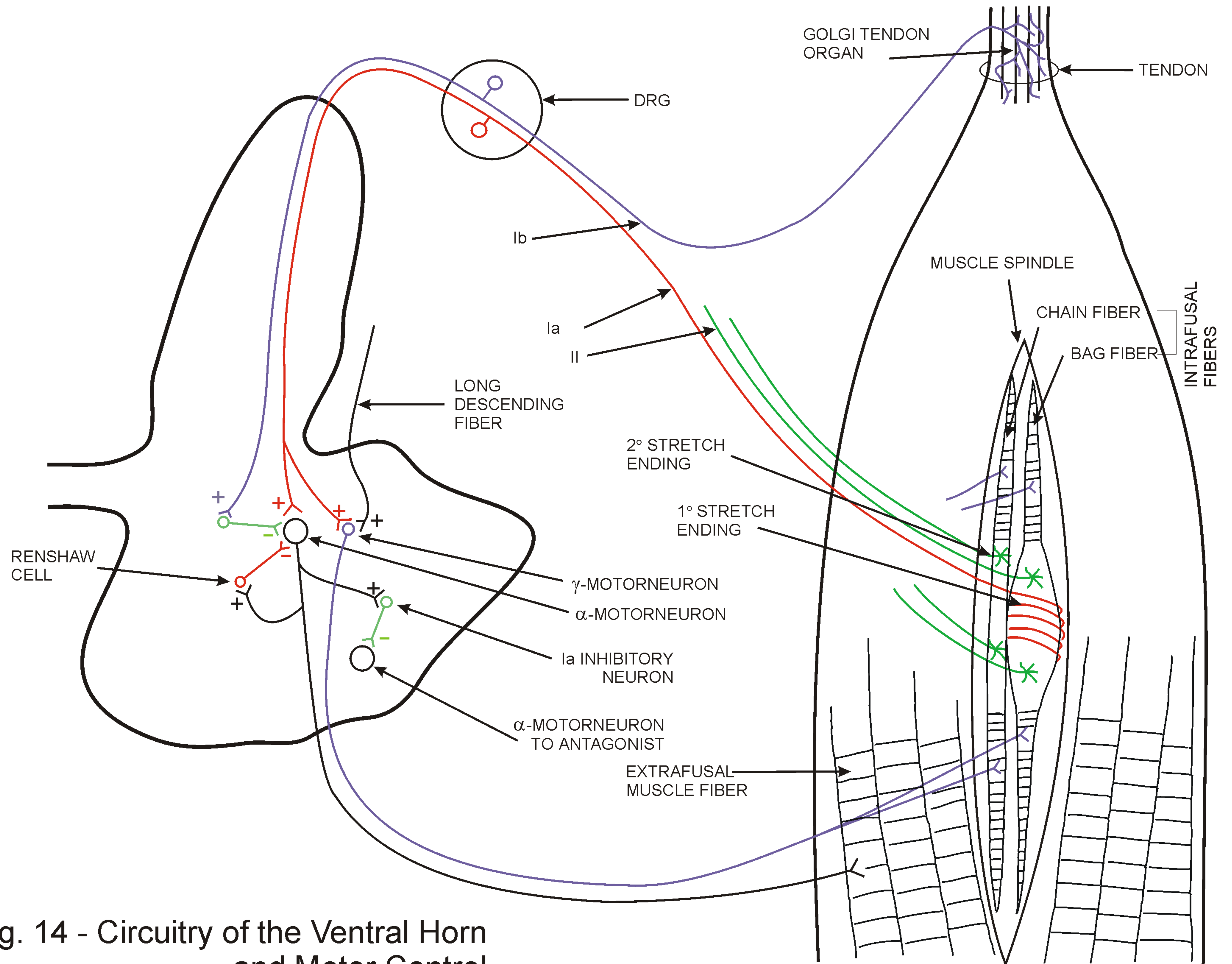
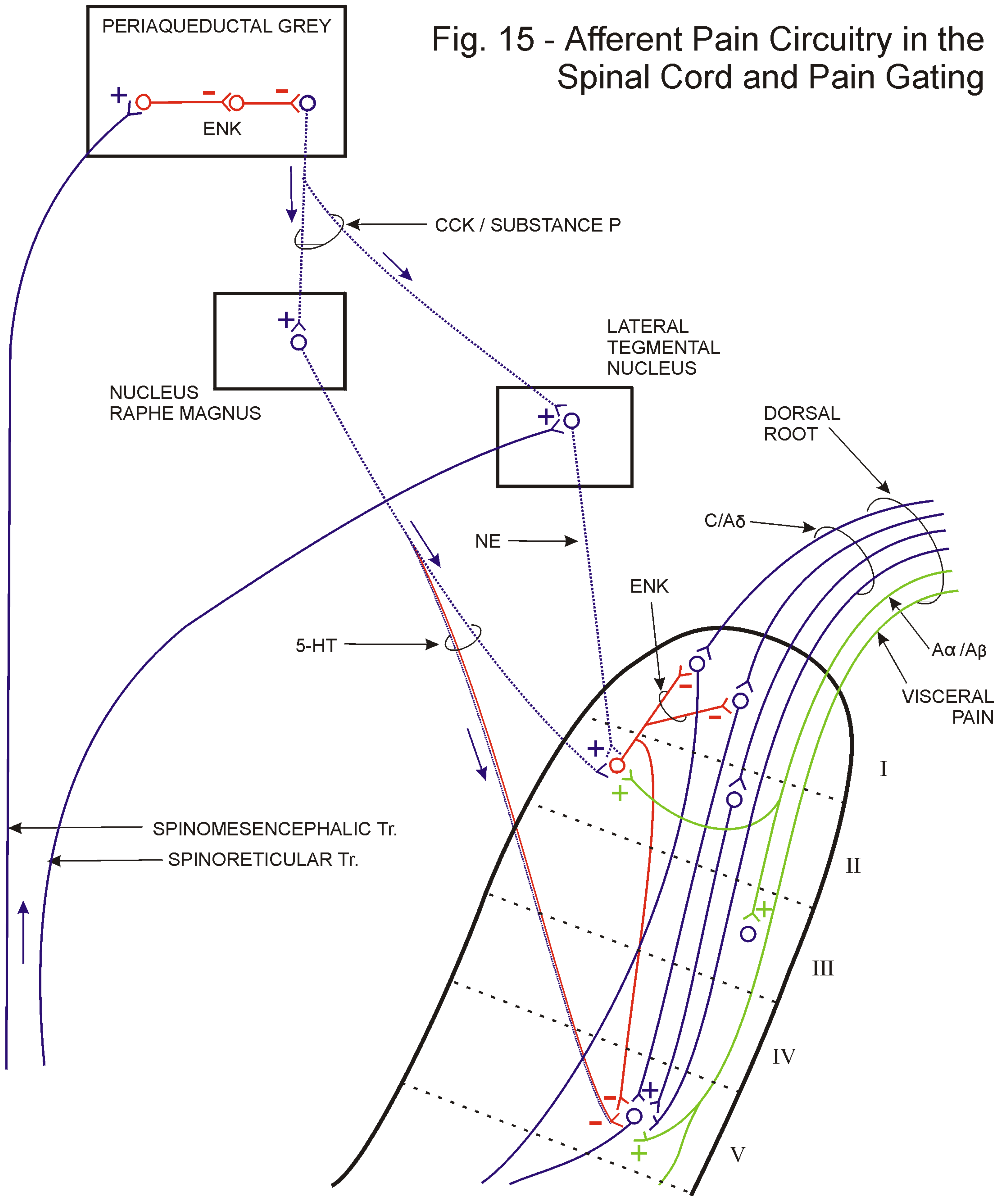


Fig. 14 - Circuitry of the Ventral Horn and Motor Control

Fig. 15 - Afferent Pain Circuitry in the Spinal Cord and Pain Gating



**BLUE** - SPINAL AND ASCENDING PAIN FIBERS  
**RED** - INHIBITORY PATHWAYS  
**GREEN** - SURFACE MECHANORECEPTIVE AND VISCERAL PAIN FIBERS  
 DOTTED LINE - DESCENDING GATING PATHWAYS



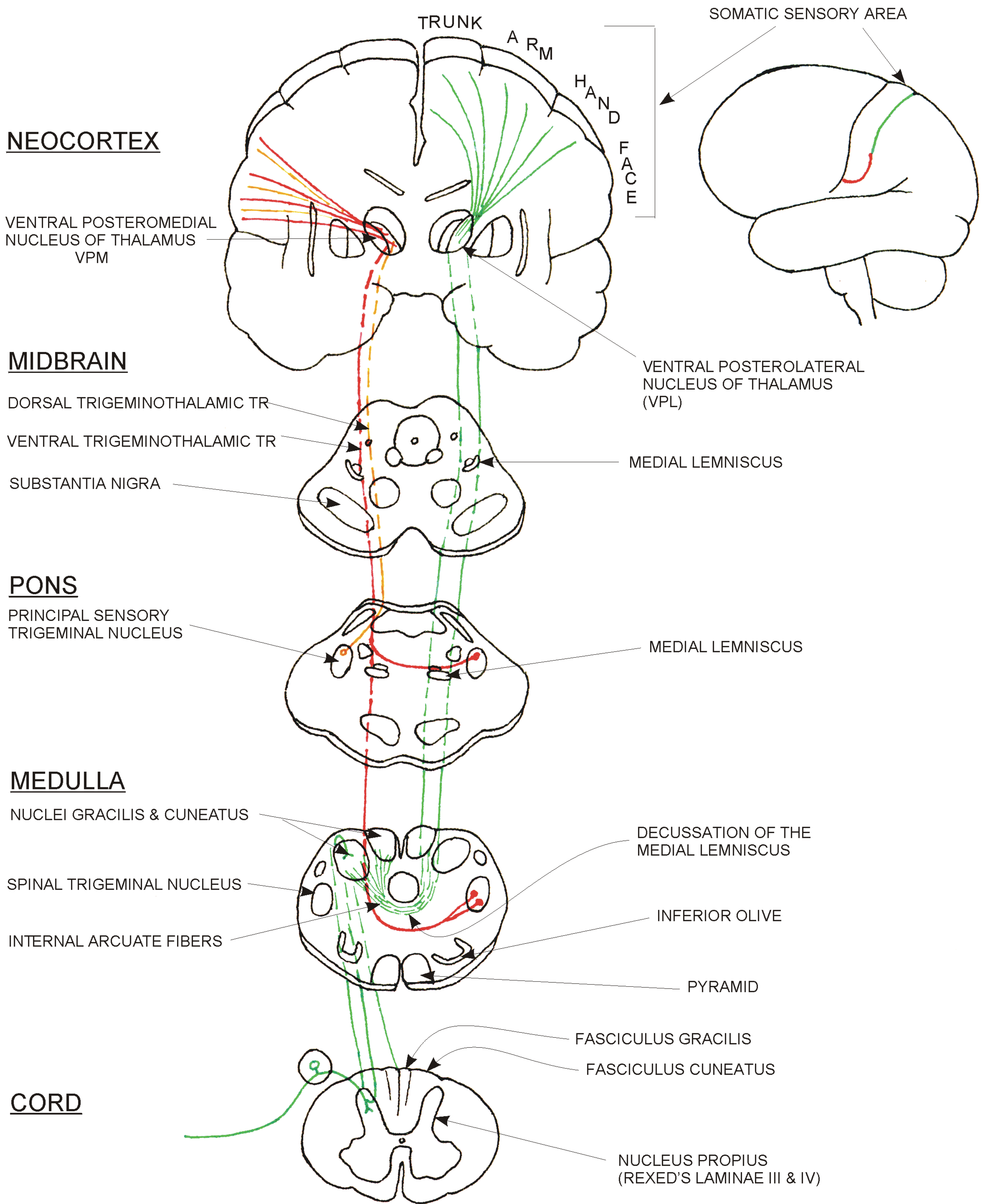
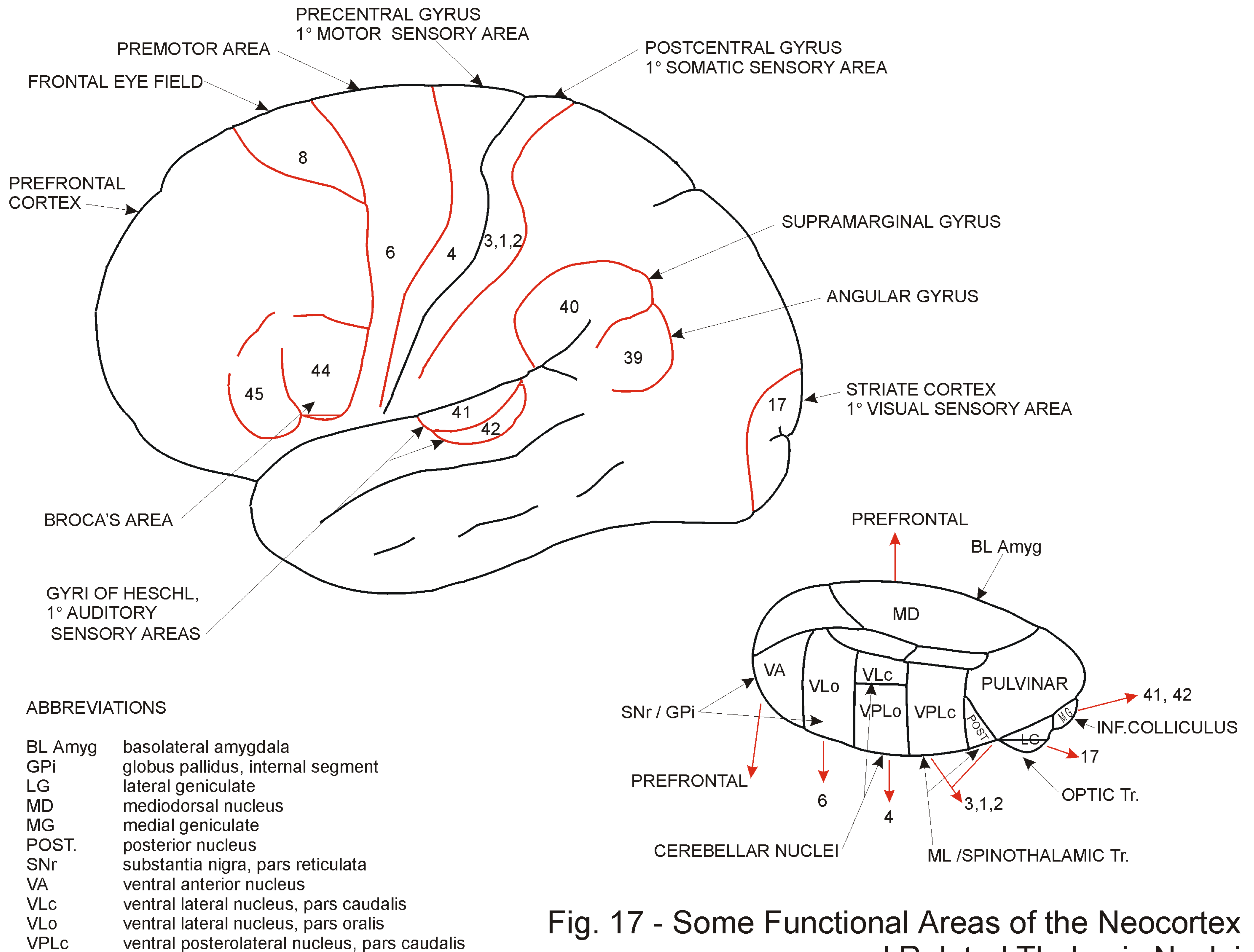
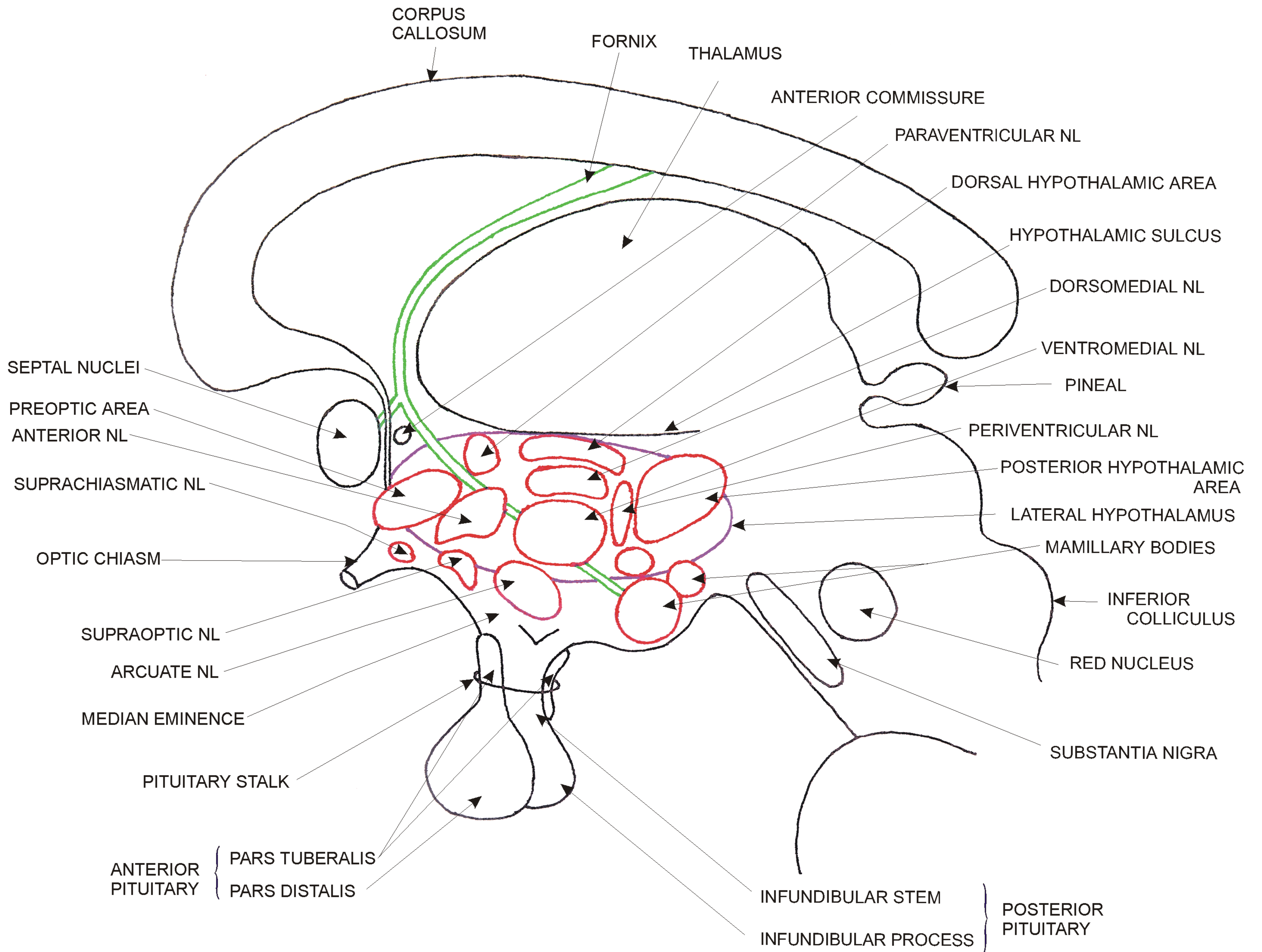


Fig. 16 - Dorsal Columns and Ascending Trigeminal Systems



**Fig. 17 - Some Functional Areas of the Neocortex and Related Thalamic Nuclei**



**Fig. 18 - Hypothalamic Nuclei**

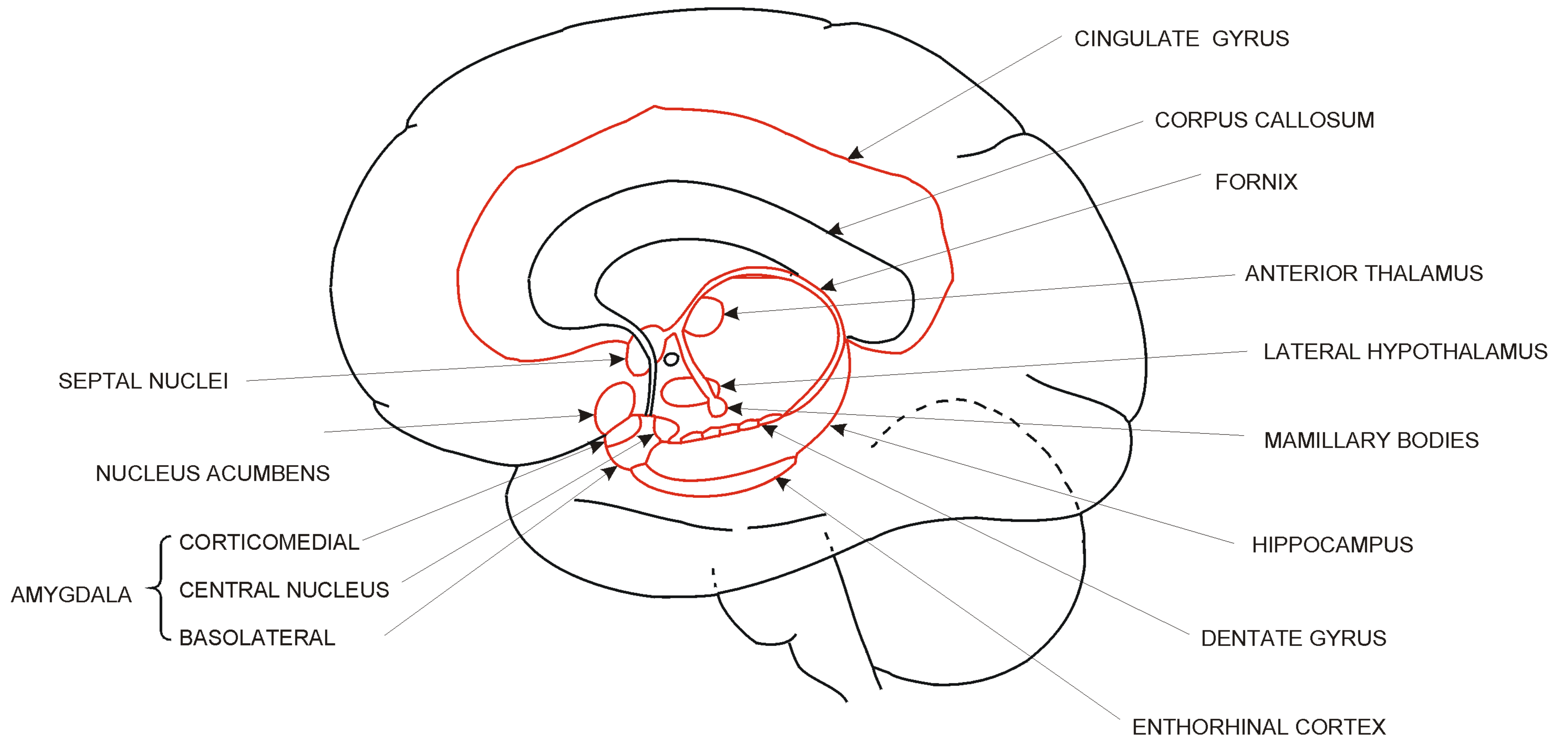


Fig. 19 - Topography of the Limbic System

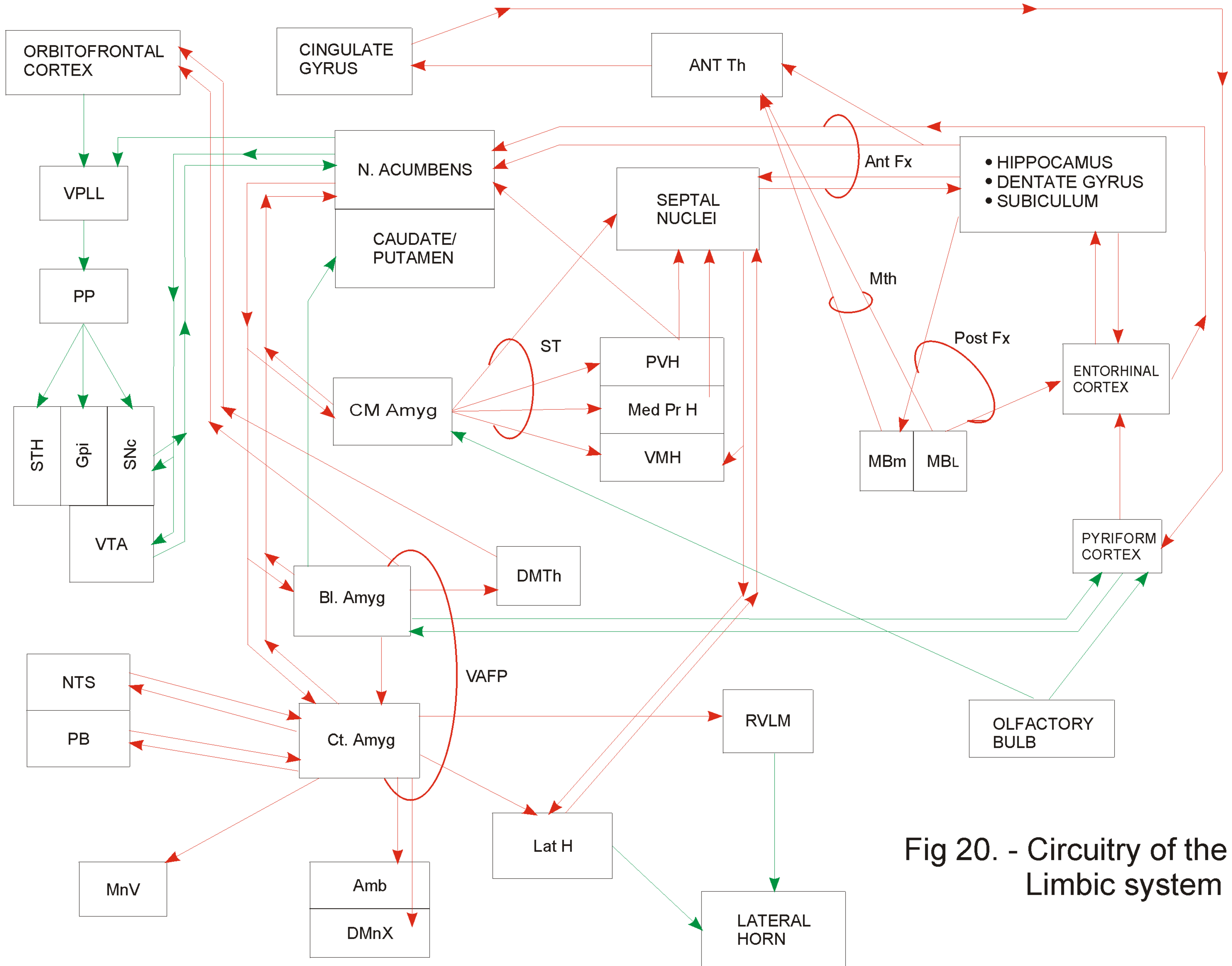


Fig 20. - Circuitry of the Limbic system

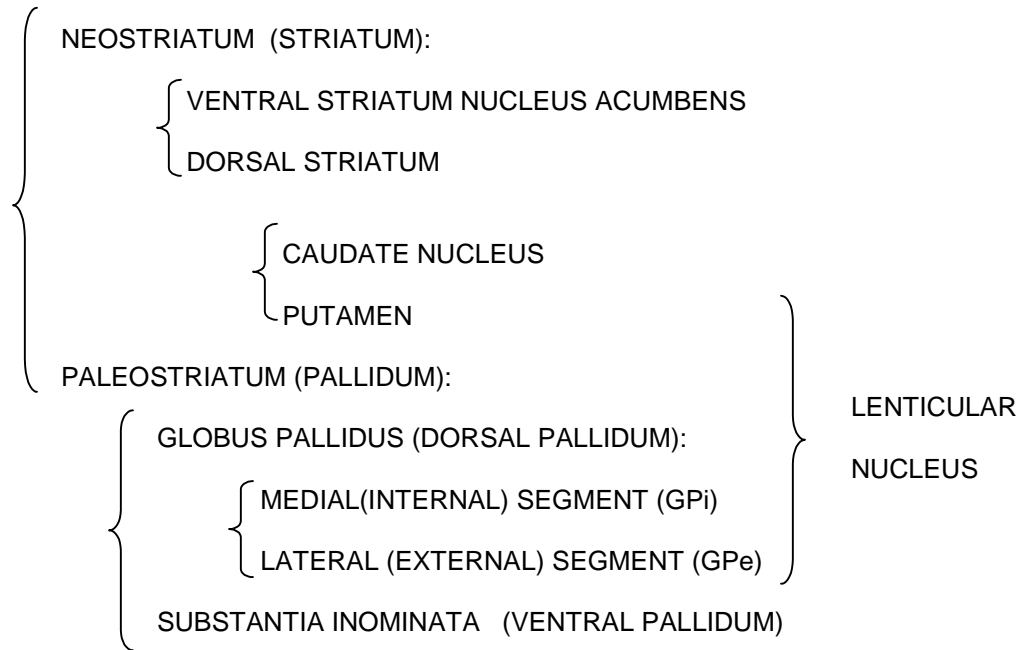
## FIG. 21 – Abbreviations for Circuitry of Limbic System (Fig. 20)

Amb	nucleus ambiguus
Ant. Fx	precommissural or anterior column of fornix
Ant. Th	anterior nuclear group of thalamus
BL Amyg	basolateral amygdala
CM Amyg	corticomedial amygdala
Ct Amyg	central nucleus of amygdala
DM Th	dorsomedial nucleus of thalamus
DMnx	dorsal motor nucleus of vagus
Gpi	globus pallidus, internal segment
Lat H	lateral hypothalamus
MBL / MBm	lateral / medial mamillary body
Med Pr H	medial preoptic hypothalamus nucleus
MnV	motor nucleus of trigeminal
MTh	mamillothalamic tract
NTS	nucleus of tractus solitarius
PB	parabrachial nucleus
Post Fx	postcommissural or posterior column of formix
PP	pedunclopontine nucleus
PVH	paraventricular nucleus of hypothalamus
RVLM	rostral ventral lateral medulla
SNC	substantia nigra, pars compacta
ST	stria terminalis
STH	subthalamic nucleus
VAFP	ventral amygdalofugal pathway
VMH	ventromedial nucleus of hypothalamus
VPLL	ventral pallidum
VTA	ventral tegmental area

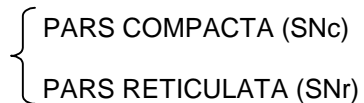
Fig. 22 – Classification of the Basal Ganglia

**BASAL GANGLIA**

**I. CORPUS STRIATUM**



**II. SUBSTANTIA NIGRA:**



**III. SUBTHALAMIC NUCLEUS**

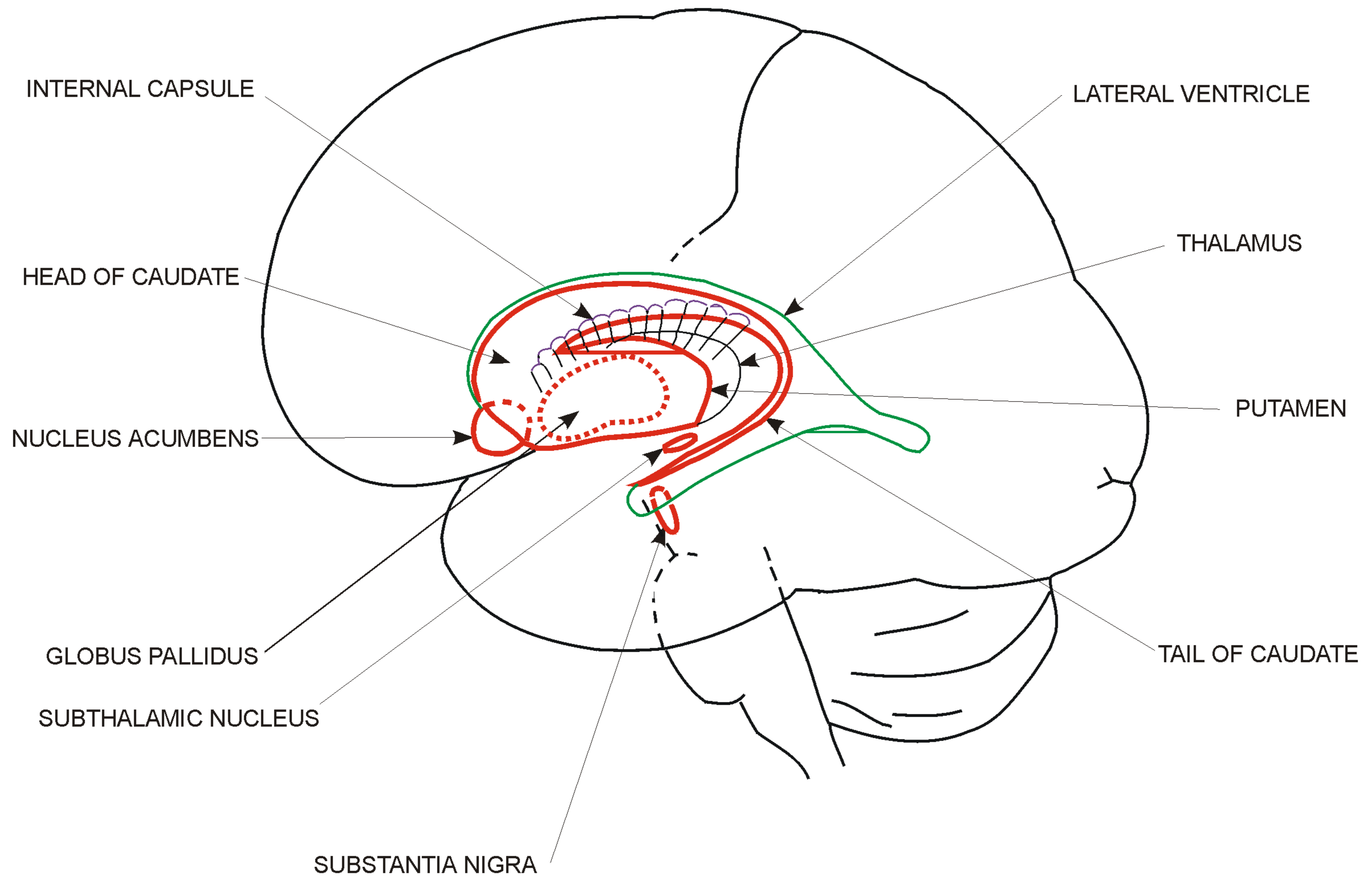


Fig. 23 - Topography of the Basal Ganglia





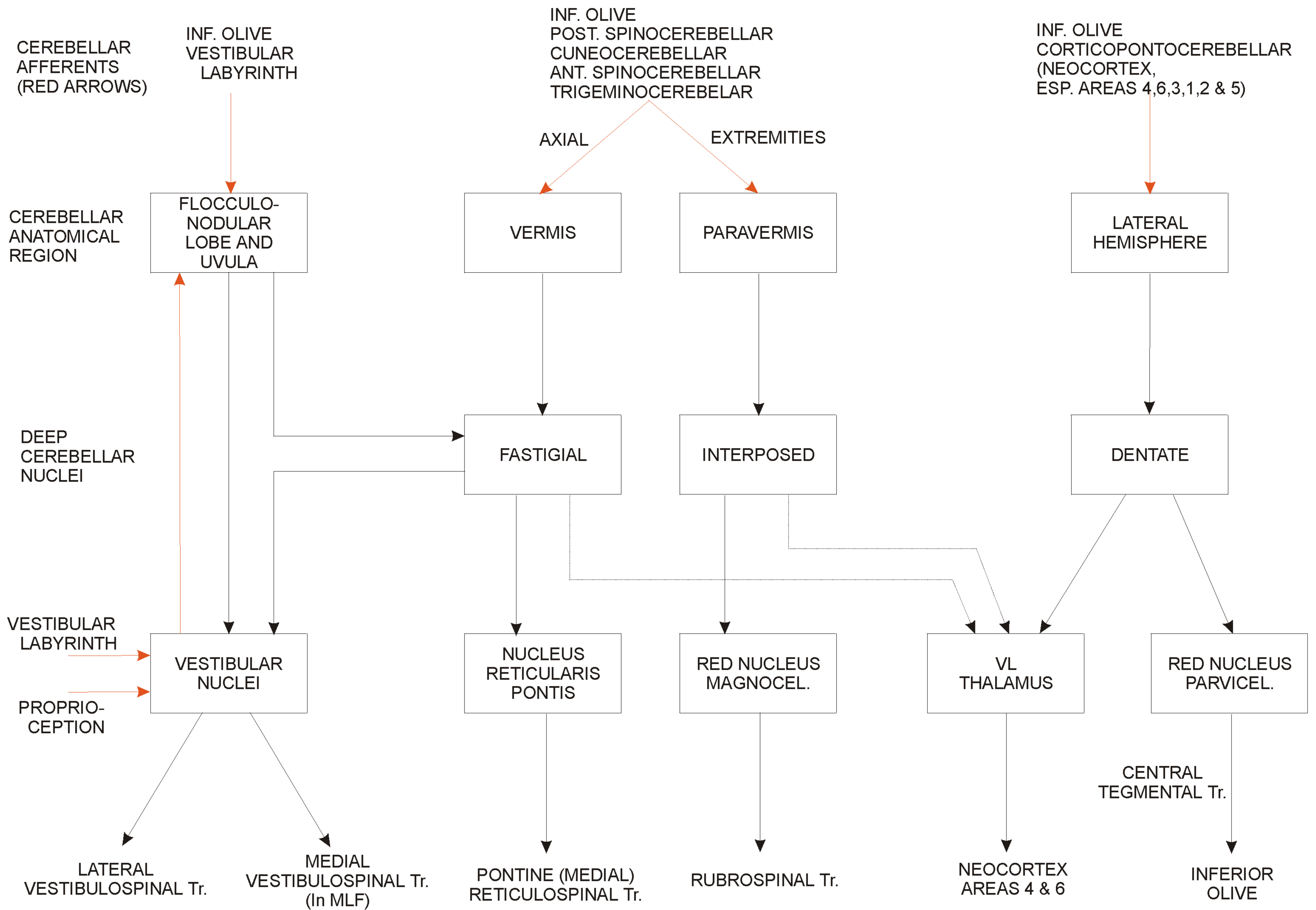


Fig. 25 - Cerebellar Organization: Afferent and Efferent Systems