

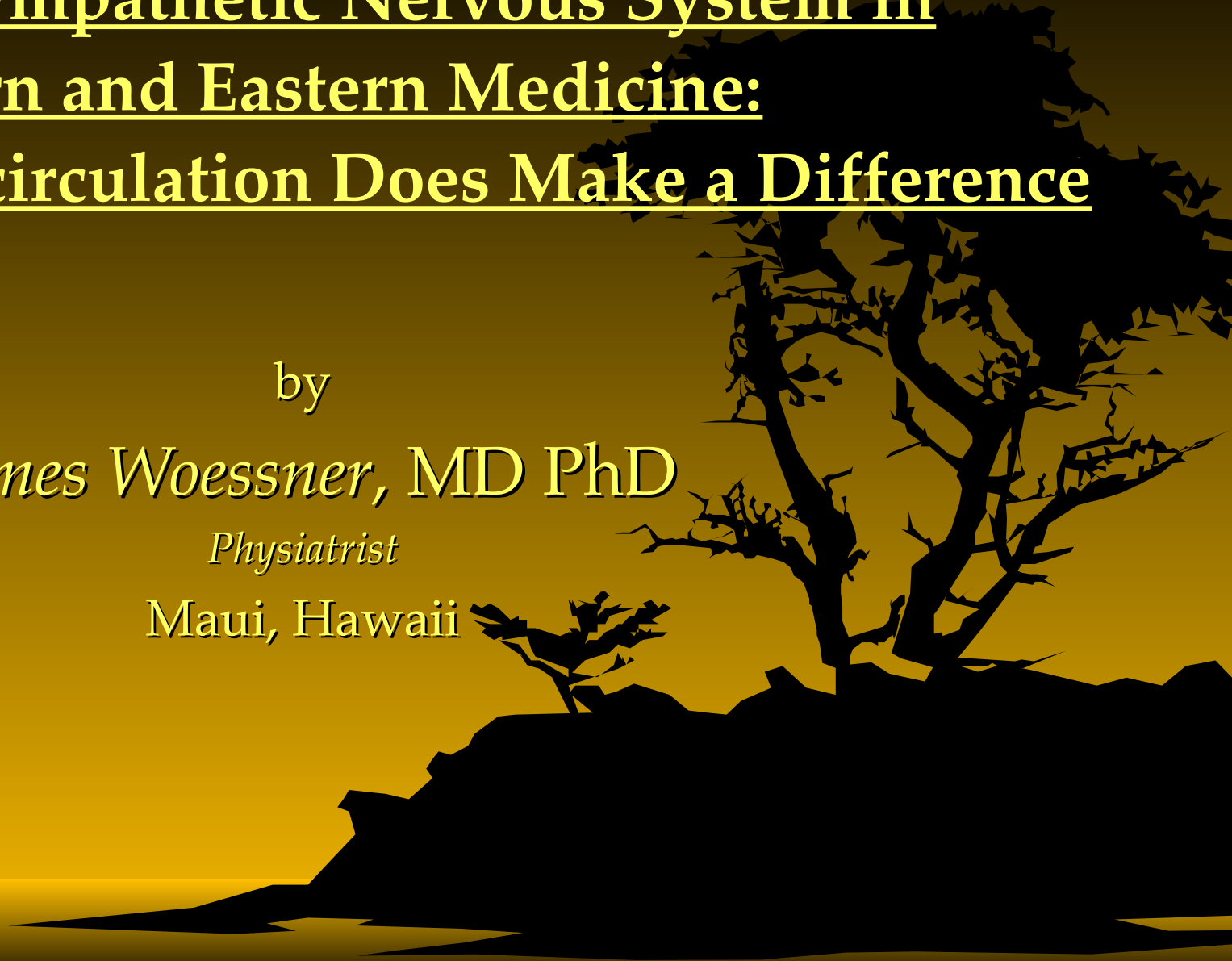
The Sympathetic Nervous System in Western and Eastern Medicine: Microcirculation Does Make a Difference

by

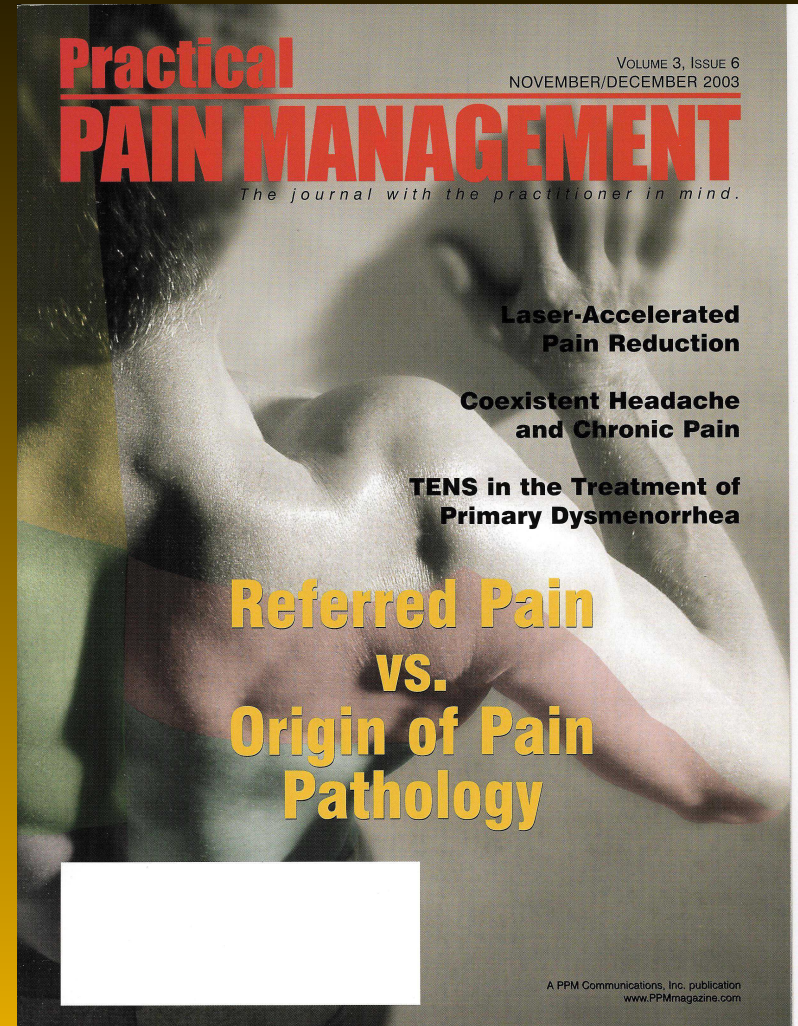
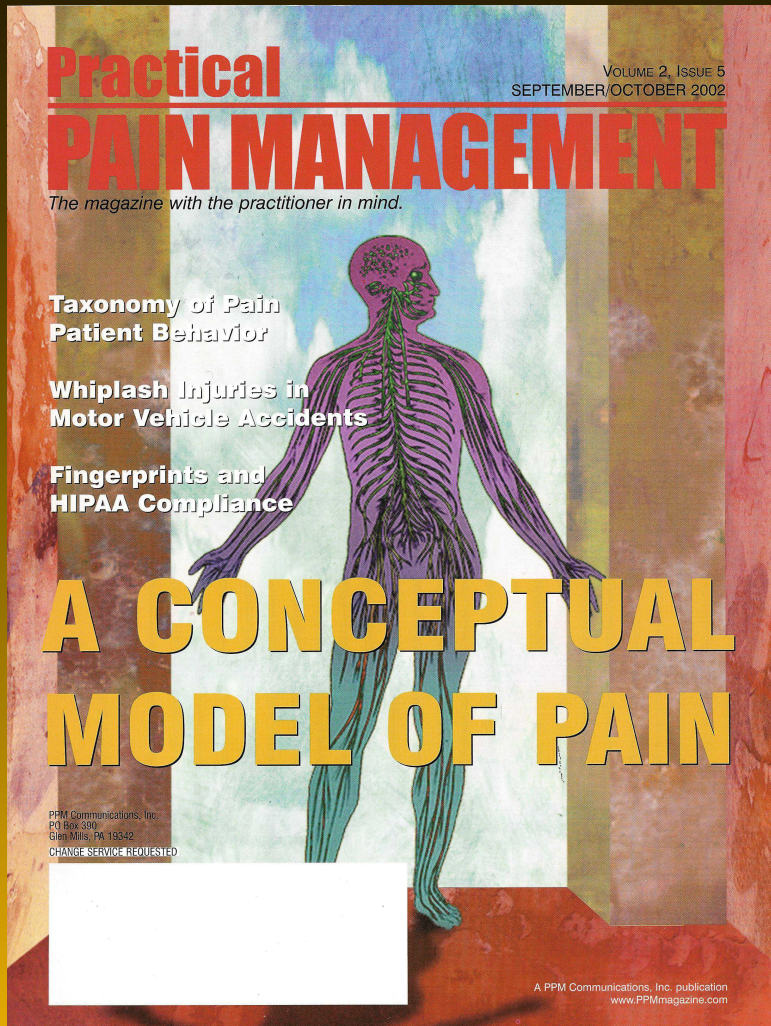
James Woessner, MD PhD

Physiatrist

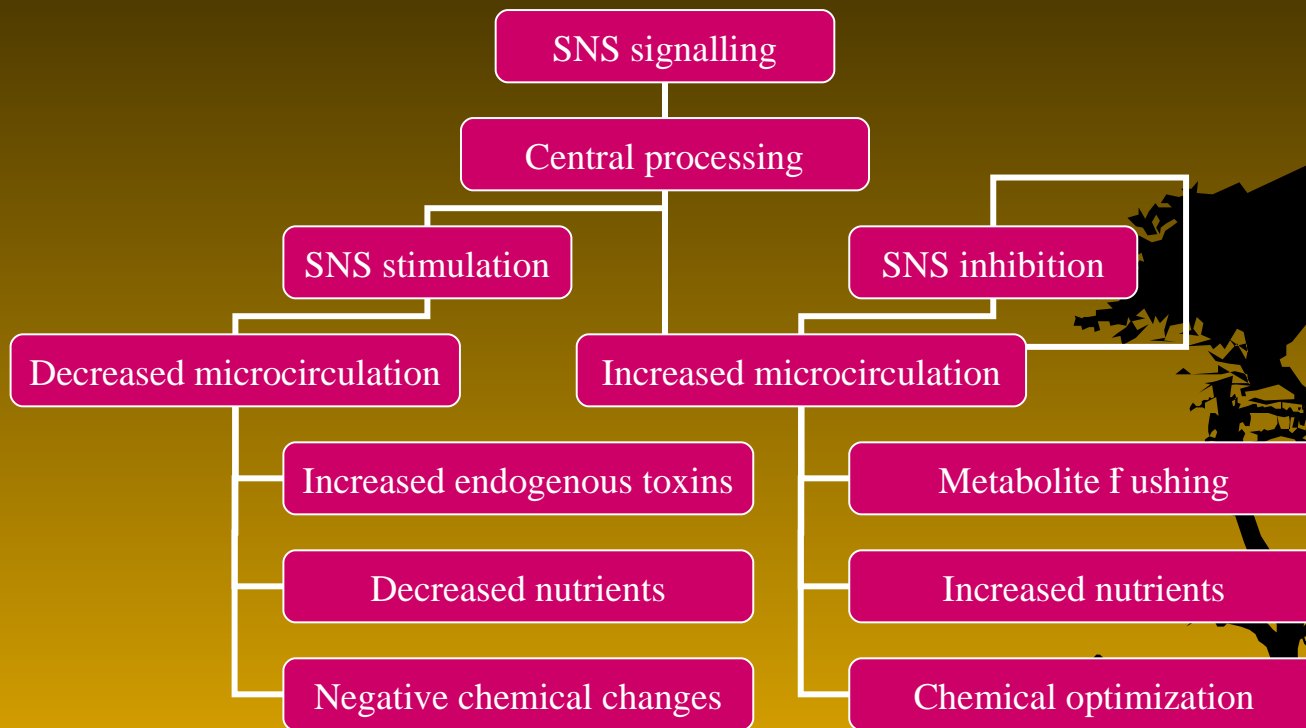
Maui, Hawaii



My Cover Articles



Circulatory Autoregulation



Conclusions

- AP represents part of an ancient system of comprehensive health care
- As scientific knowledge expands, modern correlations are being developed which help translate this ancient wisdom into today's terms
- May the Qi be with you!!!

Integument, Integument, Everywhere!



Distribution of the Nervous System

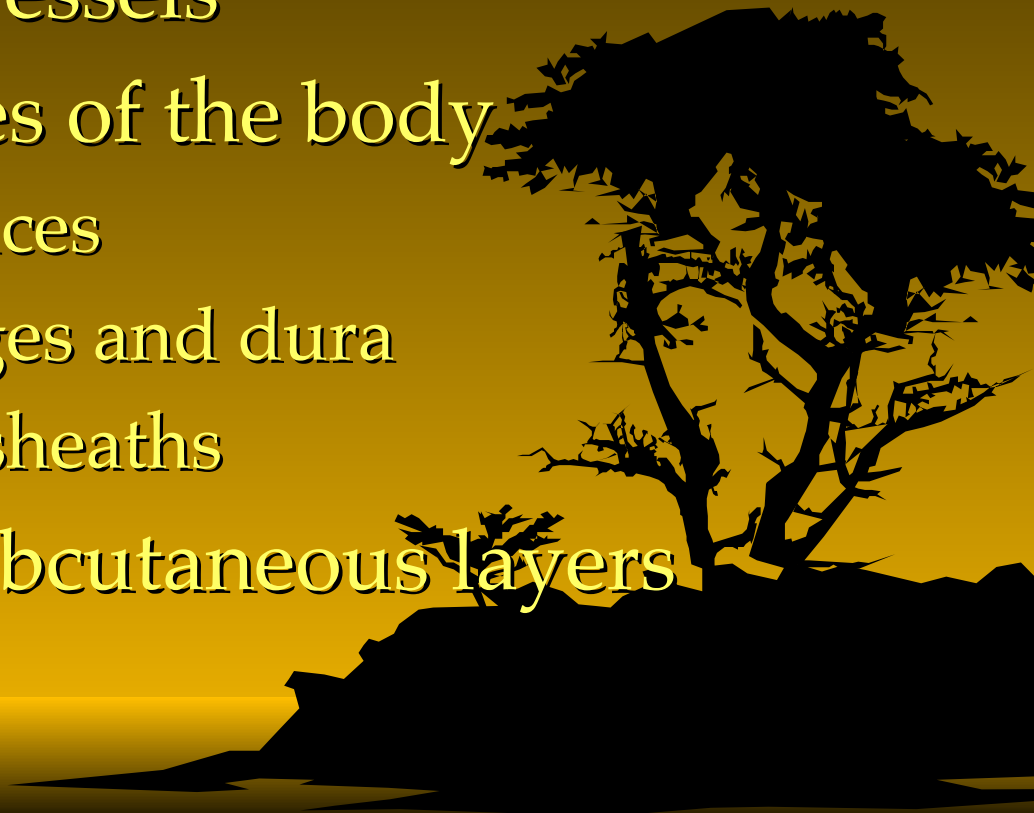
On surface of major nerves

Along blood vessels

In tissue planes of the body

- On joint surfaces
- In the meninges and dura
- Along nerve sheaths

In the skin / subcutaneous layers



There are multiple relationships!

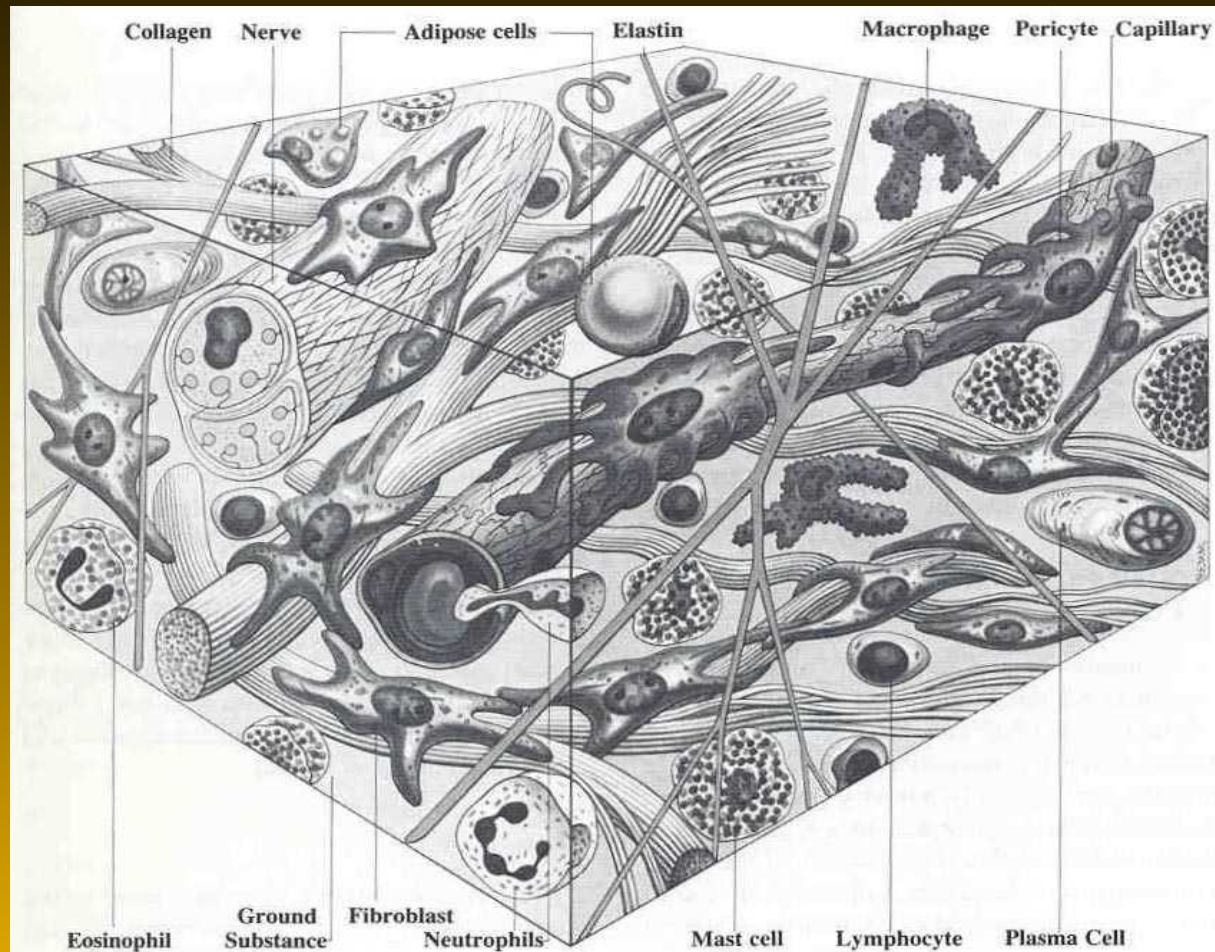


Figure 3-1 A diagrammatic representation of loose connective tissue, showing fibers, cells, ground substance, nerve, and blood vessels. *Source:* Reprinted from *Gray's Anatomy*, ed 35 (p 32) by P. Williams and R. Warwick with permission of W.B. Saunders, © 1973.

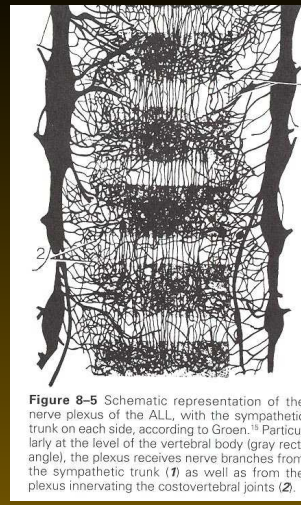
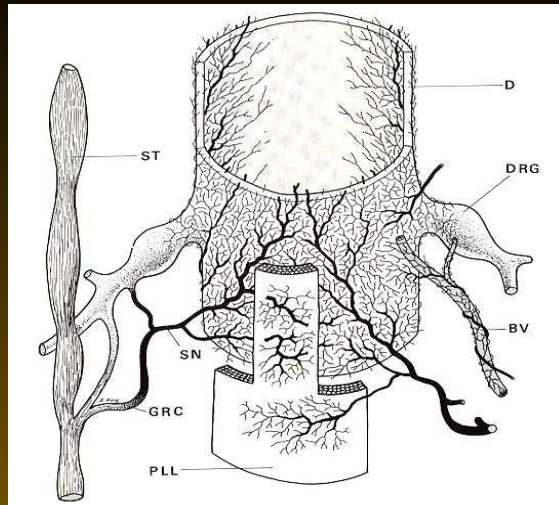


Figure 8-5 Schematic representation of the nerve plexus of the ALL, with the sympathetic trunk on each side, according to Green.¹⁸ Particularly at the level of the vertebral body (gray rectangle), the plexus receives nerve branches from the sympathetic trunk (1) as well as from the plexus innervating the costovertebral joints (2).

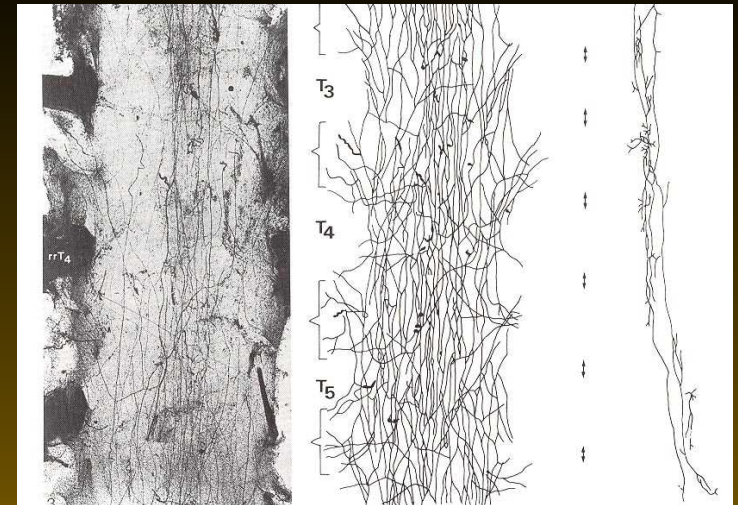


Figure 5-19. Innervation of the recurrent nerve of Luschka. The recurrent nerve of Luschka (RN) supplies the posterior longitudinal ligament (PLL), the nerve root dura (D), and conceivably the very outer layers of the annulus. AFD = anterior primary division; GGL = sympathetic ganglion; VSN = intersegmental nerve; TPL = posterior primary division; SSC = sensory sympathetic ganglion; VSN = ventral sensory nerve.

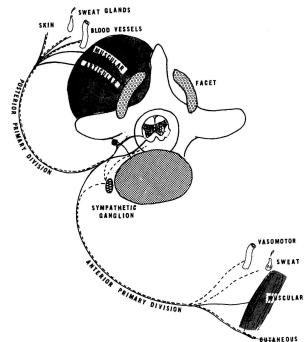


Figure 10-65. Neurologic pain pathways. The neurologic pathways by which nociceptive impulses are sent via afferent fibers to the cord. The autonomic motor pathways are also depicted.

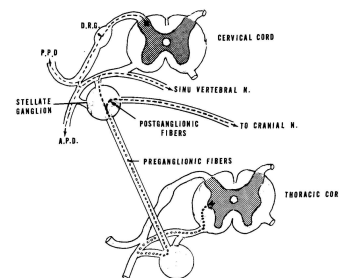


Figure 1-71. Sympathetic nervous system. The preganglionic white fibers originate from the intermediolateral horn cells of the thoracic cord and ascend to the stellate ganglion where they synapse with the postganglionic gray fibers. These autonomic nerve fibers accompany the somatic nerve when they divide into anterior primary (APD) and posterior primary (PPD) divisions. The afferent fibers enter the dorsal horn of the cord through the dorsal root ganglion (DRG).

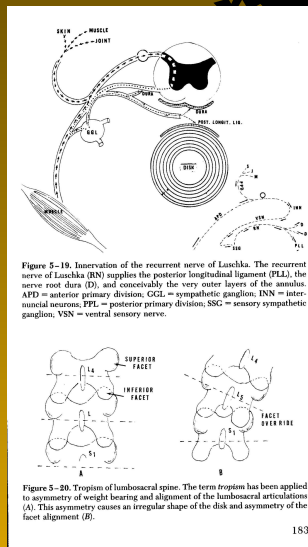


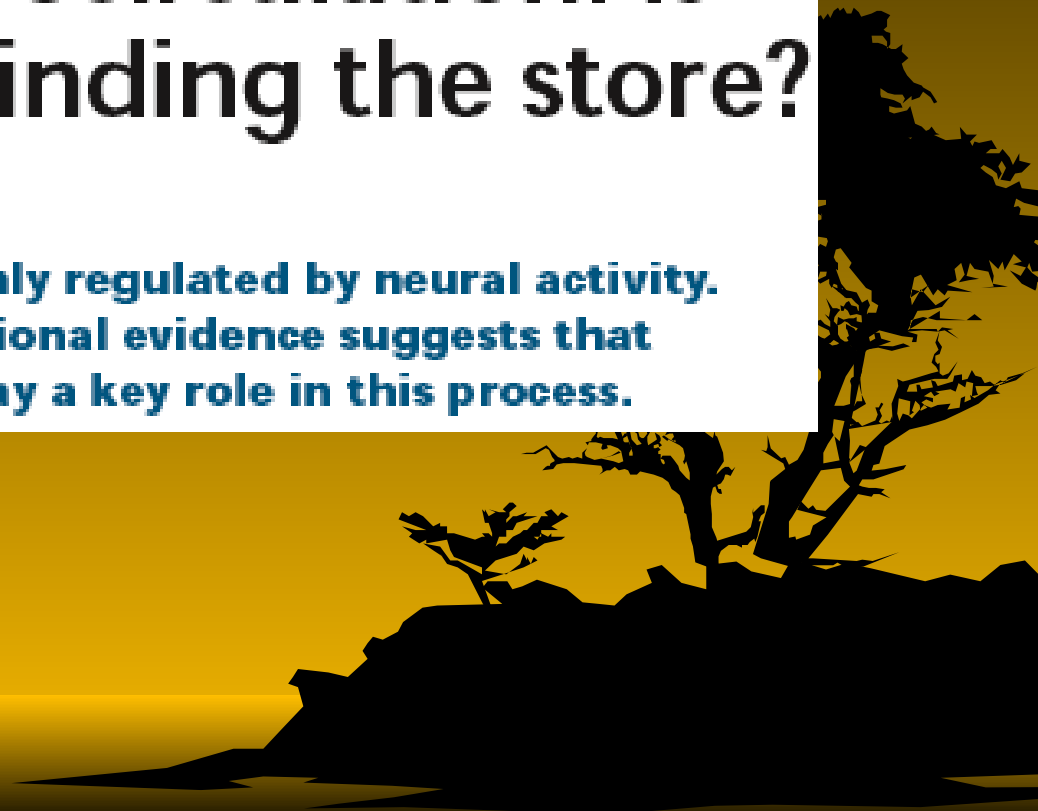
Figure 5-20. Trochanter of lumbarosacral spine. The term trochanter has been applied to asymmetry of weight bearing and alignment of the lumbarosacral articulations (A). This asymmetry causes an irregular shape of the disk and asymmetry of the facet alignment (B).

The dura is innervated with sympathetic nerves.

Neurogenic control of the cerebral microcirculation: is dopamine minding the store?

Costantino Iadecola

Cerebral blood flow is highly regulated by neural activity. New anatomical and functional evidence suggests that dopamine neurons may play a key role in this process.



Spread of vasodilatation and vasoconstriction along feed arteries and arterioles of hamster skeletal muscle

Steven S. Segal, Donald G. Welsh and David T. Kurjiaka

*The John B. Pierce Laboratory and Department of Cellular and Molecular Physiology,
Yale University School of Medicine, New Haven, CT 06519, USA*

5. Focal electrical stimulation produced constriction that spread rapidly along feed arteries and arterioles. These responses were inhibited by tetrodotoxin or prazosin, confirming the release of NA along perivascular sympathetic nerves, which are absent from arterioles studied in the cheek pouch. Thus, sympathetic nerve activity co-ordinated the contraction of smooth muscle cells as effectively as the conduction of vasodilatation co-ordinated their relaxation.
6. In the light of previous findings in the cheek pouch, the properties of vasoconstriction and vasodilatation in feed arteries and arterioles of the retractor muscle indicate that substantive differences can exist in the nature of signal transmission along microvessels of tissues that differ in structure and function.

Neuroeffector transmission in arterioles of the guinea-pig choroid

H. Hashitani, A. Windle* and H. Suzuki

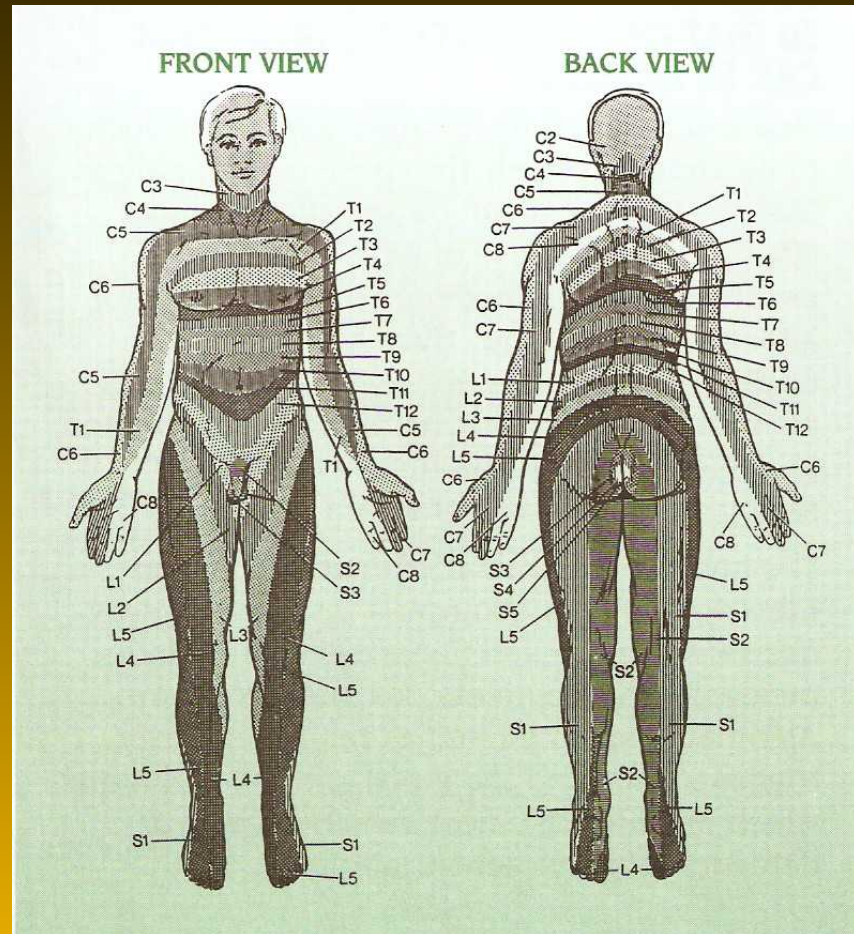
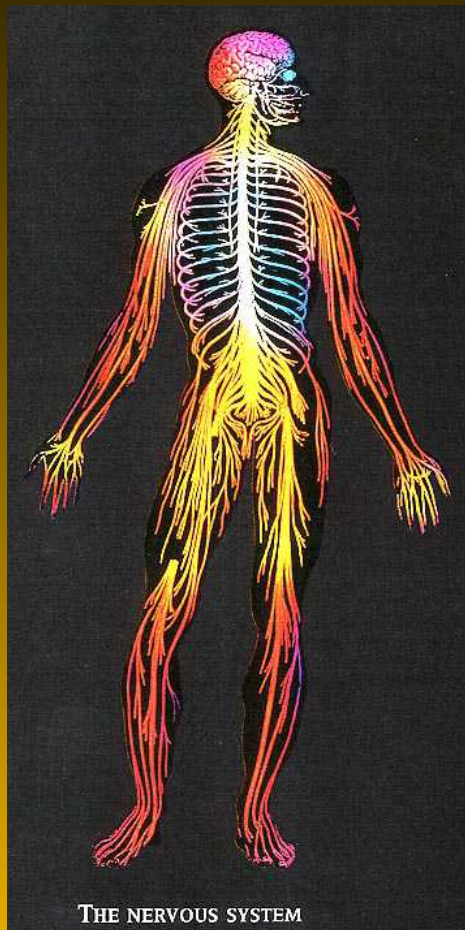
*Department of Physiology, Nagoya City University Medical School, Nagoya 467-8601, Japan and *Department of Zoology, The University of Melbourne, Parkville, Victoria 3052, Australia*

8. These findings indicate that choroidal arterioles of the guinea-pig are innervated by at least three different populations of nerves, adrenergic nerves which evoke excitatory responses, cholinergic nerves which evoke inhibitory responses and a population of nerves which cause the release of NO.

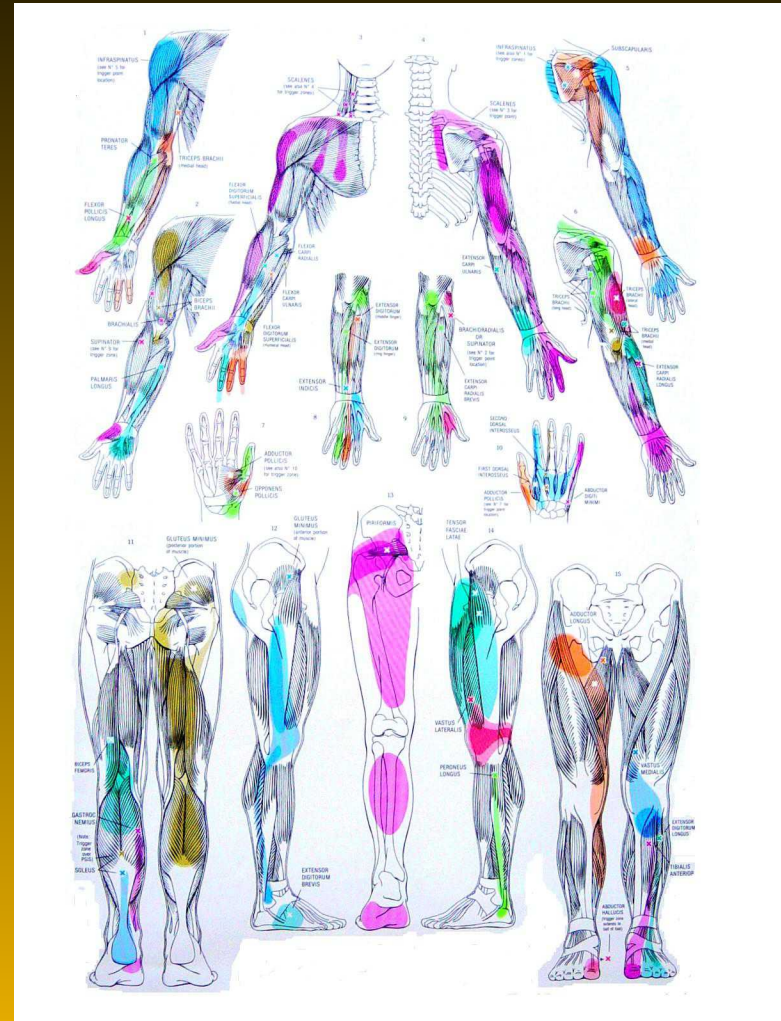
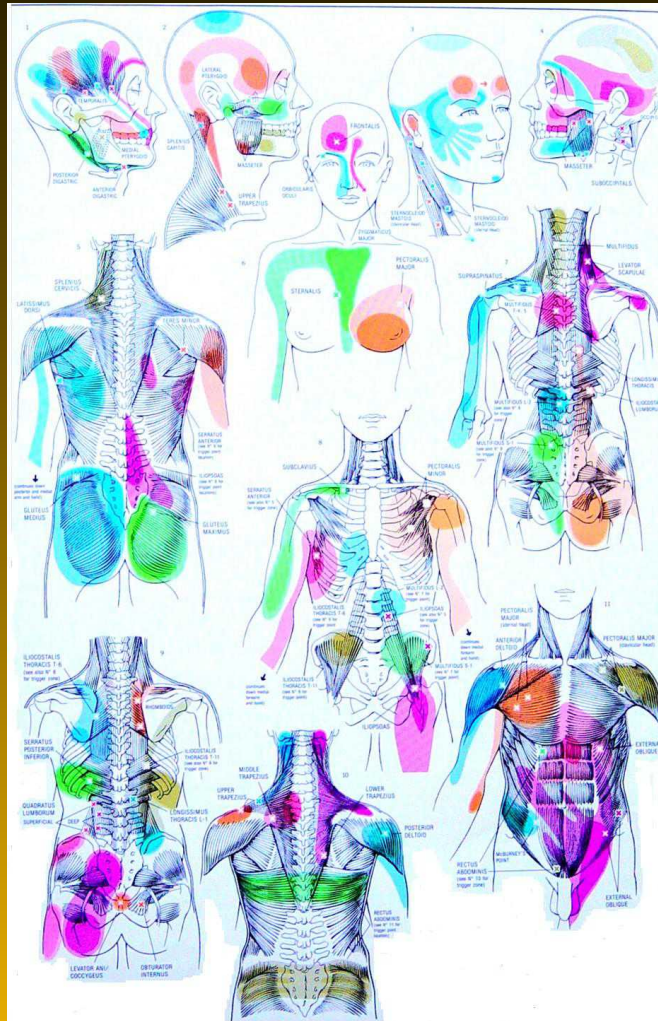
Autonomic Effects

- Referred pain
- Convergence of Somatic and Visceral inputs in CNS
 - dorsolateral funiculus
 - spinothalamic tracts
- Visceral A-delta fibers reflexively affect muscles
 - inflammation and cramping

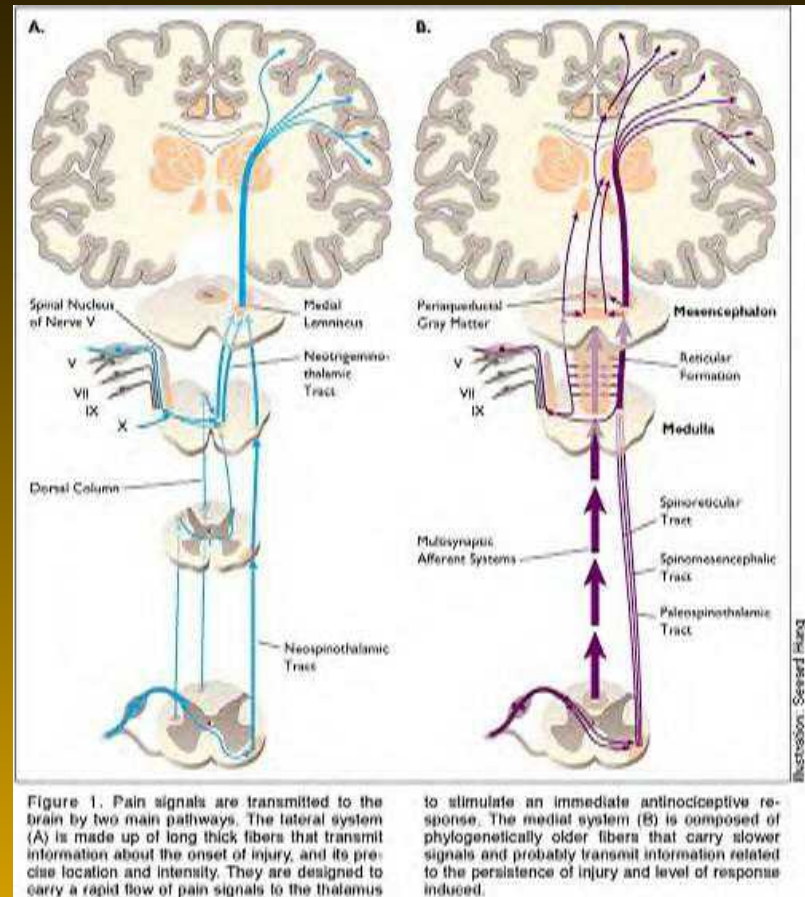
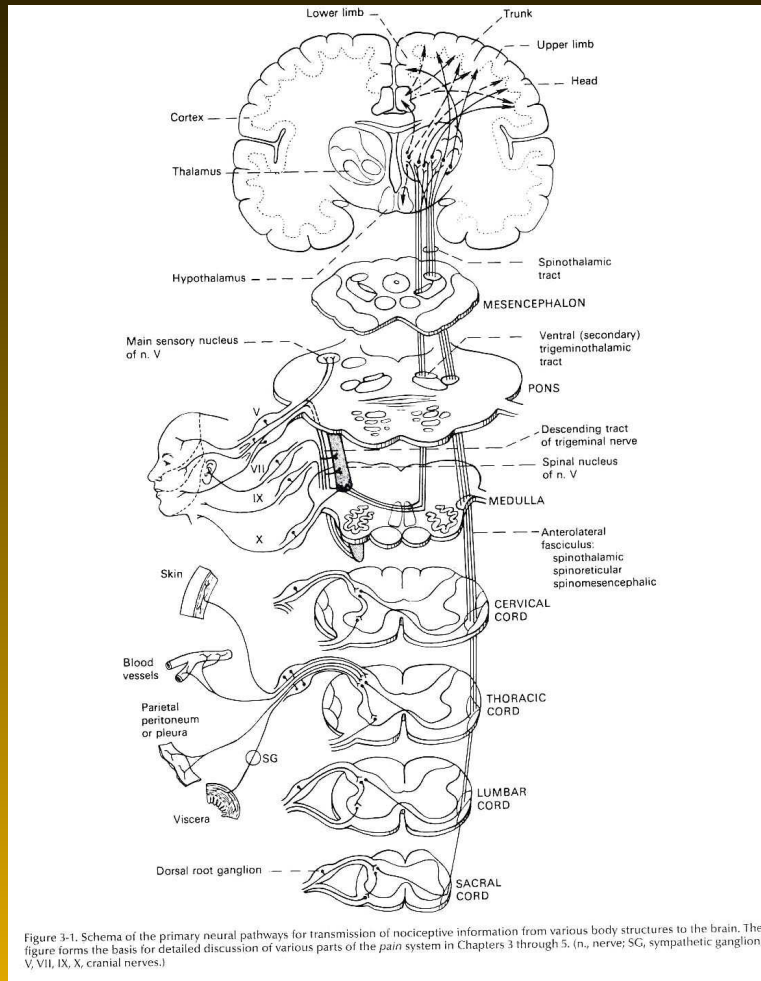
from Dr. Fischer's Phamplet



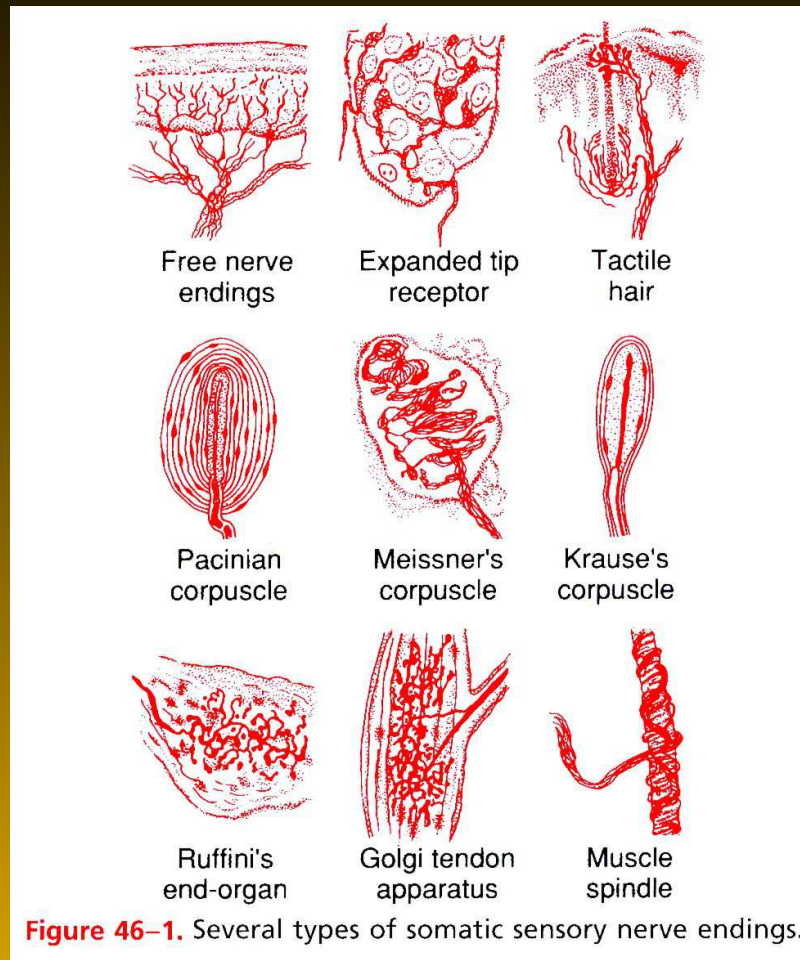
Myofascial Trigger Point Pain Referral Patterns



Pain (Afferent) Pathways



Nerve Ending Types



Nerve Fiber Types

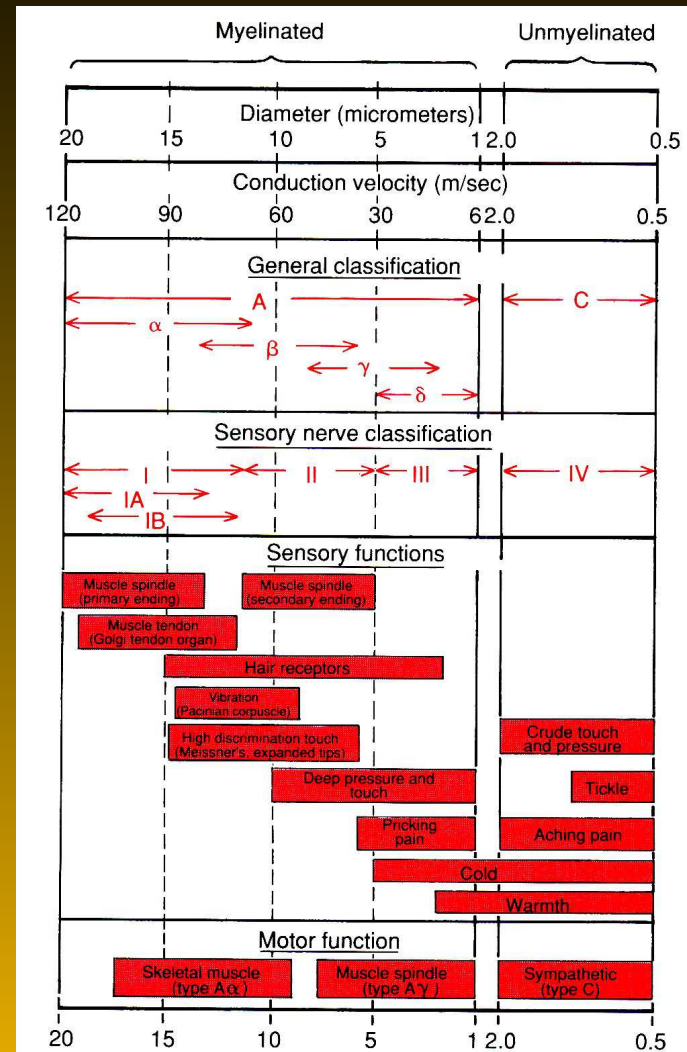
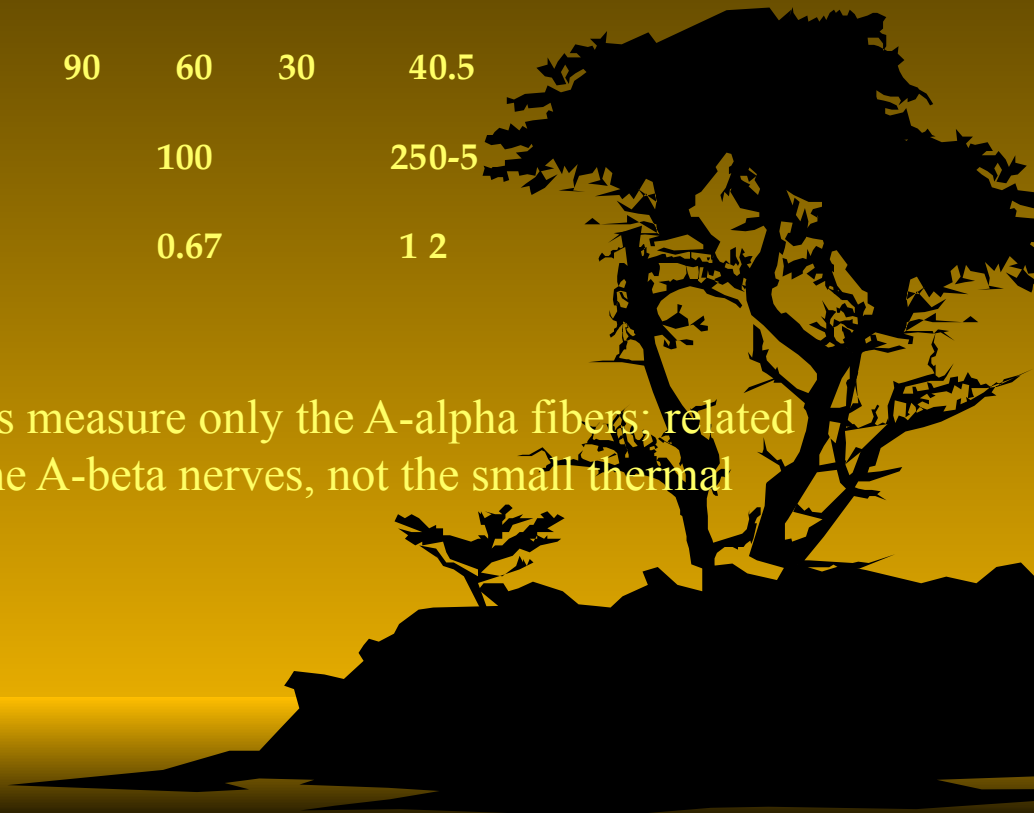


Figure 46-6. Physiological classifications and functions of nerve fibers.

The Fiber Spectrum of the Peripheral Nerves

		<u>myelinated fibers</u>				<u>unmyelinated</u>
<u>fiber class</u>	Aa	Aa	Ab	Ag	Ad	C
<u>fiber diameter</u> (micrometer)	20	15	20	5	20.5	
<u>conduction velocity</u> (m/sec)	120	90	60	30	40.5	
<u>preferred firing frequency</u> (Hz)	150		100		250-5	
<u>absolute refractory period</u> (ms)	0.4		0.67		1 2	

Note – EMGs and motor nerve studies measure only the A-alpha fibers; related sensory nerve studies only measure the A-beta nerves, not the small thermal nerves.



Sympathetic Innervation of Internal Organs and Tissues

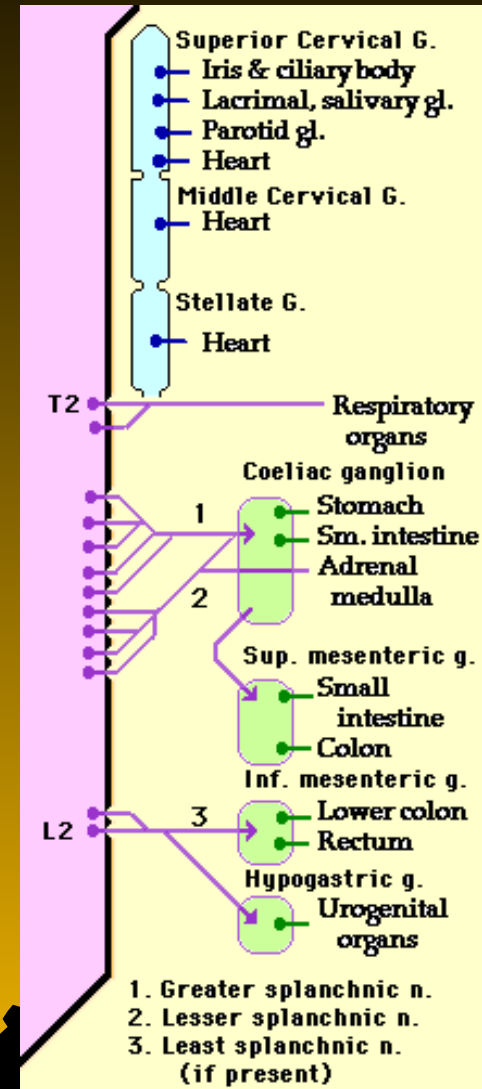
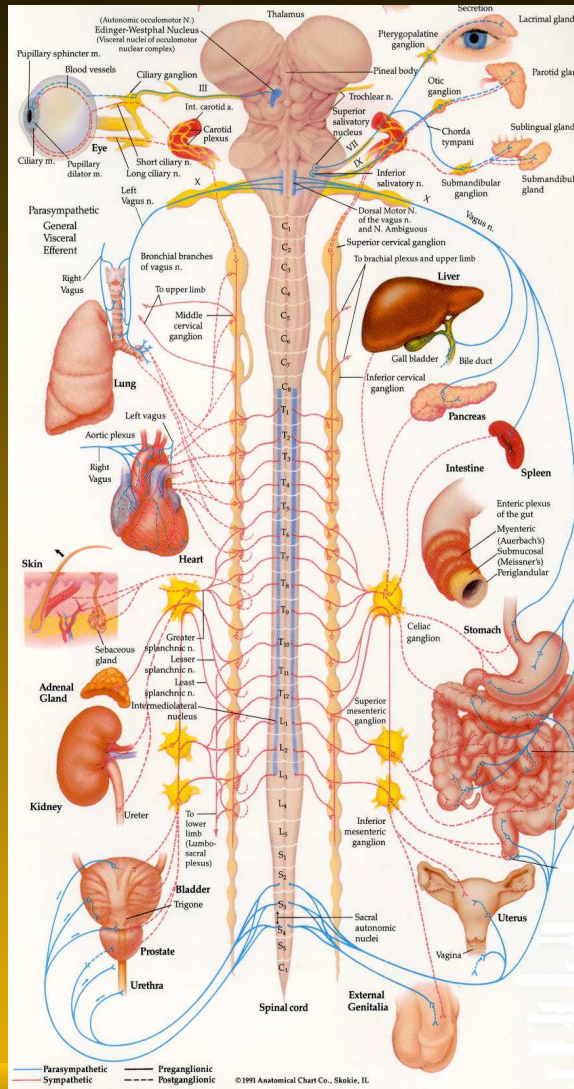
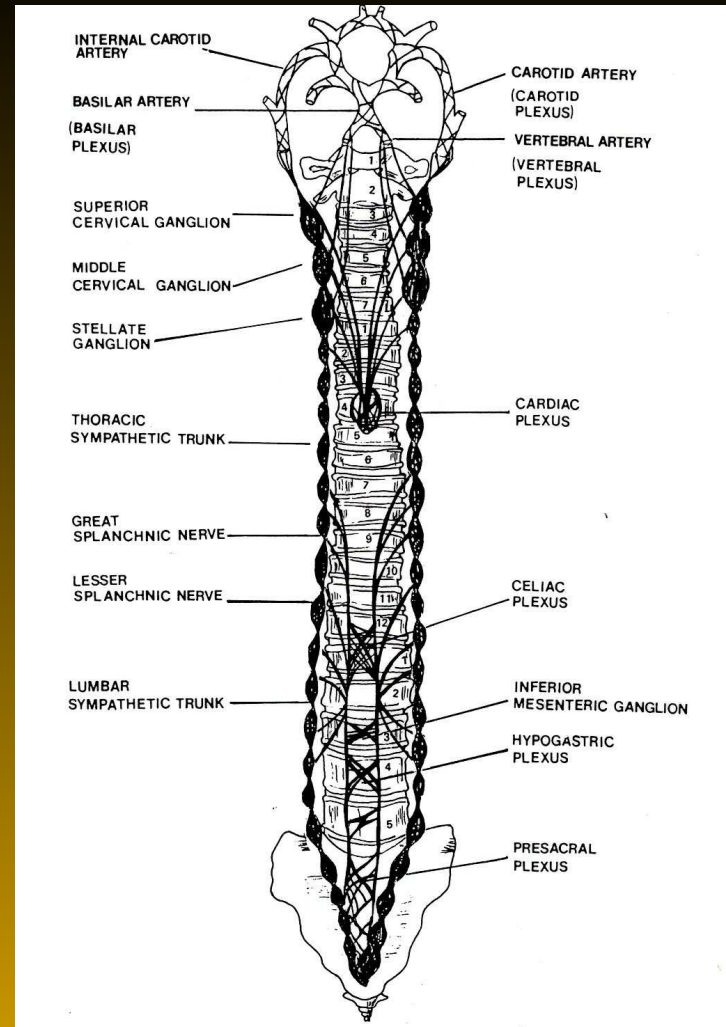
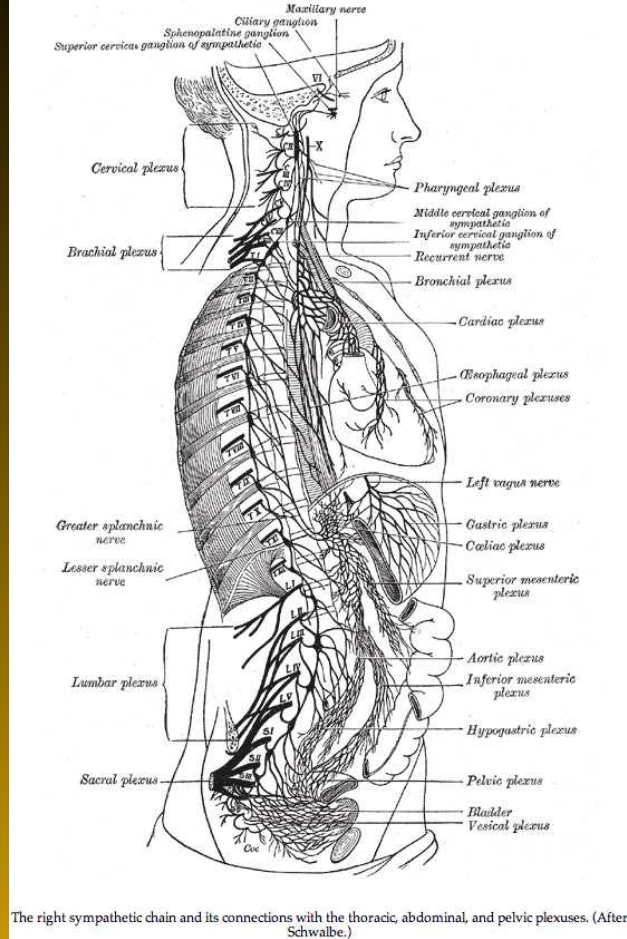


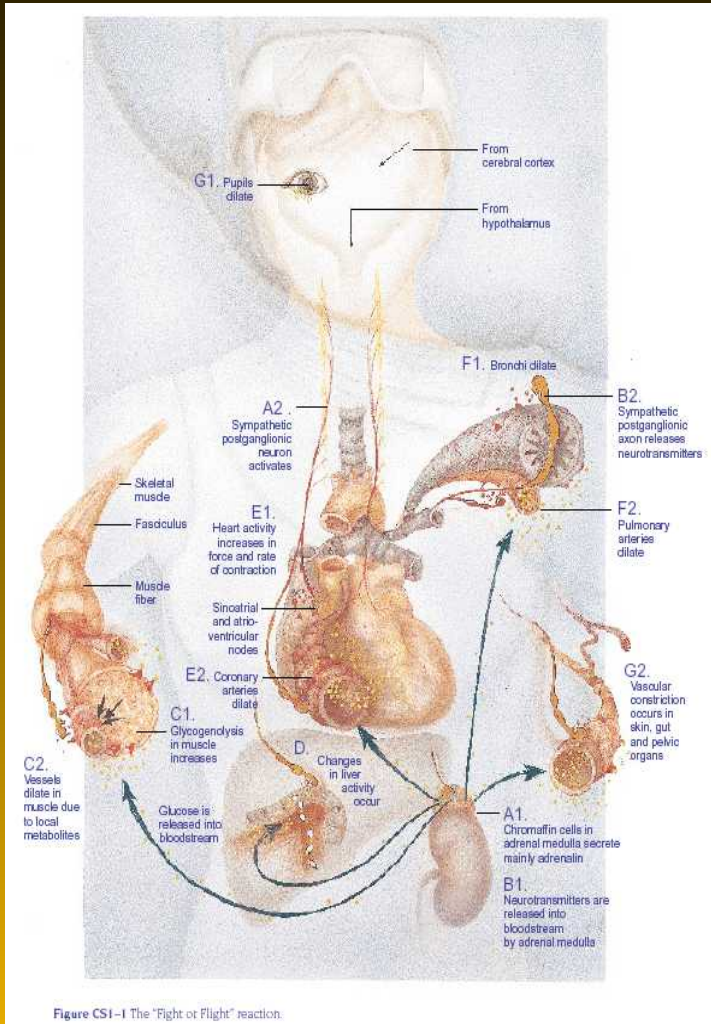
FIG. 838



The sympathetic nervous system has large plexi over multiple internal organs and can collateralize & crossover; it innervates skin, organs, tissue planes, arterioles and spindle muscle fibers.

PAIN IS NOT GOOD FOR ANYONE'S HEALTH!

If the sympathetic C-fiber pathways are acutely stimulated and/or chronically neuropathically affected, would we not expect internal organ dysfunction?



Fight or Flight changes:

- - From cerebral cortex
- G1 - Pupils dilate
- - From hypothalamus
- F1 - Bronchi dilate
- B2 - Sympathetic neurotransmitters released
- A2 - Sympathetic postganglionic neuron activates
- - Skeletal muscle
- E1 - Heart contractions increase in rate & force
- F2 - Pulmonary arteries dilate
- - Fasciculus
- - Muscle fiber
- - Sinoatrial and atrioventricular nodes
- E2 - Coronary arteries dilate
- G2 - Skin, gut & pelvic organ vessels constrict
- C1 - Muscle glycogenolysis increases
- D - Liver functions change
- C2 - Vessels in muscle dilate
- - Glucose released in blood
- A1 - Adrenaline excretion occurs
- B1 - Adrenal neurotransmitters released

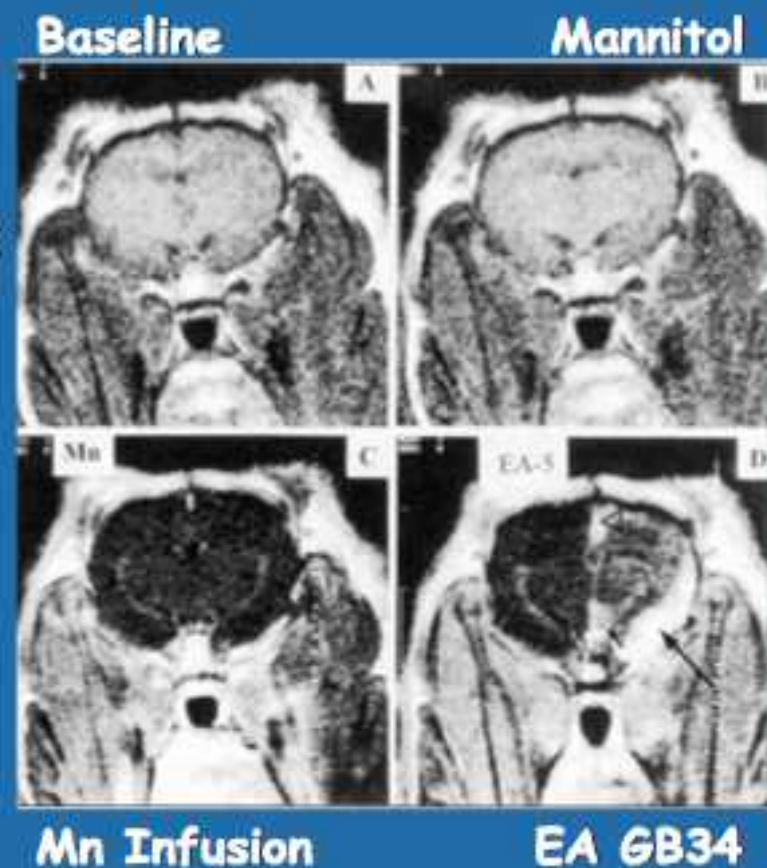
Thermographic Differences



Basically, efferent sympathetic C-fibers

Effects of Acupuncture

- Using manganese-enhanced fMRI (functional magnetic resonance imaging), visual effects can be seen in human and animal neural tissues

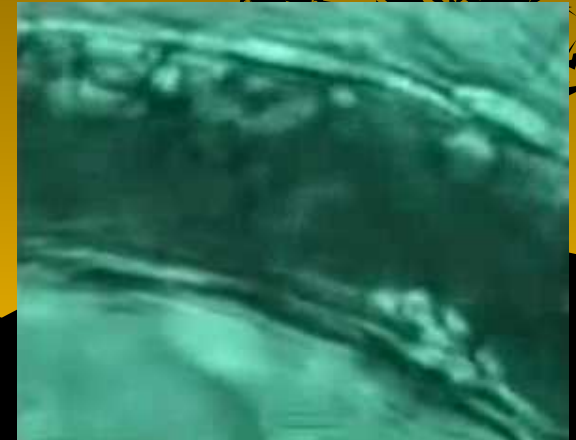
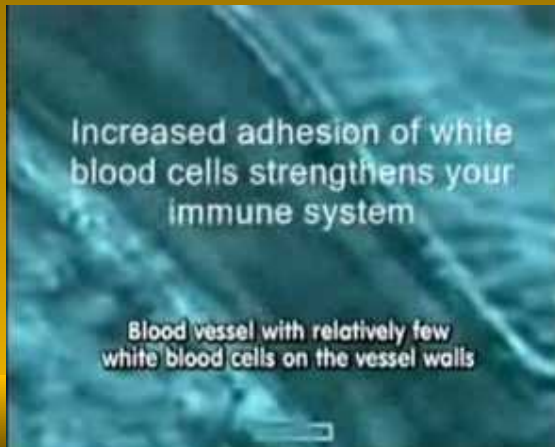


Circulatory Changes

Capillaries before and after EMF treatment



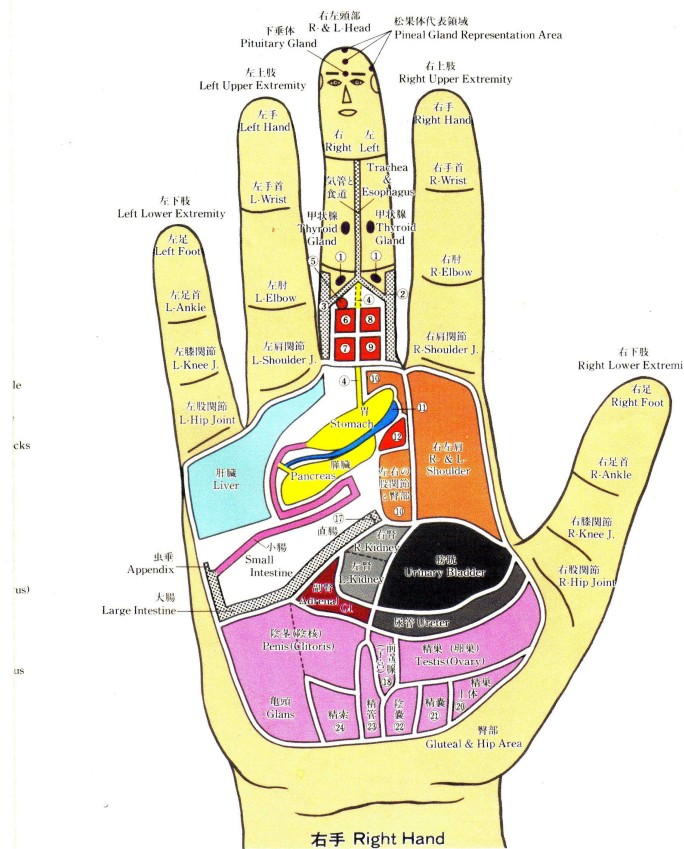
WBC margination before and after EMF treatment



Organ Representations on the Hands

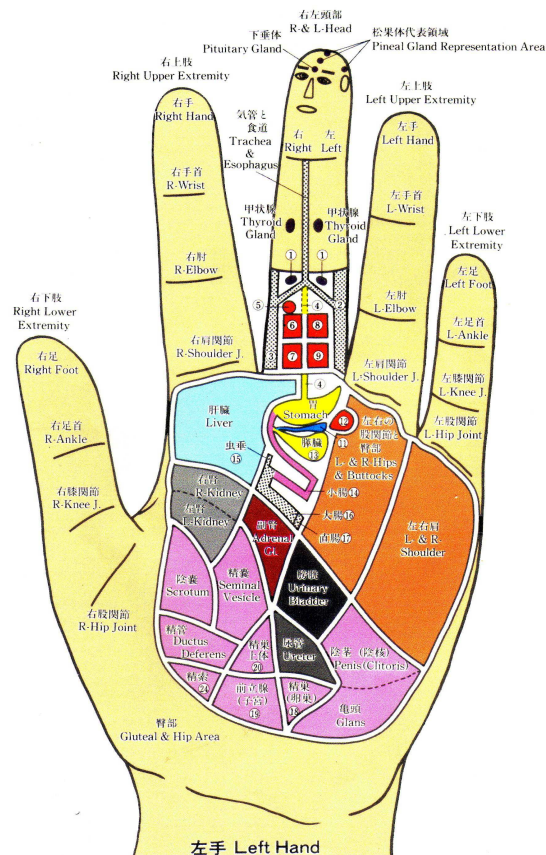
ト法による手の臓器代表領域

Localized by the Bi-Digital O-Ring Test



バイ・デジタルO-リングテスト

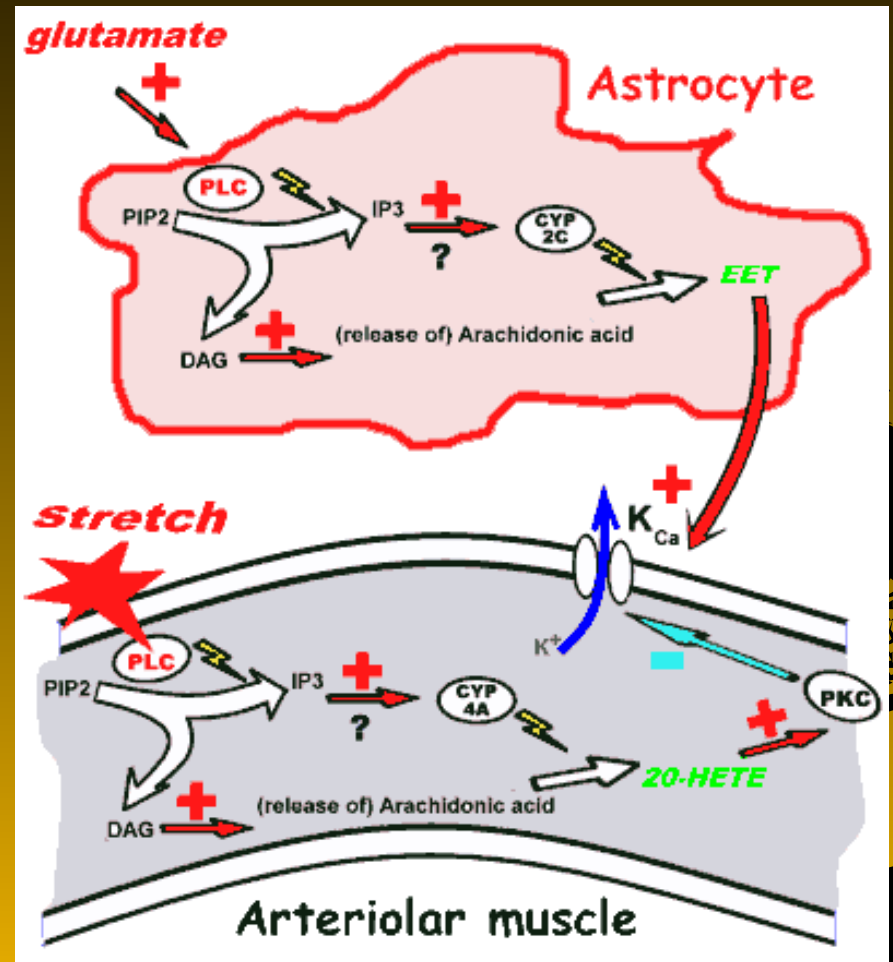
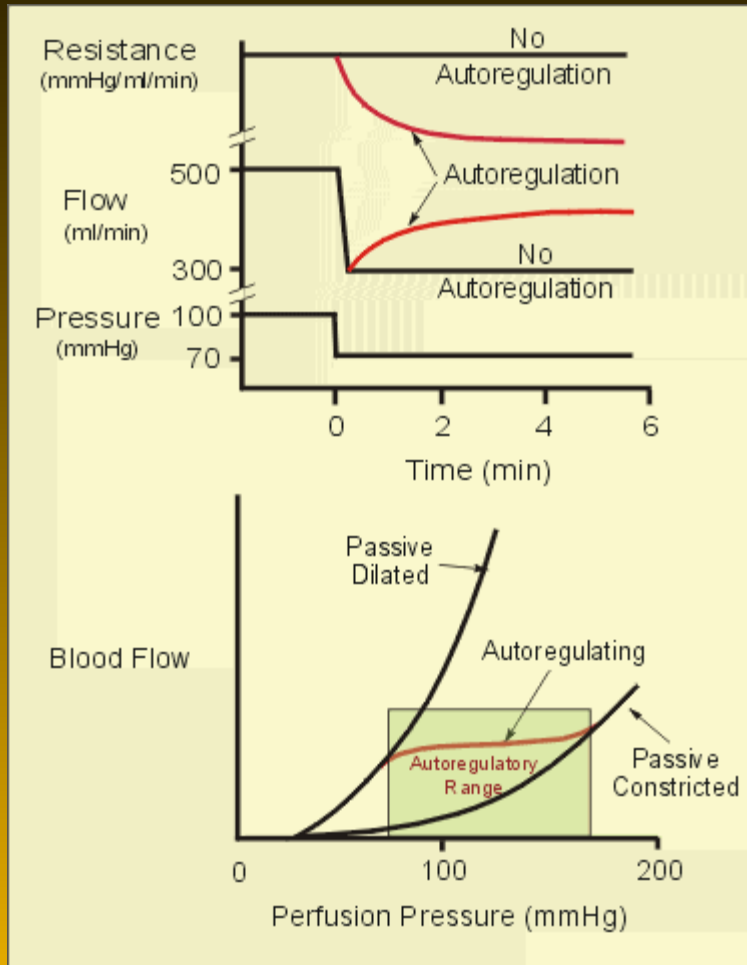
Organ Representation Areas of the Har



- ① 胸腺 Thymus G
- ② 左肺 Left Lung
- ③ 右肺 Right Lung
- ④ 食道 Esophagus
- ⑤ 胃 Stomach
- ⑥ 右心房 Right Atr
- ⑦ 右心室 Right Vtr
- ⑧ 左心房 Left Atr
- ⑨ 左心室 Left Vtr
- ⑩ 左右の股関節と L & R Hips &
- ⑪ 胆嚢 Gall Bladd
- ⑫ 脾臓 Spleen
- ⑬ Pancreas
- ⑭ Small Intestine
- ⑮ Appendix
- ⑯ Large Intestine
- ⑰ Rectum
- ⑱ Testis (Ovary)
- ⑲ Prostate Gland
- ⑳ Epididymis
- ㉑ Seminal Vesicle
- ㉒ Scrotum
- ㉓ Ductus Deferen
- ㉔ Funiculus Sper

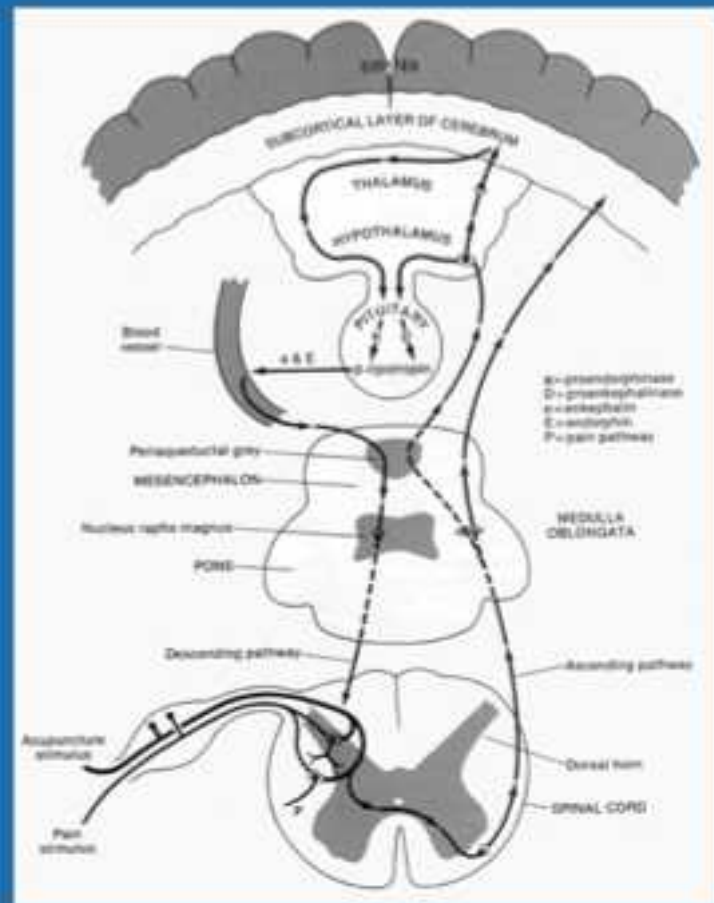
()内は女性の場合

Autoregulation



Distant Effects of AP

- Nociceptive afferents activate Group II static load muscle fibers
- Brings propriospinal system into play
- Results in propagation of impulses to distant regions
- Descending control signals from the brainstem recreate homeostasis



Bioelectric Theory

- DC energy channels correspond to AP meridians
- Points of low electrical resistance on the skin correspond to AP points

Acupuncture

- AP point
- Meridian
- Qi

Bioelectric

- Amplifier
- Conductor
- Bioelectricity

Peripheral SNS Stimulation

Ion movement

- Air breathing
- Blood circulation
- Neuron protoplasmic flow
- Interstitial fluid movement

Acupuncture (metal needle in EMF)

Electroacupuncture

Electrotherapy / Electromedicine

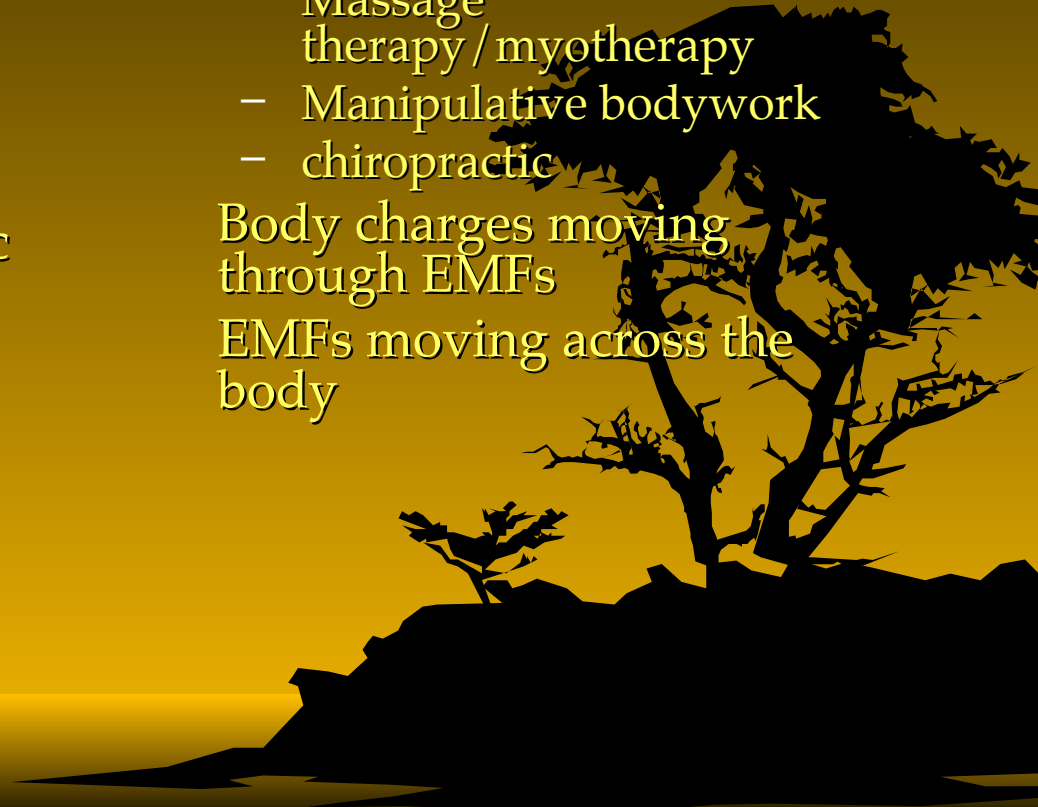
- ENB machines
- IF units
- HVGC machines
- Microcurrent devices

Tissue plane movement

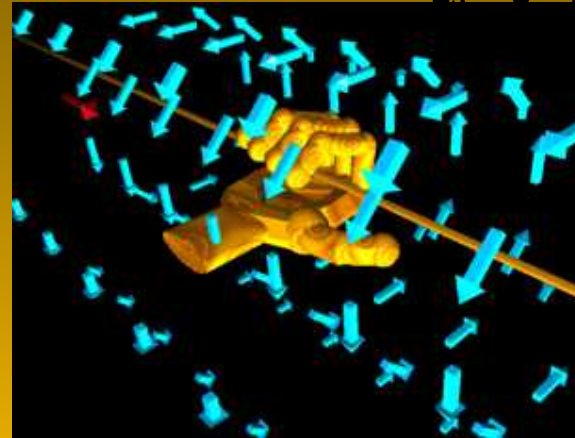
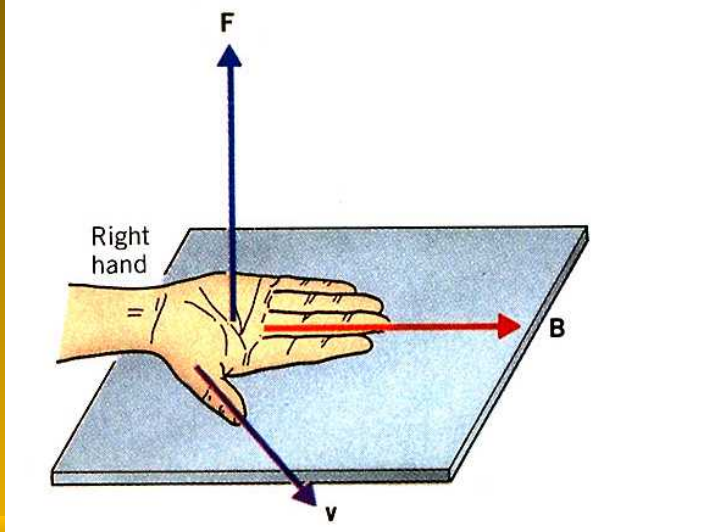
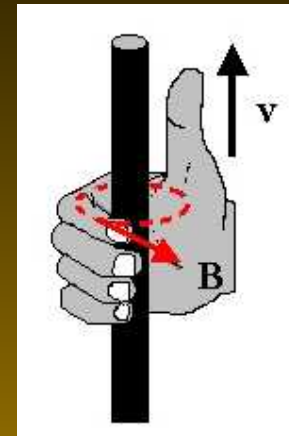
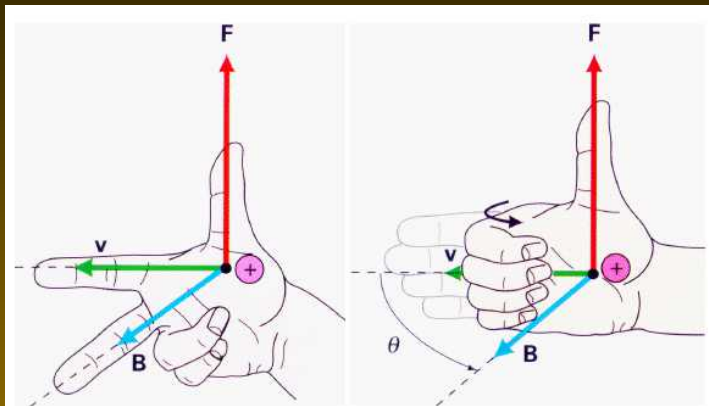
- Stretching
- Exercise
- Stress
- Massage therapy / myotherapy
- Manipulative bodywork
- chiropractic

Body charges moving through EMFs

EMFs moving across the body



The Right Hand Rule



Electromagnetic Field in Various Forms

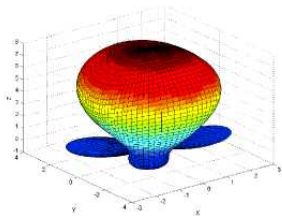
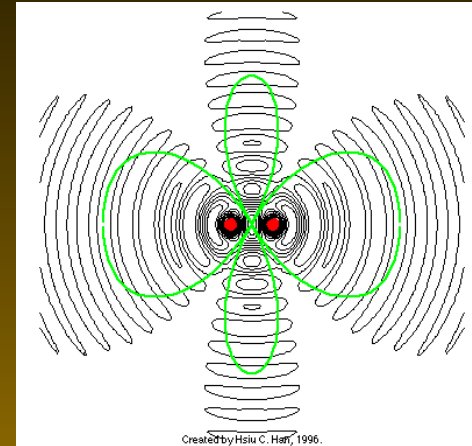
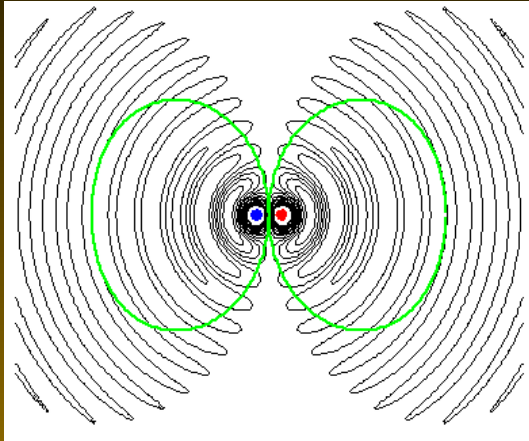


Fig. 7a, $\gamma = 0$

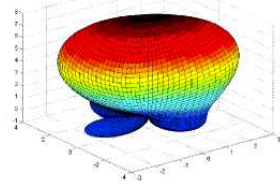


Fig. 7b, $\gamma = \pi/8$

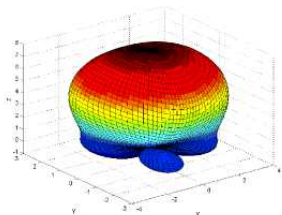


Fig. 7c, $\gamma = \pi/4$

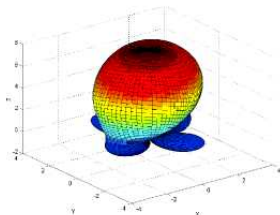


Fig. 7d, $\gamma = 3\pi/4$

Fig. 7. $L/(ka) = 1$, a three-dimensional plot showing pressure magnitude on the surface of a radiating sphere with a radius equal to 1,500,000 Bohr orbits supporting the fields of Eqs. (84)–(87). Phase variation with zenith angle is suppressed.

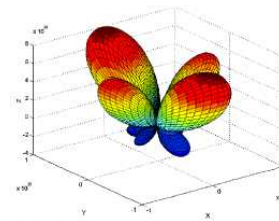


Fig. 11a, $\gamma = 0$

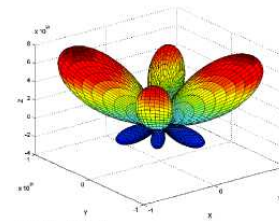


Fig. 11b, $\gamma = \pi/8$

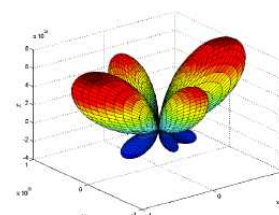


Fig. 11c, $\gamma = \pi/4$

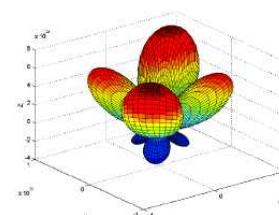


Fig. 11d, $\gamma = 3\pi/4$

Fig. 11. $L/(ka) = 1,500,000$, three-dimensional plot of electric pressure versus zenith angle. Phase variation with zenith angle is suppressed. Effects on the surface of a radiating sphere with a radius equal to one Bohr orbit supporting the fields of Eqs. (61)–(64).

Questions and Comments

