

# **Historic overview of Pain Medicine and research into human pain**

**Dr.med. Konrad Maurer**

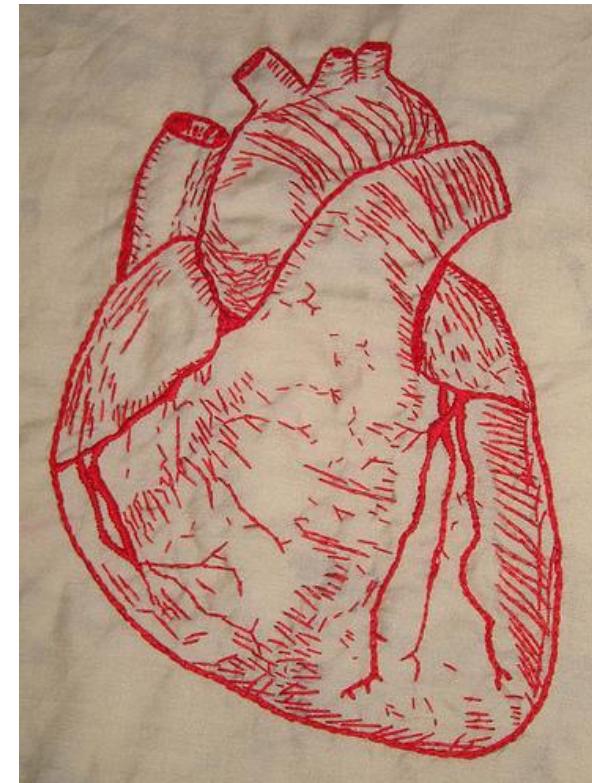
**Pain Research Unit  
Institute of Anesthesiology  
University Hospital Zürich  
Switzerland**





# Ancient cultures

- Egypt
- Greek
- Roman
- Indian
- → Center of sensation was believed to be in the heart



# Mechanistic Views of Pain



Galen  
130 -201 A.D.



Avicenna  
980 – 1037 A.D.



# Mechanistic Views of Pain

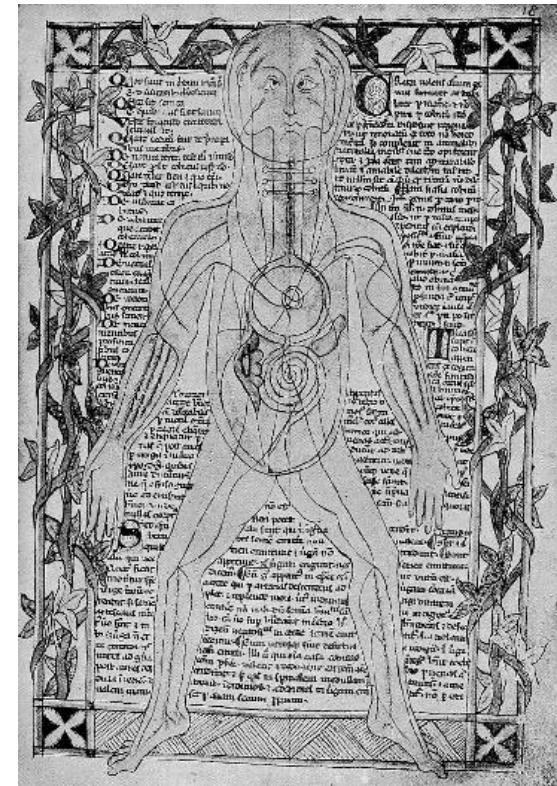
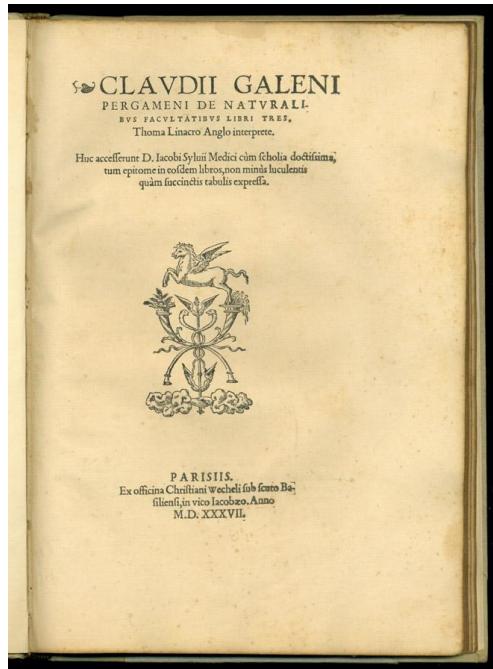


FIG. 12.

Medieval anatomical diagram (fourteenth century).  
(From Ashmolean Codex No. 399, folio 18 recto, Bodleian Library, Oxford.)

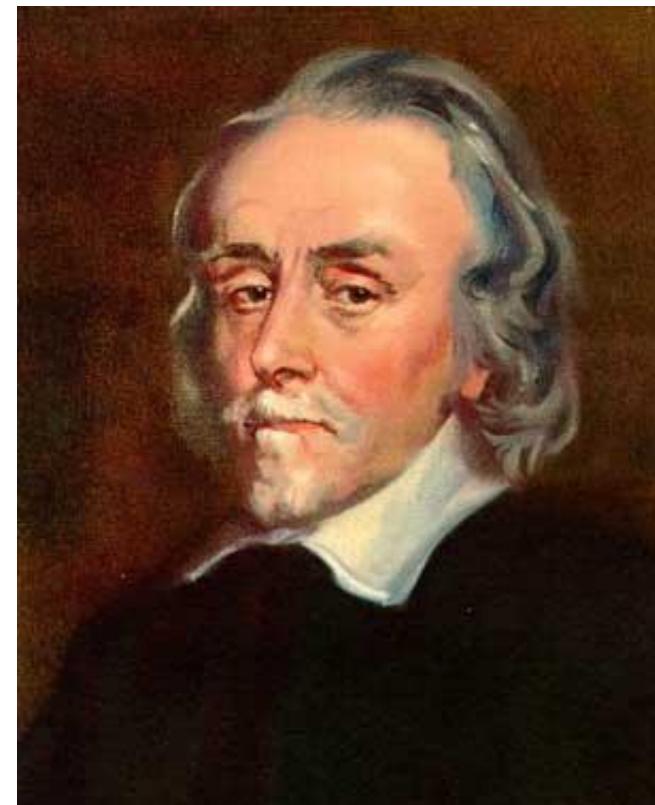
Intellectual basis for pain as an actual physical sensation



# Mechanistic Views of Pain

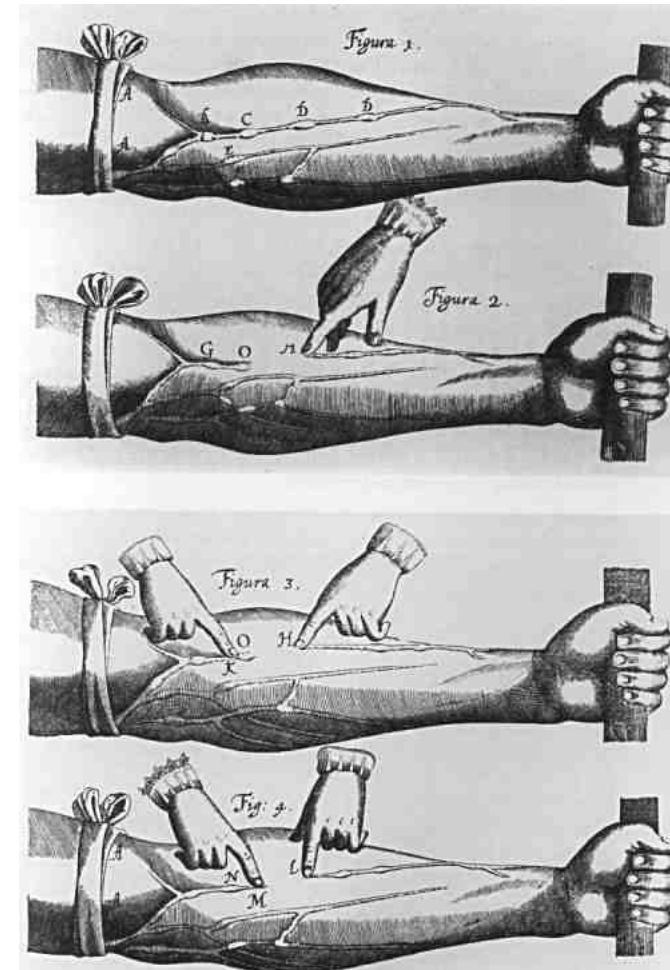


René Descartes  
1596 - 1650



William Harvey  
1578 - 1657

# Mechanistic Views of Pain

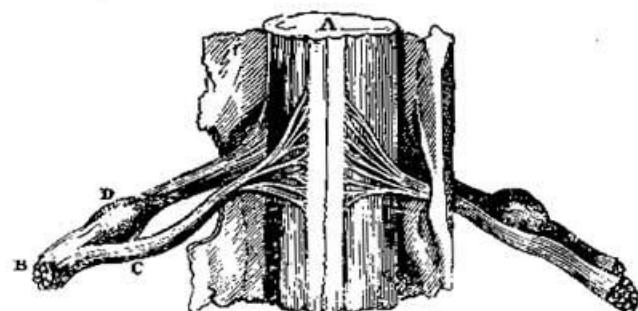
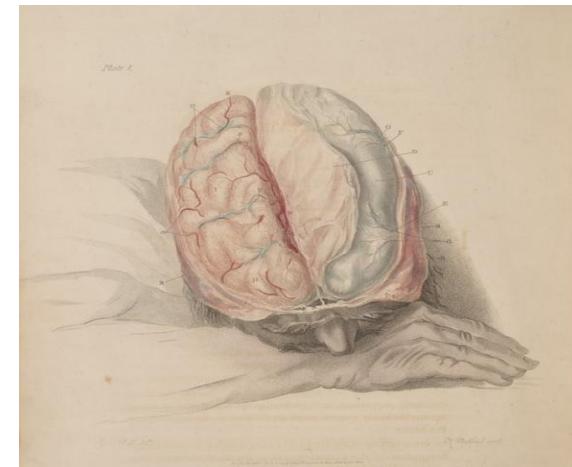


# Specificity Theory



Charles Bell  
1774 - 1842

,Pain has a real physical basis,



A the spinal marrow seen in front; B a spinal nerve; C the anterior root of the spinal nerve; D the ganglion on the posterior root.

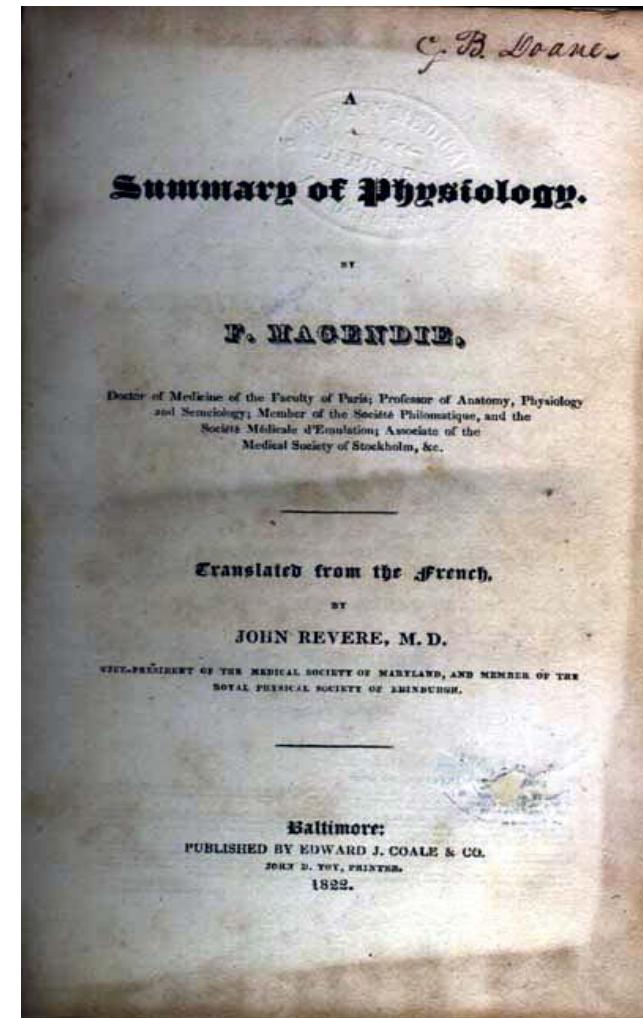


# Specificity Theory

© Académie nationale  
de médecine



François Magendie  
1783 - 1855



# Specificity Theory

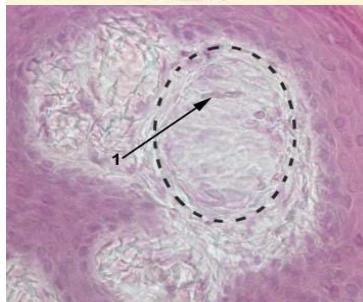


Johannes Müller  
1801–1858

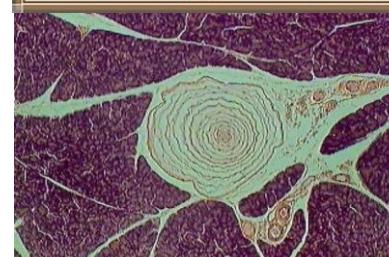
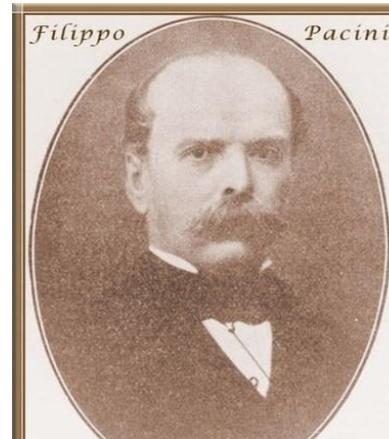
(T)he same cause, such as electricity, can simultaneously affect all sensory organs, since they are all sensitive to it; and yet, every sensory nerve reacts to it differently; one nerve perceives it as light, another hears its sound, another one smells it; another tastes the electricity, and another one feels it as pain and shock. **One nerve perceives a luminous picture through mechanical irritation, another one hears it as buzzing, another one senses it as pain.** . . . He who feels compelled to consider the consequences of these facts cannot but realize that the specific sensibility of nerves for certain impressions is not enough, since all



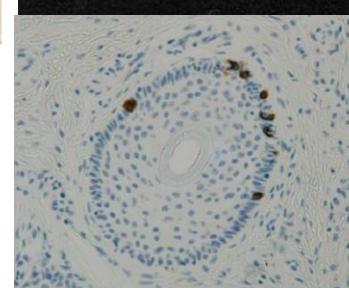
# Specificity Theory



Georg Meissner  
1829 - 1905



Filippo Pacini  
1812 - 1883

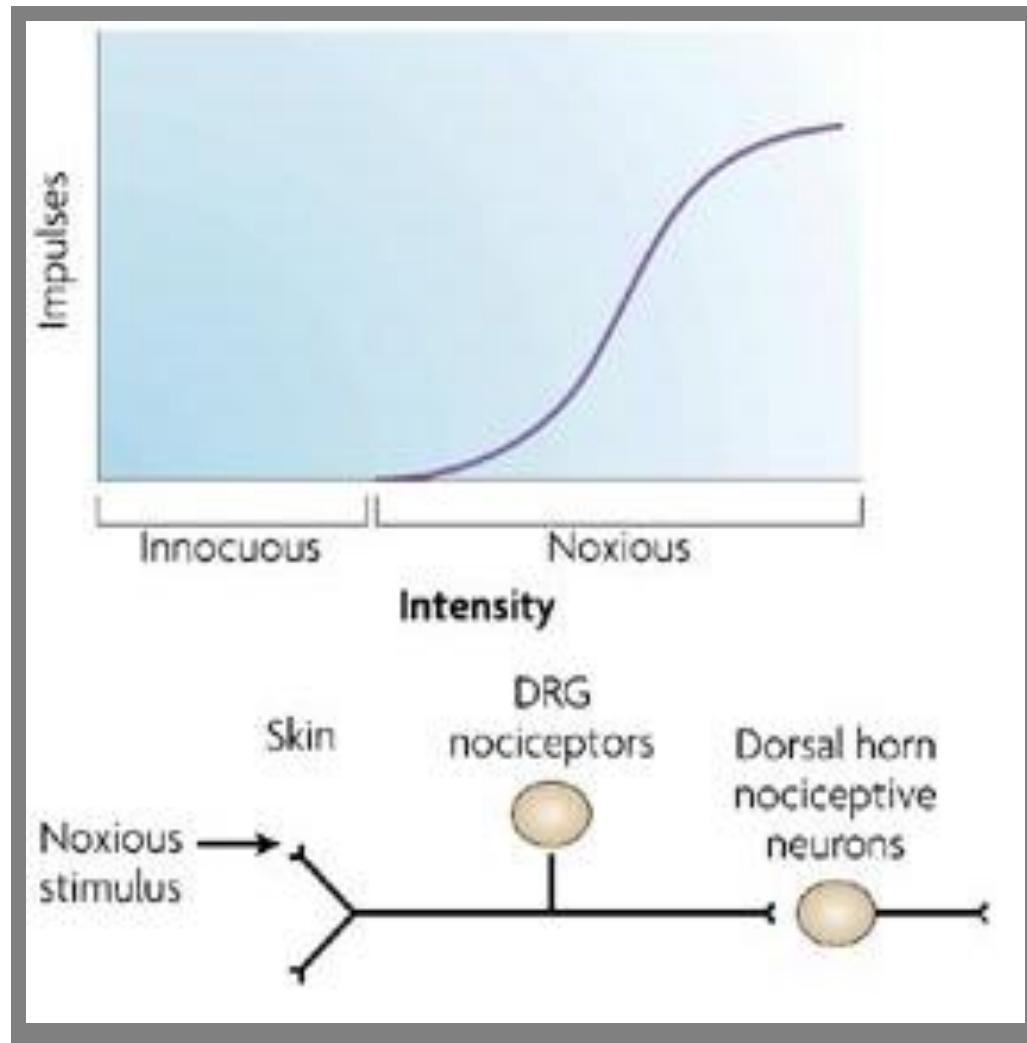


Friedrich  
Merckel  
1845 - 1919

Specific receptors



# Specificity Theory

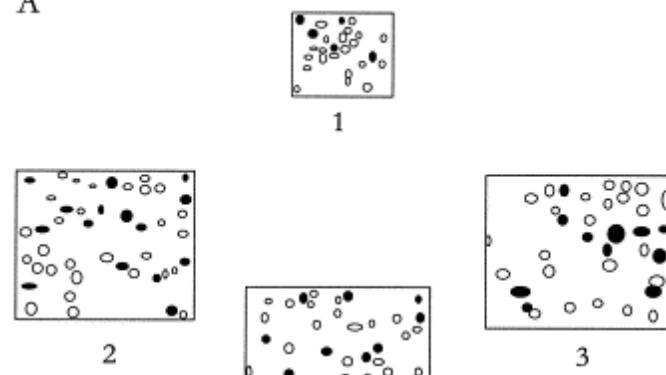


# Pattern Theory

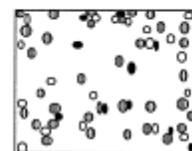


Wilhelm Erb  
1840 - 1921

A



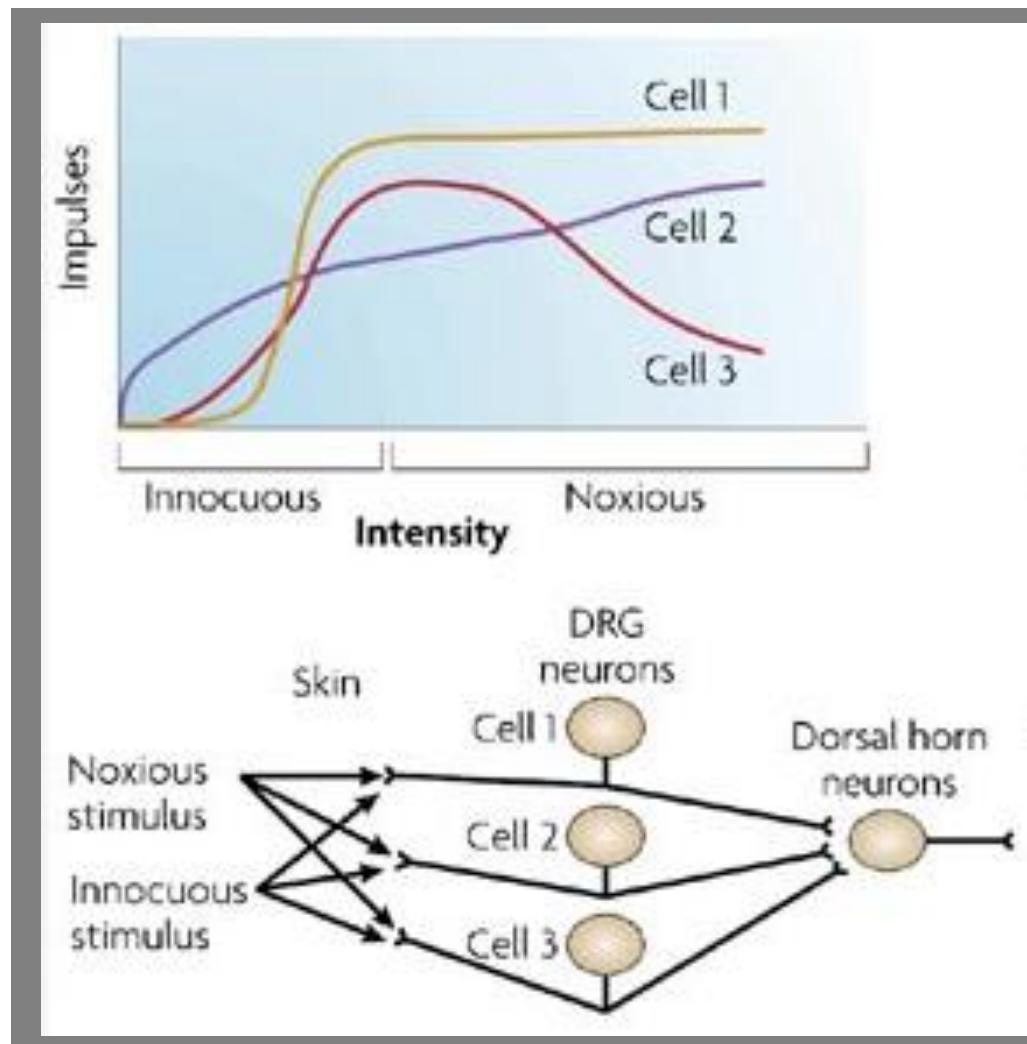
B



Alfred Goldscheider  
1858 - 1935



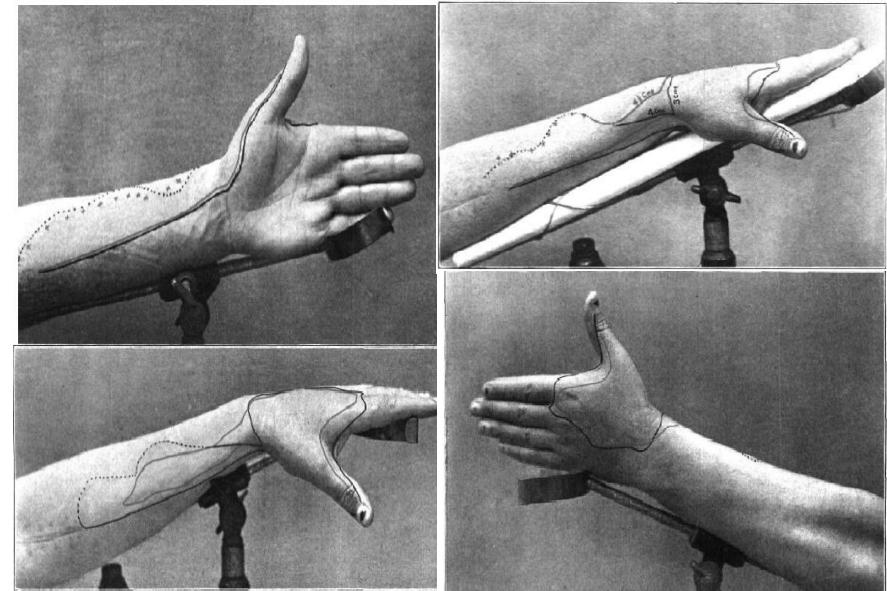
# Pattern Theory



# Intensity Theory (Summation)



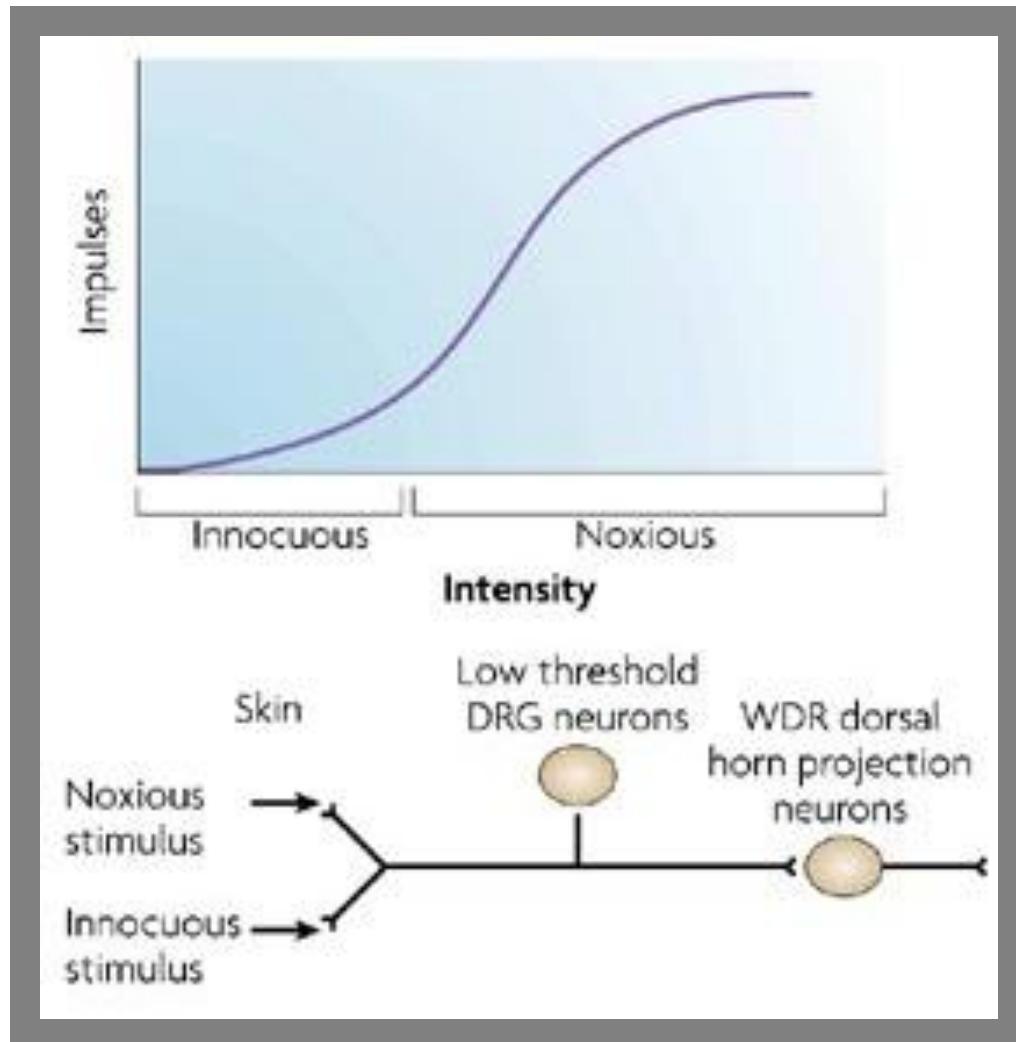
Charles Sherrington  
1857 - 1952



Concept of polymodal nociceptor and WDR neurons still valid today



# Intensity Theory (Summation)

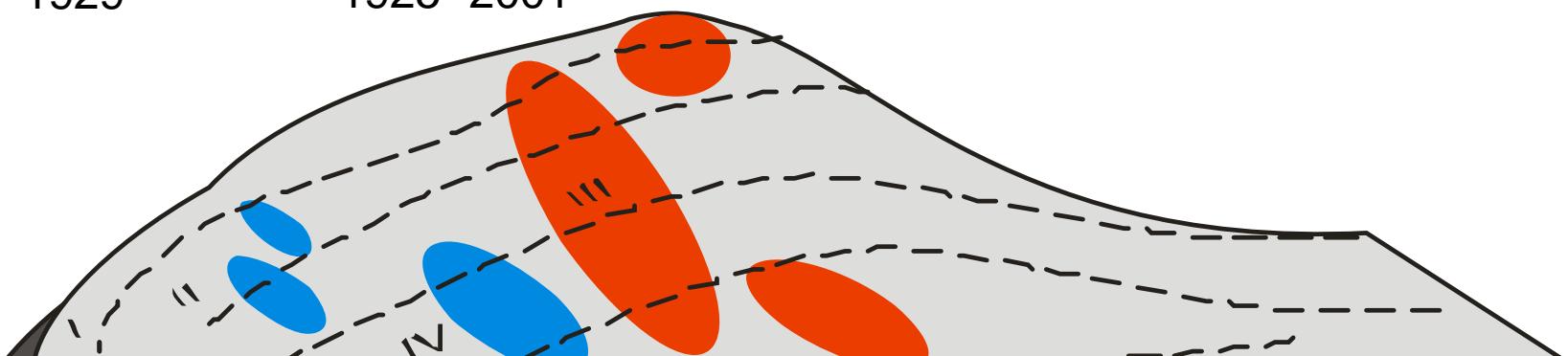
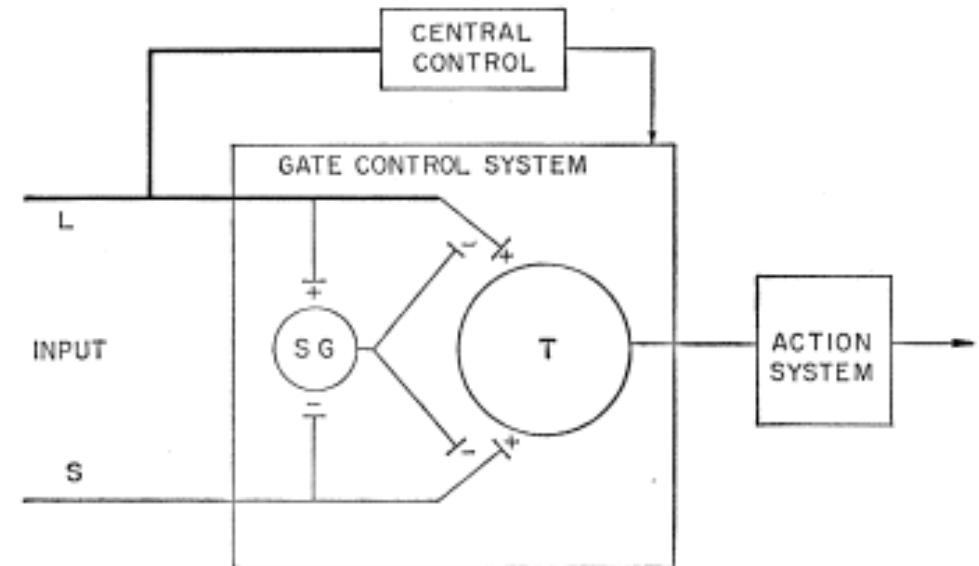


# Gate Control Theory

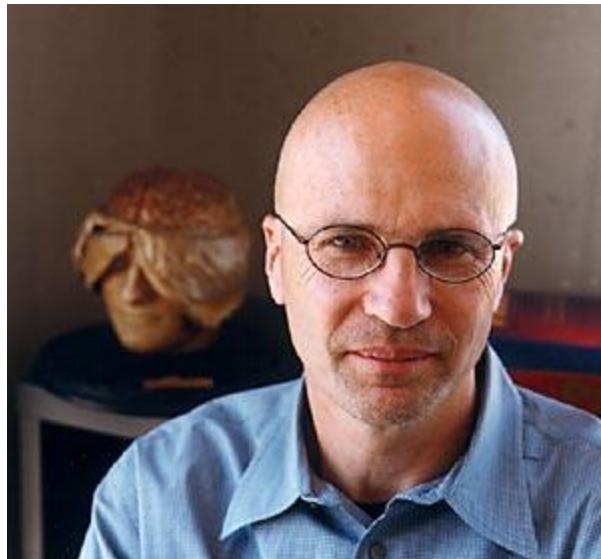


Ronald Melzack  
1929\*

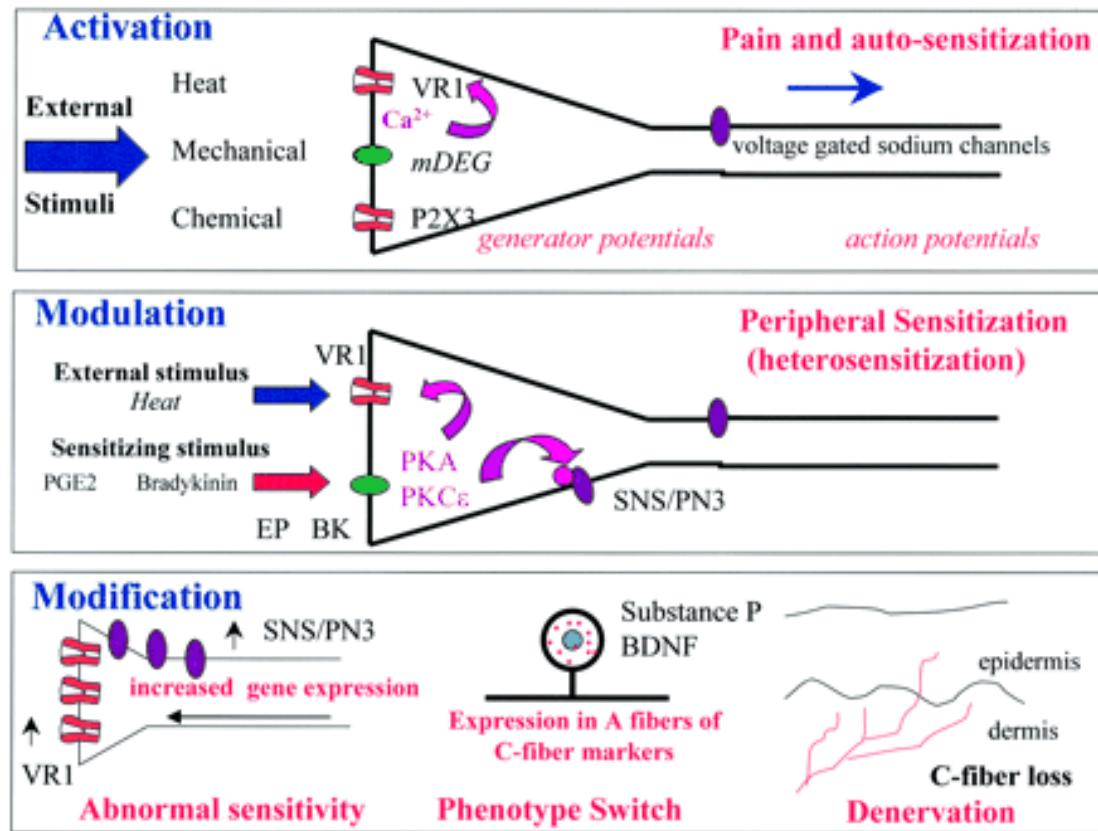
Pat Wall  
1925 -2001



# Neural Plasticity and Central Sensitization



Clifford Woolf  
1956\*



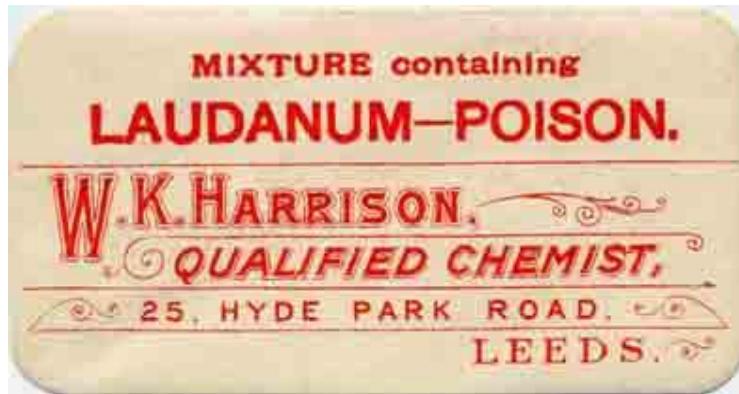
The capacity of neurons to change their structure, function or chemical profile via activation, modulation and modification contributing to pain hypersensitivity\*



# Pharmacological Milestones



# Pharmacological Milestones



Thomas Sydenham  
1624 - 1689

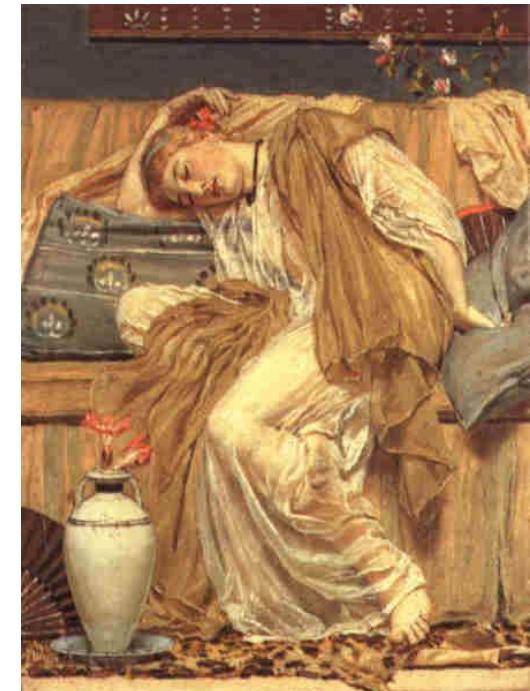
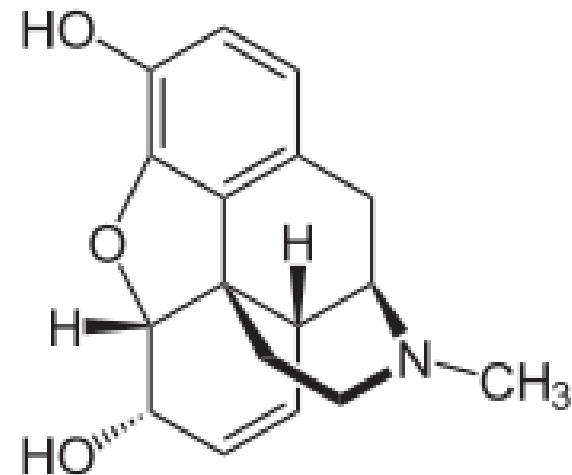


# Pharmacological Milestones

‘..into the arm of morpheus..’

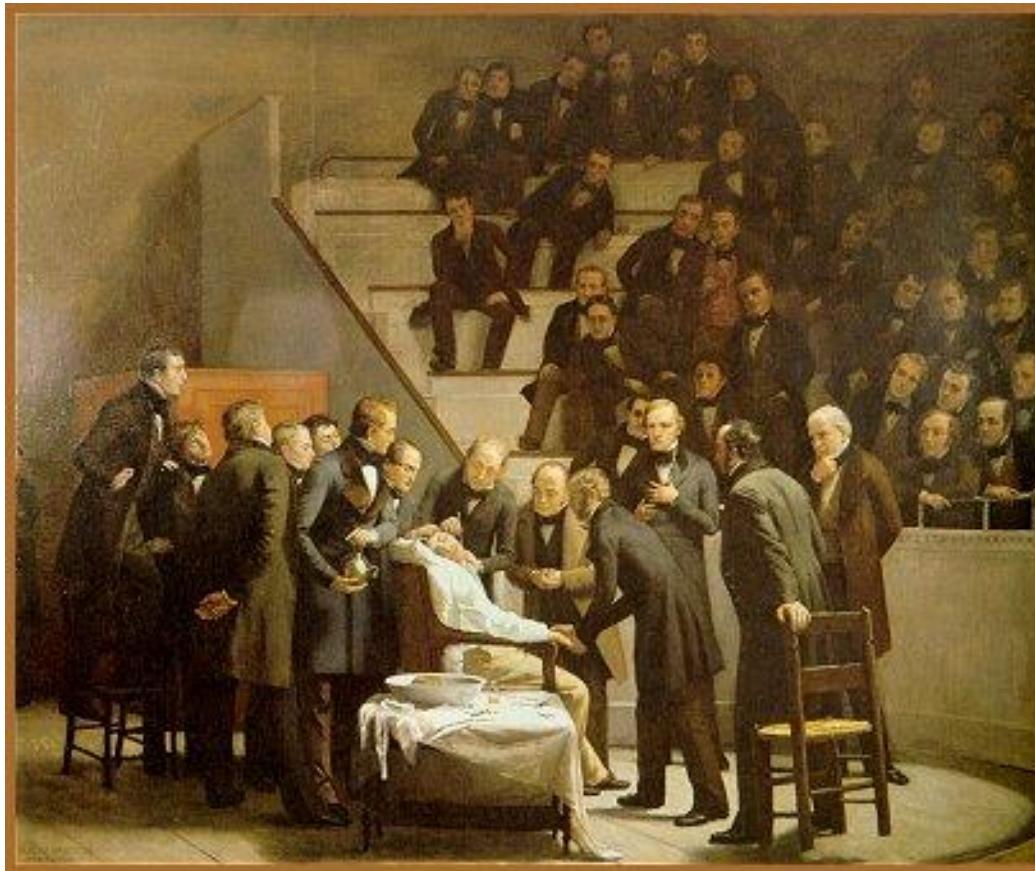


Friedrich Sertürner  
1783 - 1841



# Pharmacological Milestones

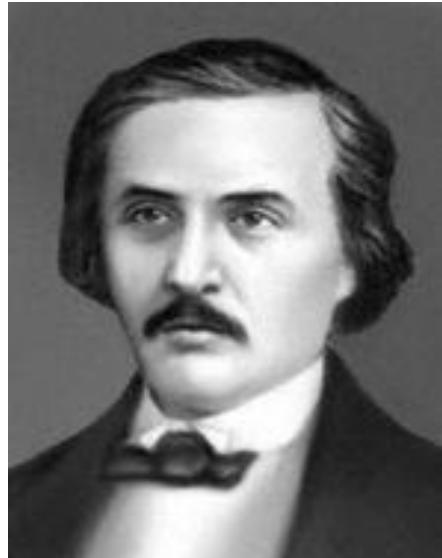
"Gentlemen, this is not a humbug"



William T.G. Morton  
1819 - 1868



# Pharmacological Milestones



Charles von Gerhardt  
1816 - 1856



BAYER

One Real Aspirin

Counterfeits and substitutes may be ineffective, and even harmful. Refuse them. Protect yourself by demanding

Bayer-Tablets of Aspirin

Every tablet and every package of genuine Aspirin bears

"The Bayer Cross Your Guarantee of Purity"

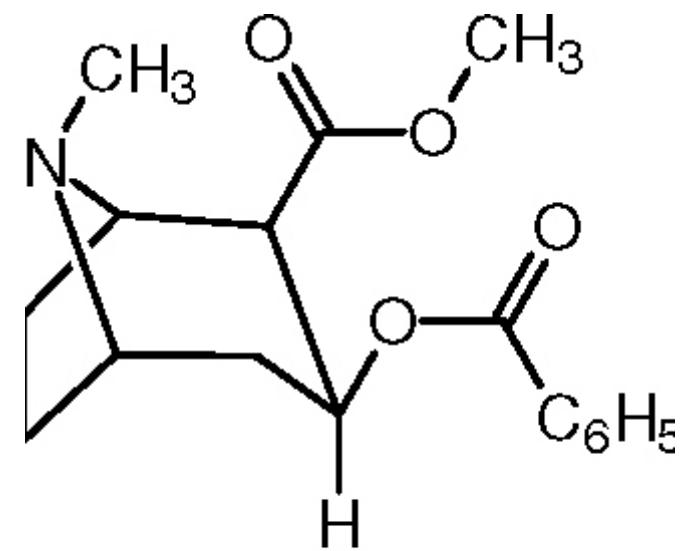
Pocket Boxes of 12, Bottles of 24 and Bottles of 200  
The trade-mark "Aspirin" (Reg. U. S. Pat. Off.) is a guarantee that the pharmaceutical value of salicylic acid in these tablets is of the reliable Bayer manufacture.



# Pharmacological Milestones



Albert Niemann  
1834 - 1861



cocaine

# Pharmacological Milestones



Carl Koller  
1857 - 1944



# Anatomically Specific Treatments of Pain



# Anatomically Specific Treatments of Pain

- **Spinal anesthesia**
- Surgical sympathectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation



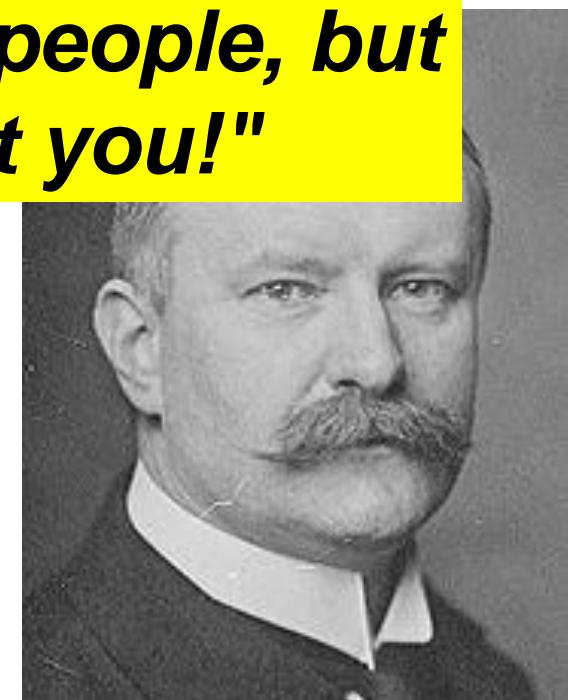
August Bier  
1861 - 1949



# Anatomically Specific Treatments of Pain

***"Medical scientists are nice people, but you should not let them treat you!"***

- Surgical sympathectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation



August Bier  
1861 - 1949

# Anatomically Specific Treatments of Pain

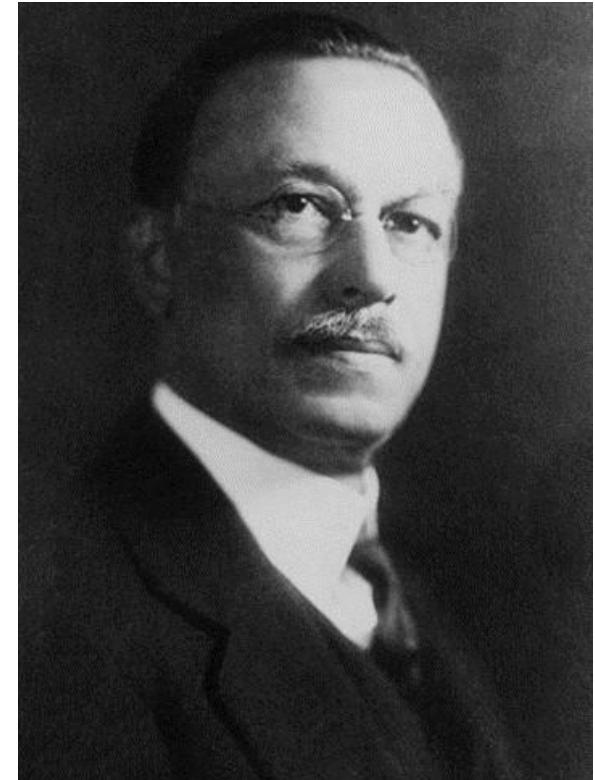
- Spinal anesthesia
- **Surgical sympathectomy**
- Nerve blocks/ablation procedures
- Spinal cord stimulation



René Leriche  
1879 - 1955

# Anatomically Specific Treatments of Pain

- Spinal anesthesia
- Surgical sympathectomy
- **Nerve blocks/ablation procedures**
- Spinal cord stimulation



Gaston Labat  
1876 - 1934



# Anatomically Specific Treatments of Pain

- Spinal anesthesia
- Surgical sympathectomy
- Nerve blocks/ablation procedures
- Spinal cord stimulation

## Electrical Inhibition of Pain by Stimulation of the Dorsal Columns:

*Preliminary Clinical Report*

C. NORMAN SHEALY, M.D.\*  
J. THOMAS MORTIMER, M.S.†  
JAMES B. RESWICK, D.Sc.†

### ABOUT THE AUTHORS

★ C. NORMAN SHEALY, M.D. is Chief of Neurosurgery, Gundersen Clinic, La Crosse, Wisconsin, and Assistant Clinical Professor of Neurosurgery, University of Wisconsin, Madison. He graduated in 1956 from Duke University Medical School, Durham, North Carolina, interned at Duke University, and served as resident at Barnes Hospital, St. Louis, Missouri, and at Massachusetts General Hospital, Boston. Special honors achieved by Dr. Shealy include the First Annual Harold G. Wolff, M.D. Award and a Borden Award for Best Undergraduate Research.



Dr. Shealy



# Pain Medicine in the early 21<sup>th</sup> Century



René Descartes  
1596 - 1650



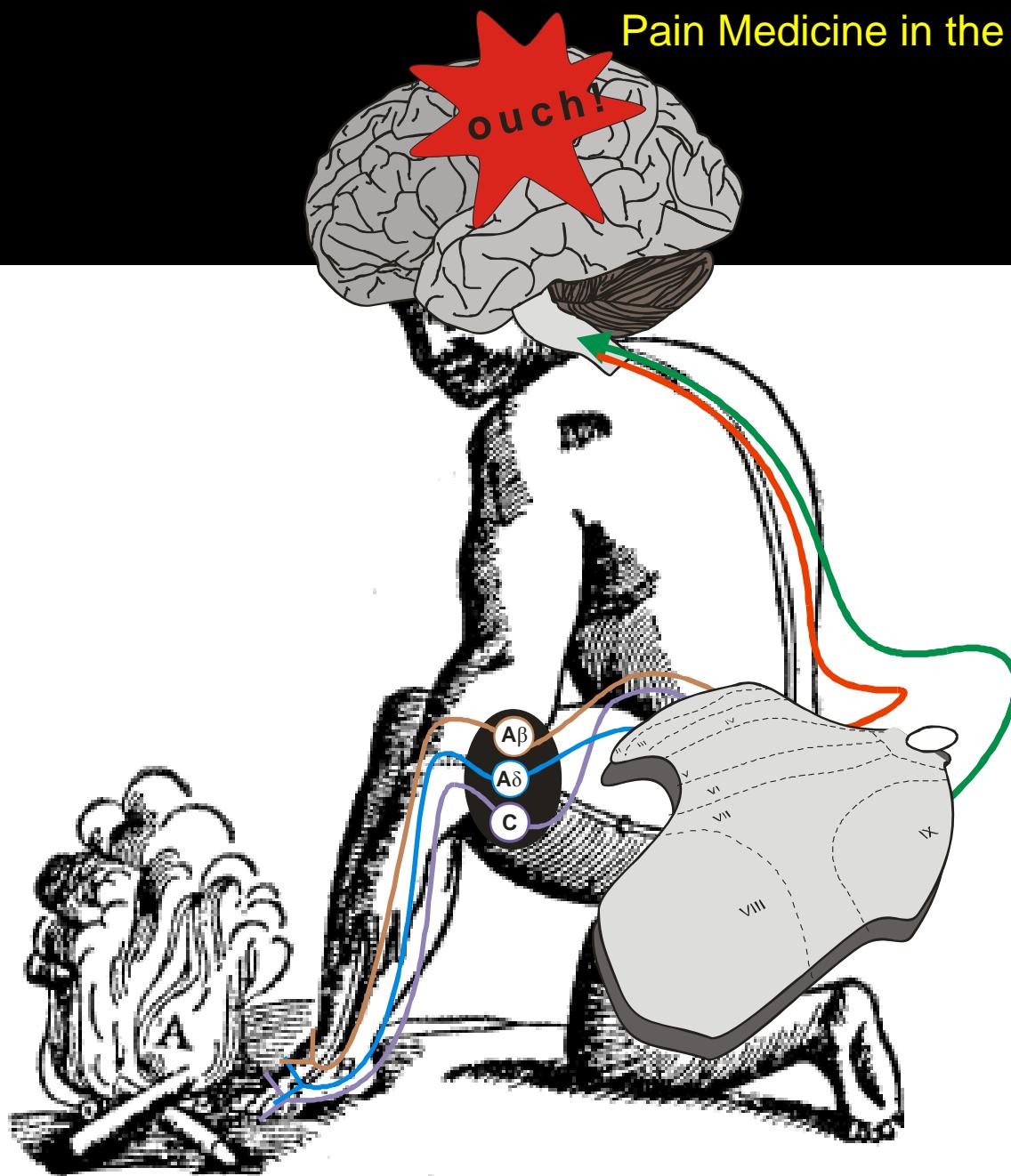


René Descartes  
1596 - 1650

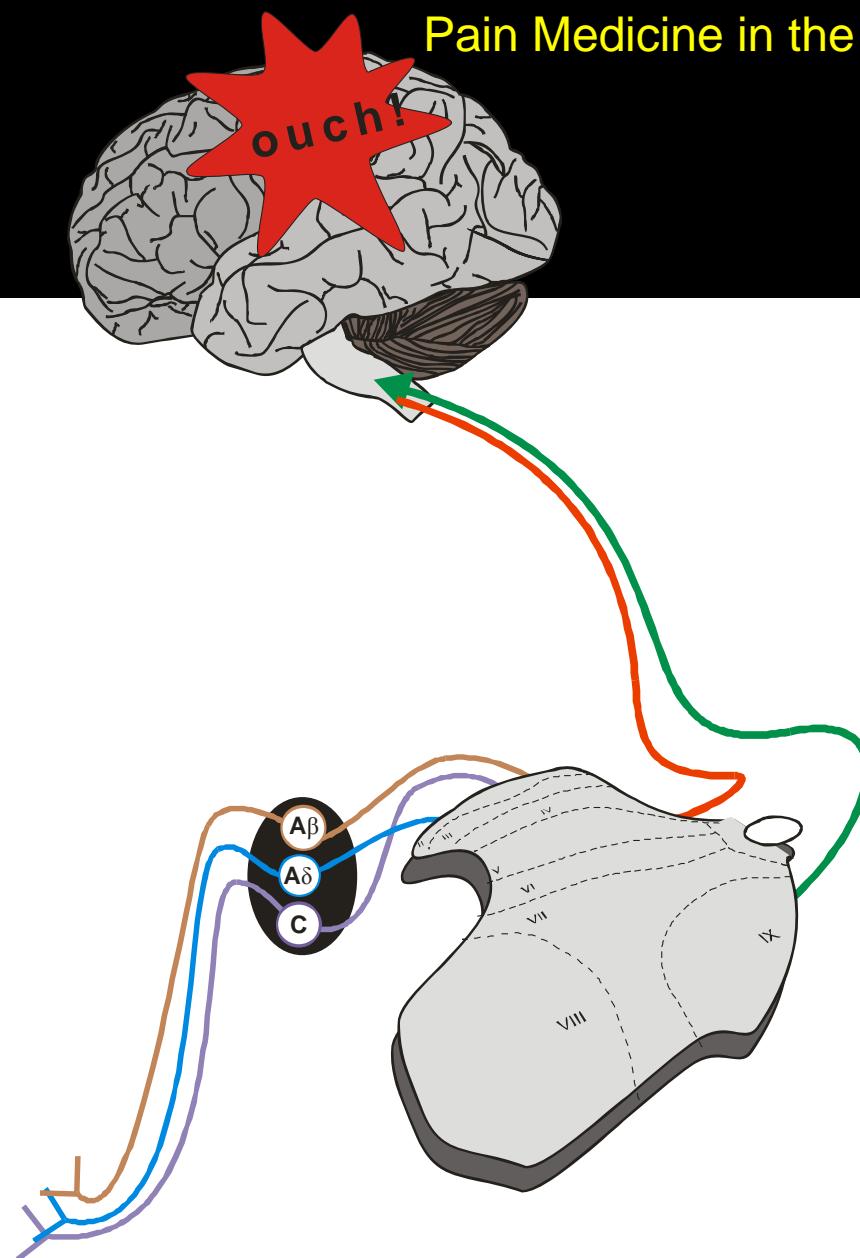
Pain Medicine in the early 21<sup>th</sup> Century

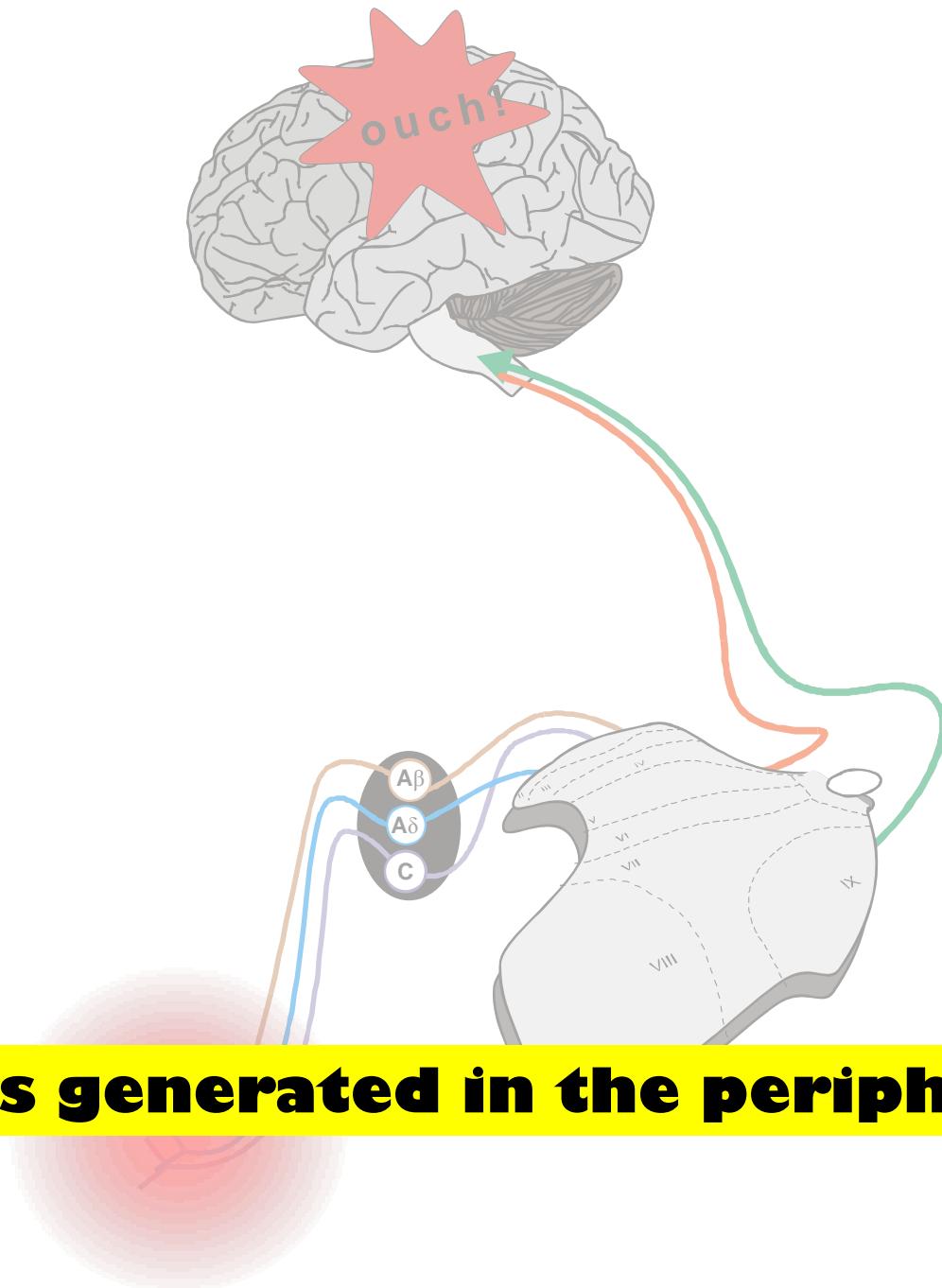


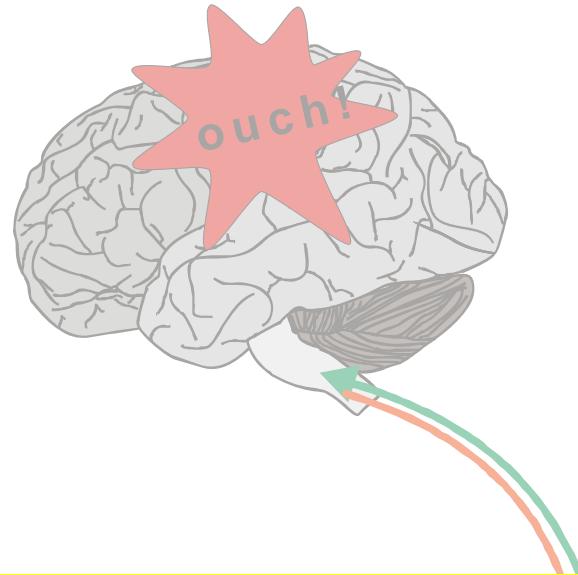
# Pain Medicine in the early 21<sup>th</sup> Century



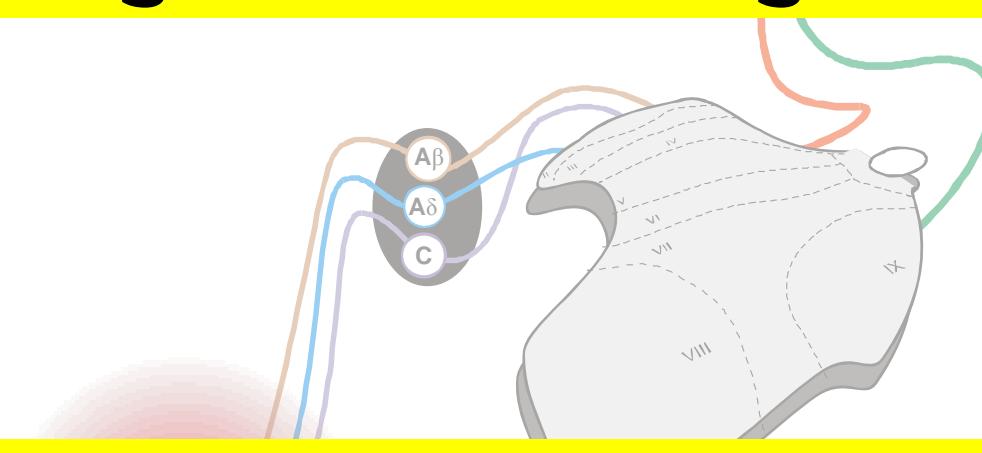
# Pain Medicine in the early 21<sup>th</sup> Century







## CNS: Inhibiting and facilitating mechanisms



**Pain is generated in the periphery**

# **‘Neuromatrix’ Cognitive & behavioral changes**



**CNS: Inhibiting and facilitating mechanisms  
Central sensitization: 2 Hyperalgesia, Allodynia**



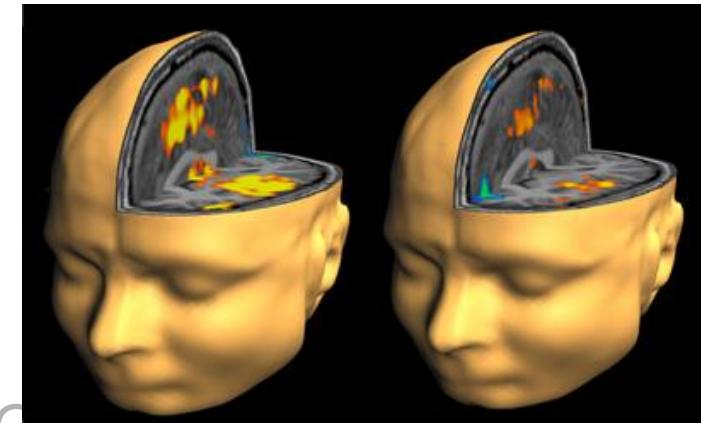
**Pain is generated in the periphery  
Peripheral sensitization: 1 Hyperalgesia**



# ‘Mechanism-based pain management’

- Many diagnostic tools available:

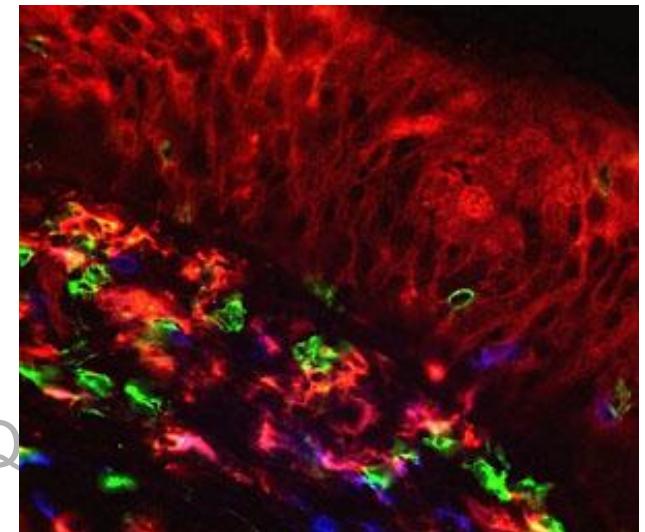
- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC, QST
- Pharmacological tests
- Genetic tests



# ‘Mechanism-based pain management’

- **Many diagnostic tools available:**

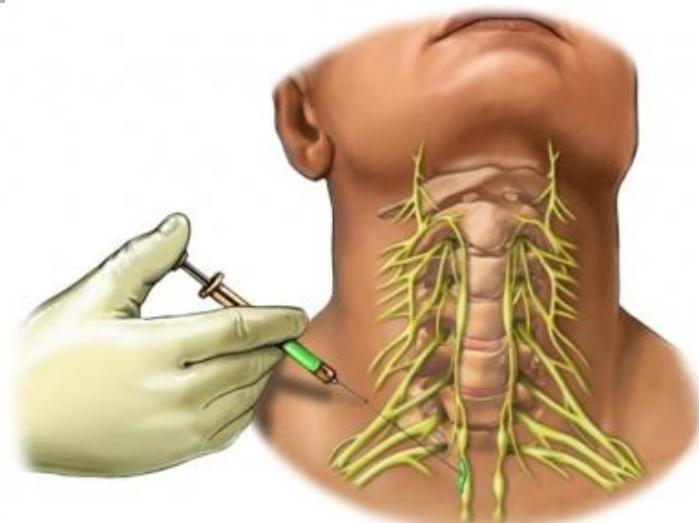
- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC, QST
- Pharmacological tests
- Genetic tests



# ‘Mechanism-based pain management’

- **Many diagnostic tools available:**

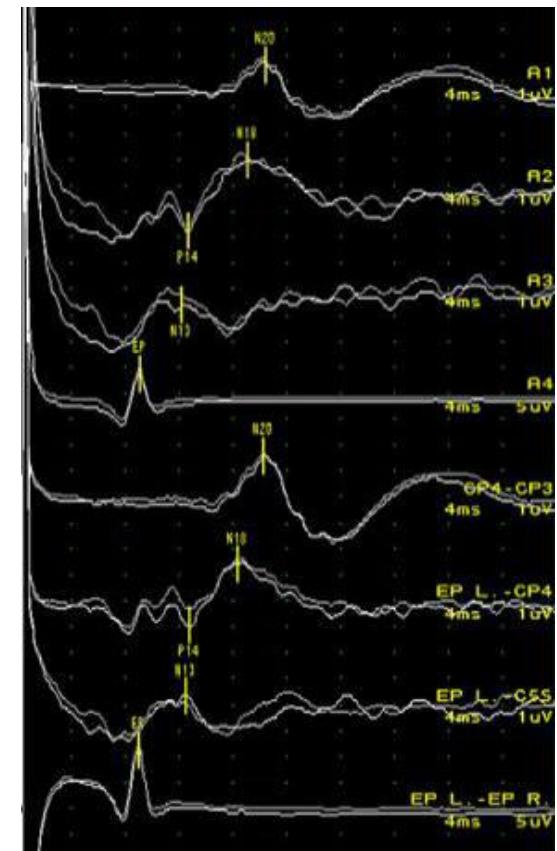
- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC
- Pharmacological tests
- Genetic tests



# ‘Mechanism-based pain management’

- Many diagnostic tools available:

- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- **Neurophysiology:**
  - EMG, EEG, SSEP, QTRAC, QST
- Pharmacological tests
- Genetic tests



# ‘Mechanism-based pain management’

- **Many diagnostic tools available:**

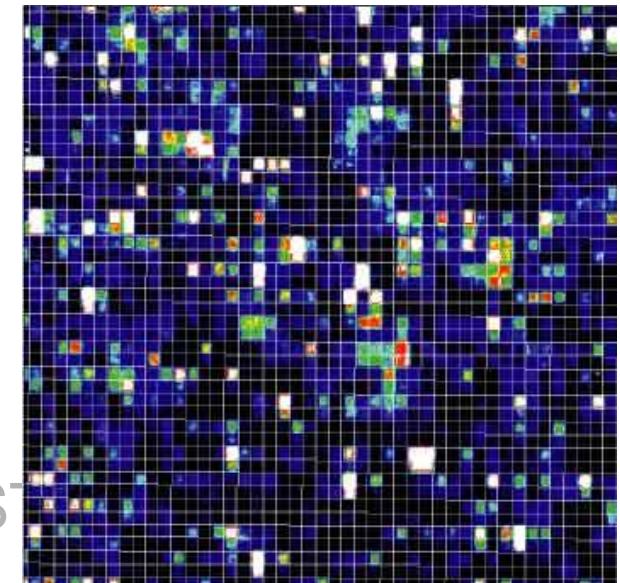
- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC, QST
- **Pharmacological tests**
- Genetic tests



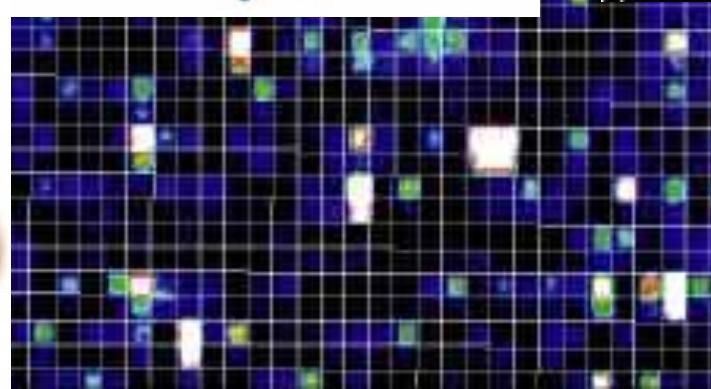
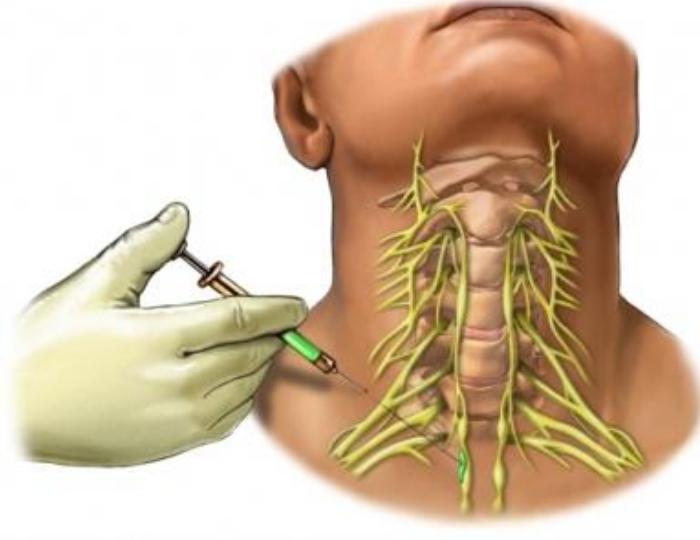
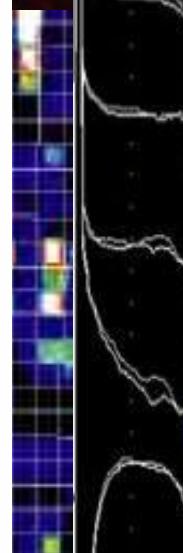
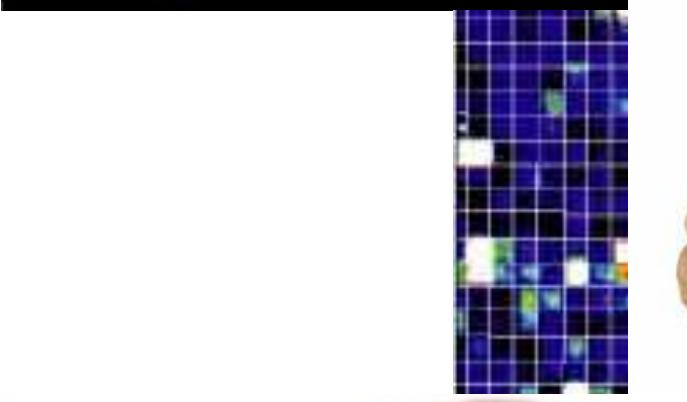
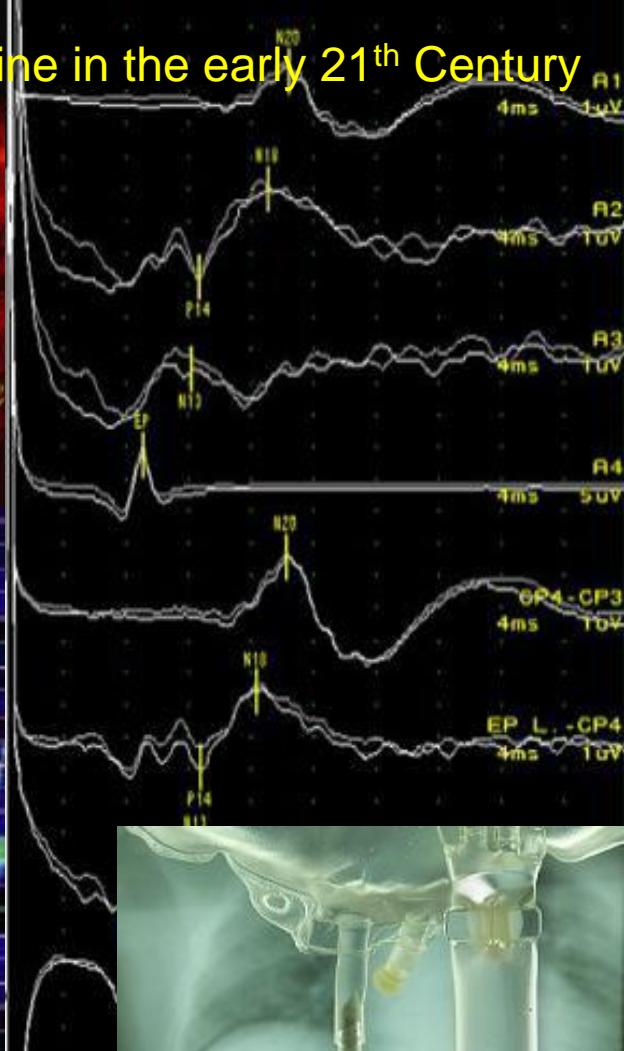
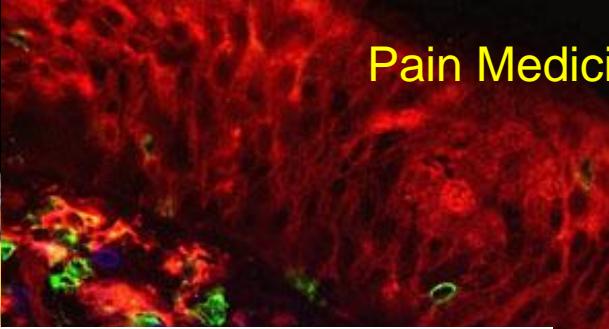
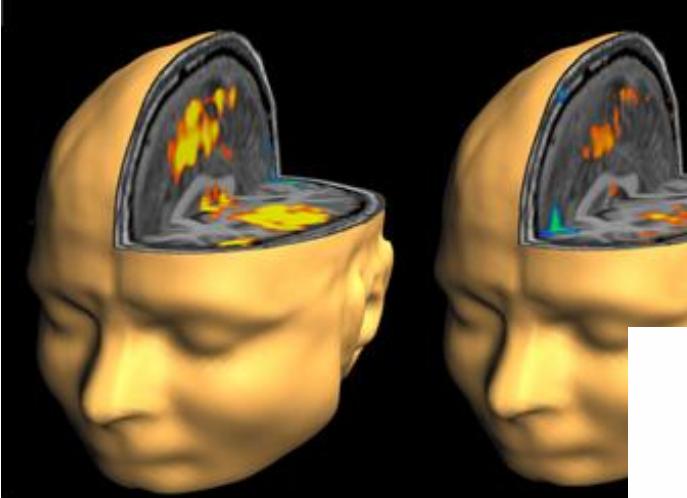
# ‘Mechanism-based pain management’

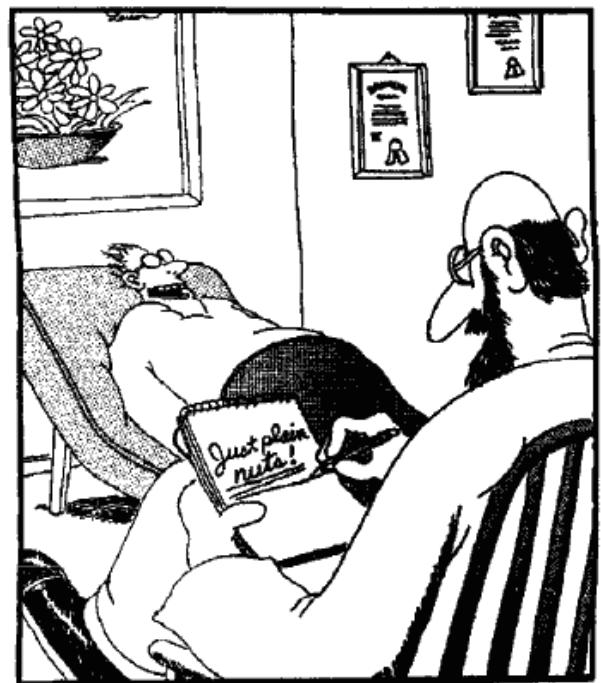
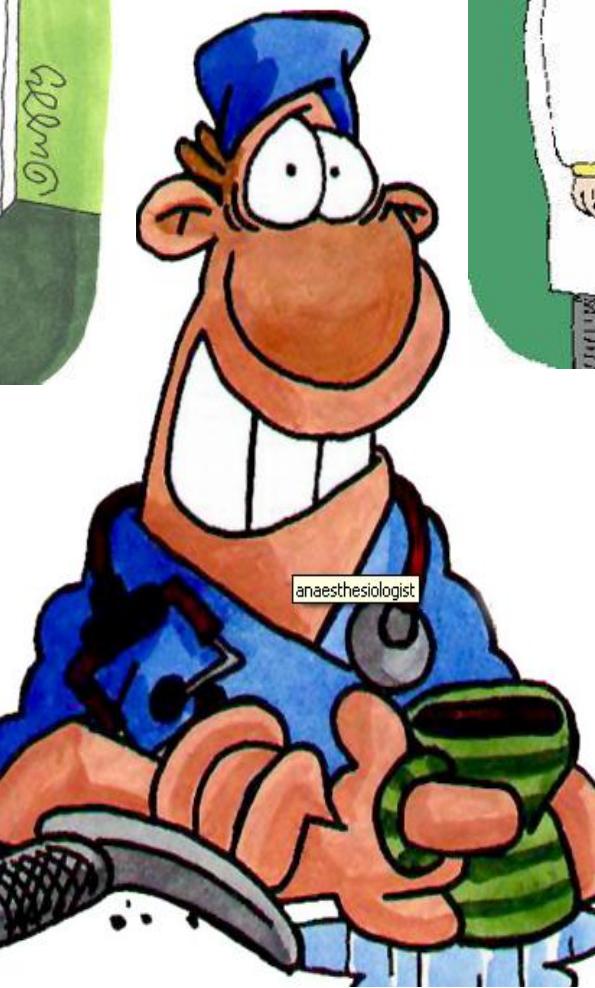
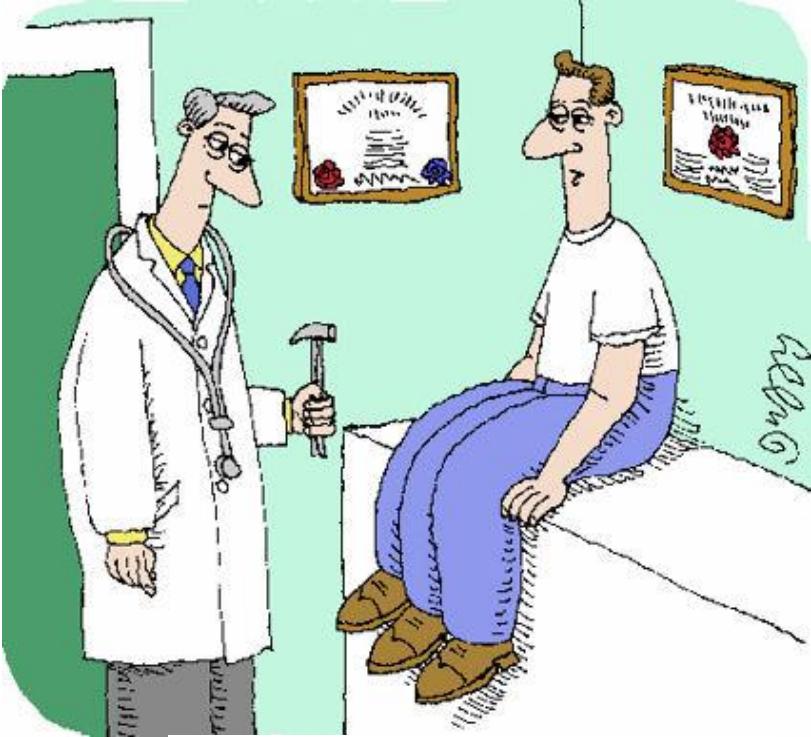
- **Many diagnostic tools available:**

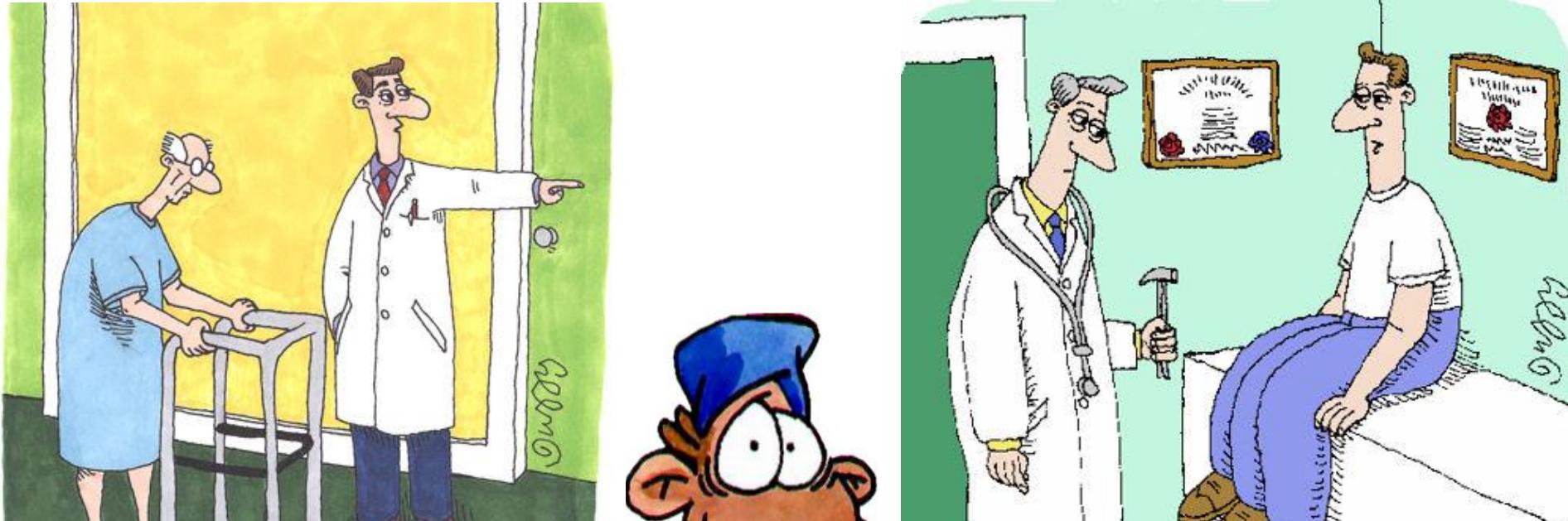
- X-ray, CT, MRI, fMRI, PET
- Immunohistology
- Diagnostic nerve blocks
- Neurophysiology:
  - EMG, EEG, SSEP, QTRAC, QST
- Pharmacological tests
- **Genetic tests**



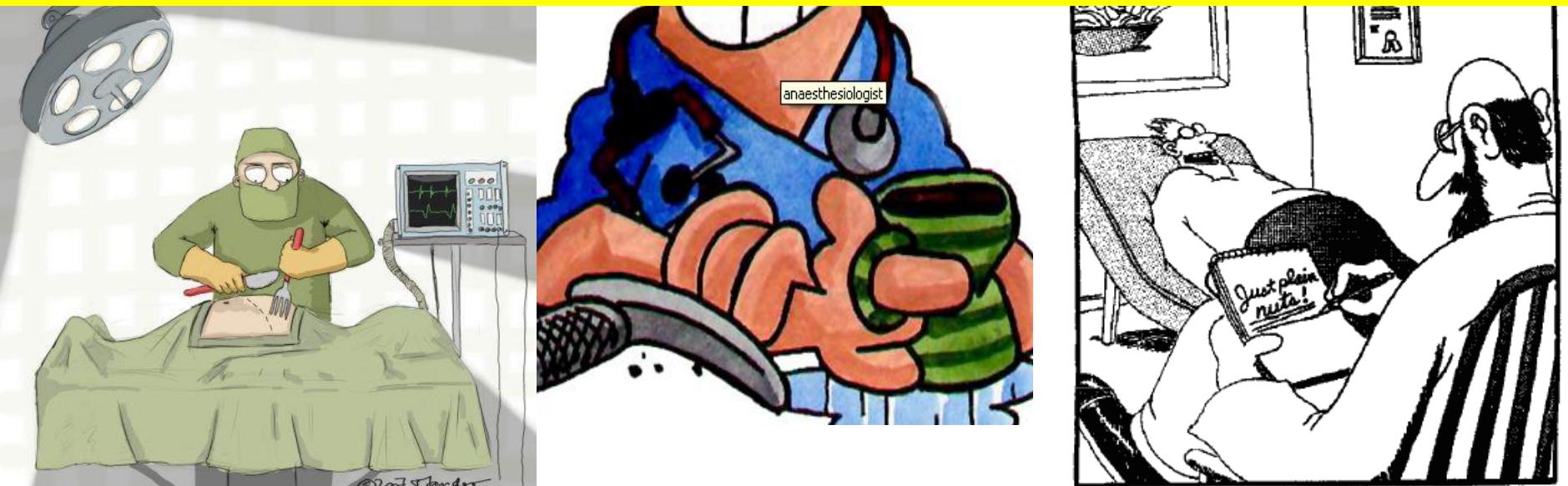
# Pain Medicine in the early 21<sup>th</sup> Century

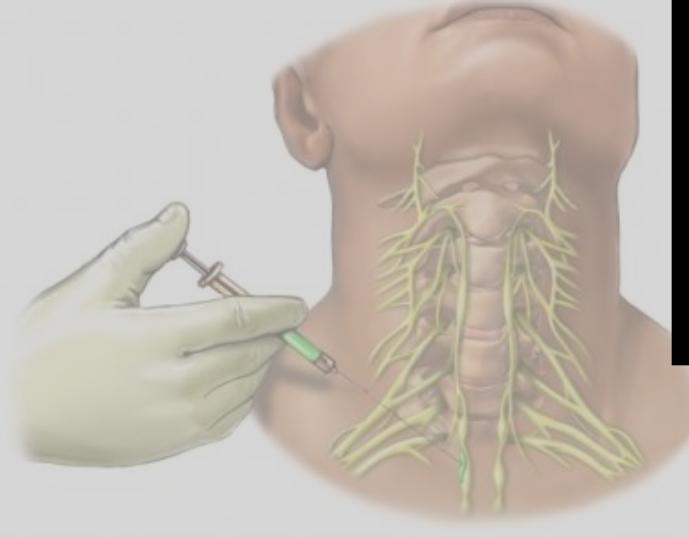






## Mechanism-based pain management in a multidisciplinary pain unit





**John J. Bonica**  
**1917 - 1994**

