The drug cabinet in the brain

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www.noigroup.com

Aims

- present some extraordinary gifts of neuroscience to rehabilitation

- introduce two new evidence based clinical applications

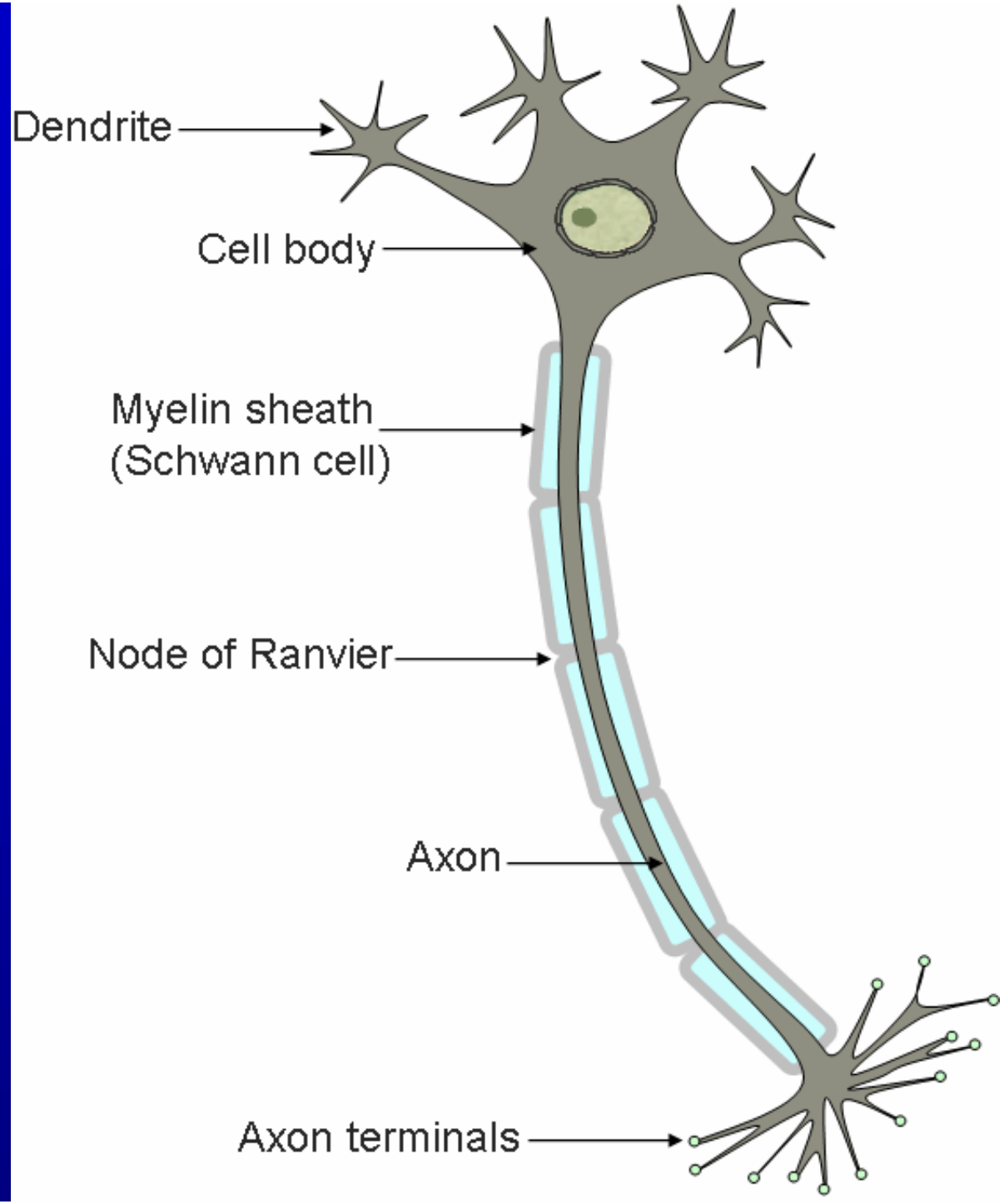
The pain sciences revolution

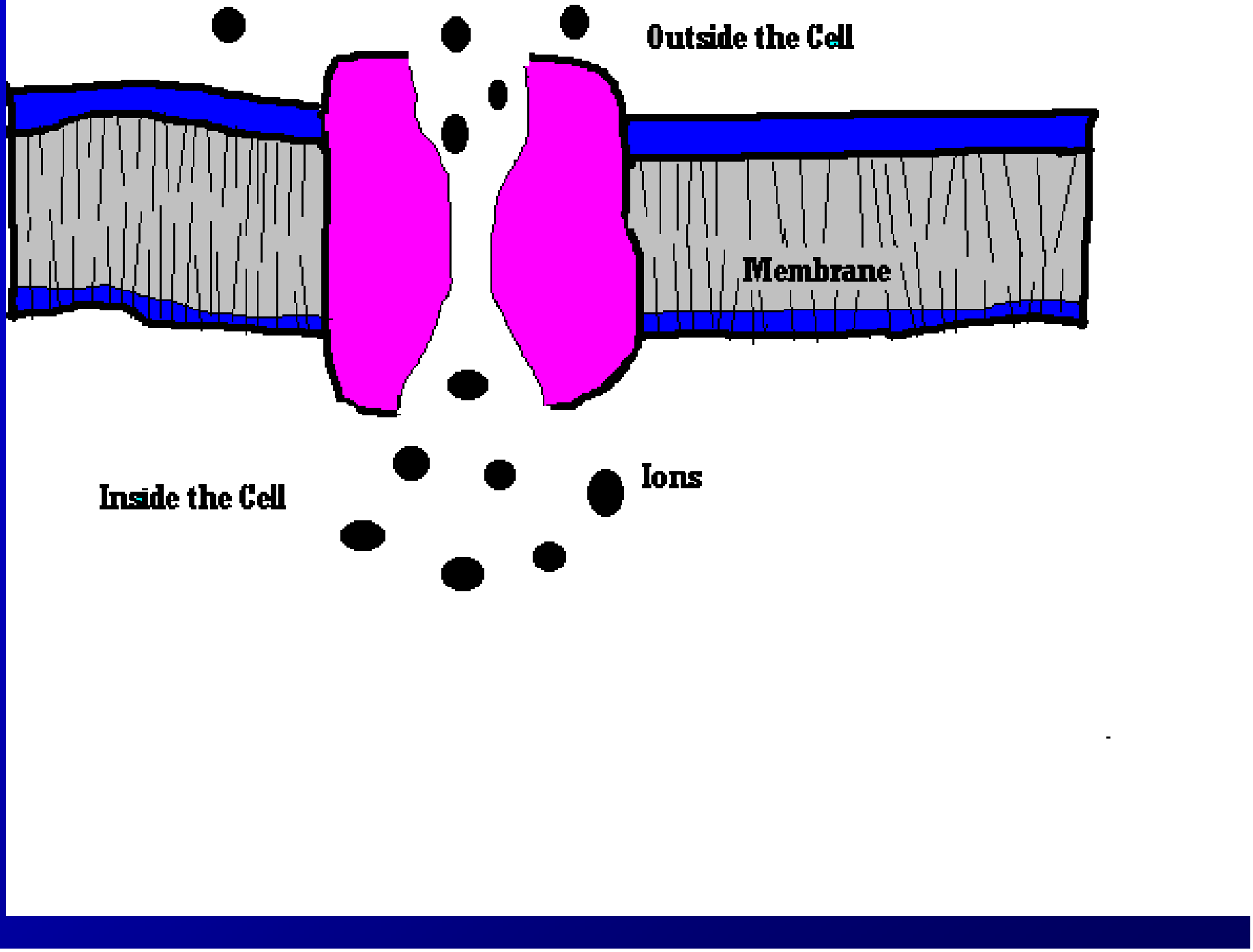
Neuroscience/pain sciences `trendy”

Gift 1 – the ion channel

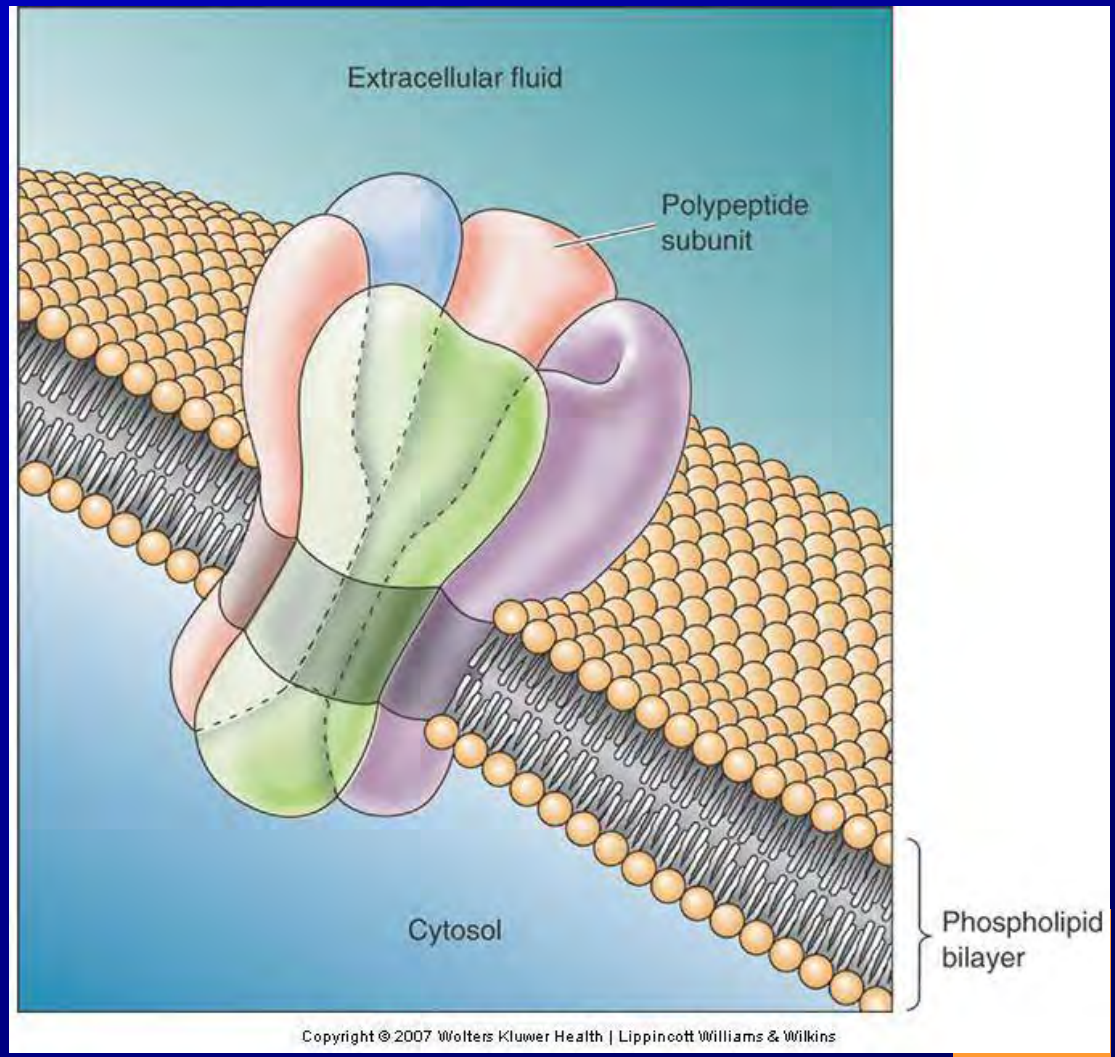
“the molecular targets of rehab”

The neurone

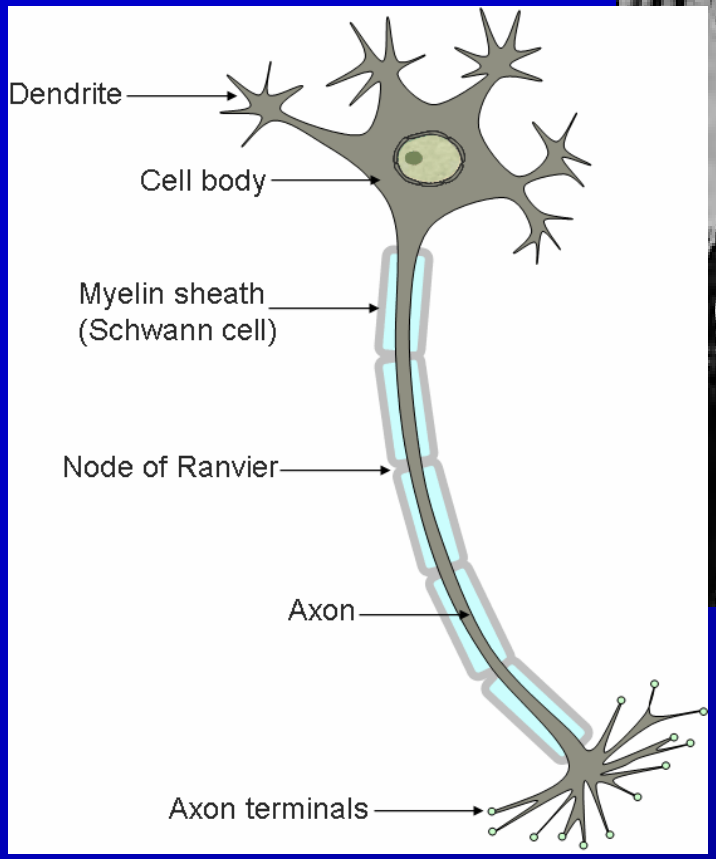

Dendrite
Cell body
Myelin sheath
(Schwann cell)
Node of Ranvier
Axon
Axon terminals

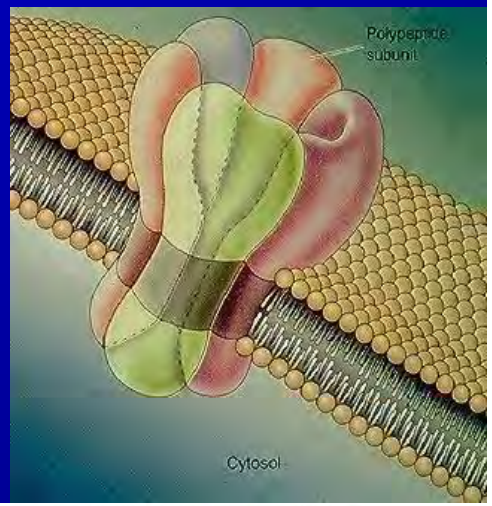

Outside the Cell
Membrane
Ions
Inside the Cell

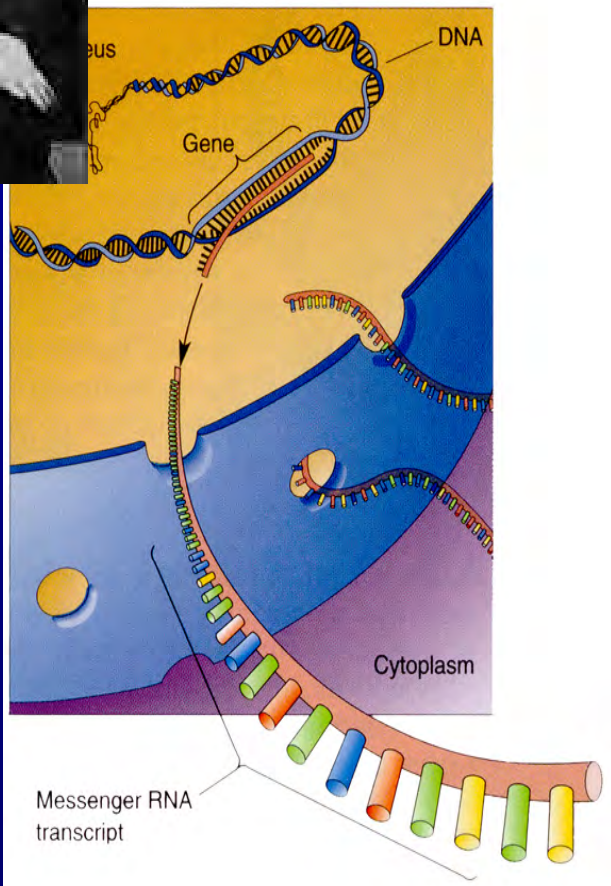
The ion channel



From Bear et al 2001



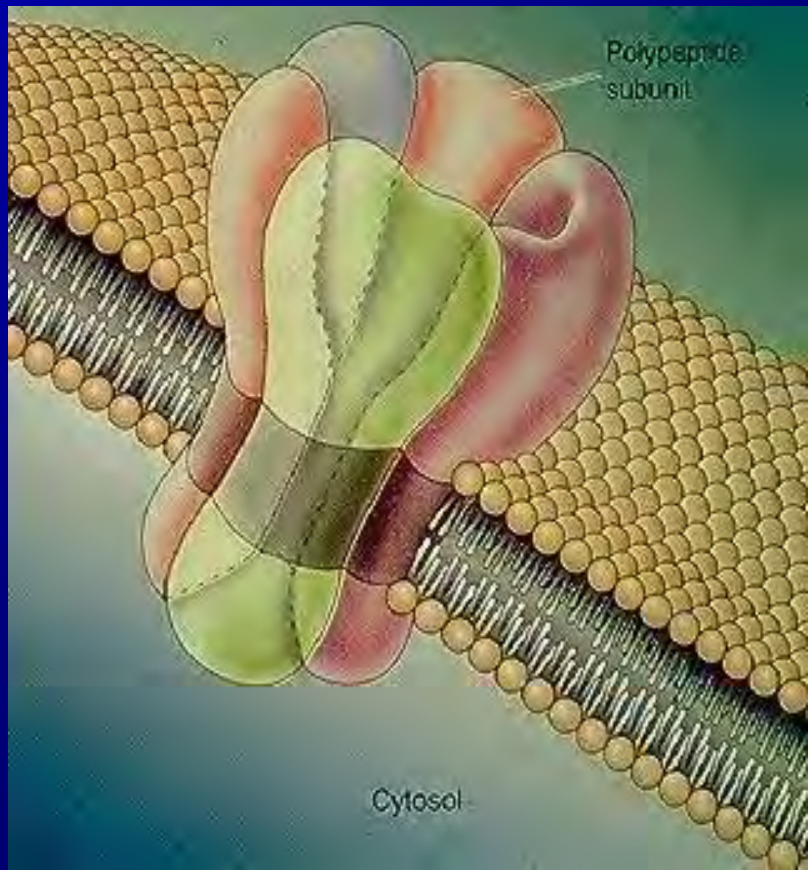




"DNA makes messenger RNA. Messenger RNA` makes proteins and proteins make us"

Your molecular biology degree ……..

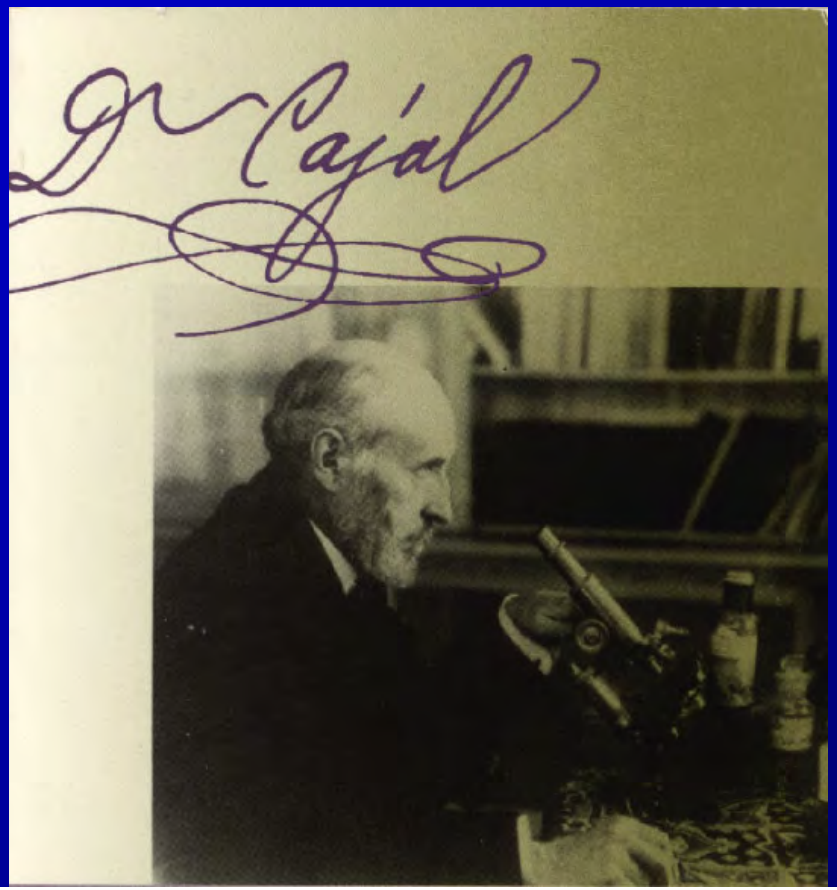
- Open or closed
- Many different kinds of sensors
- Live for two days, like butterflies
- Reflect your perceived needs



From Bear et al 2001

Gift 2 – the synapse

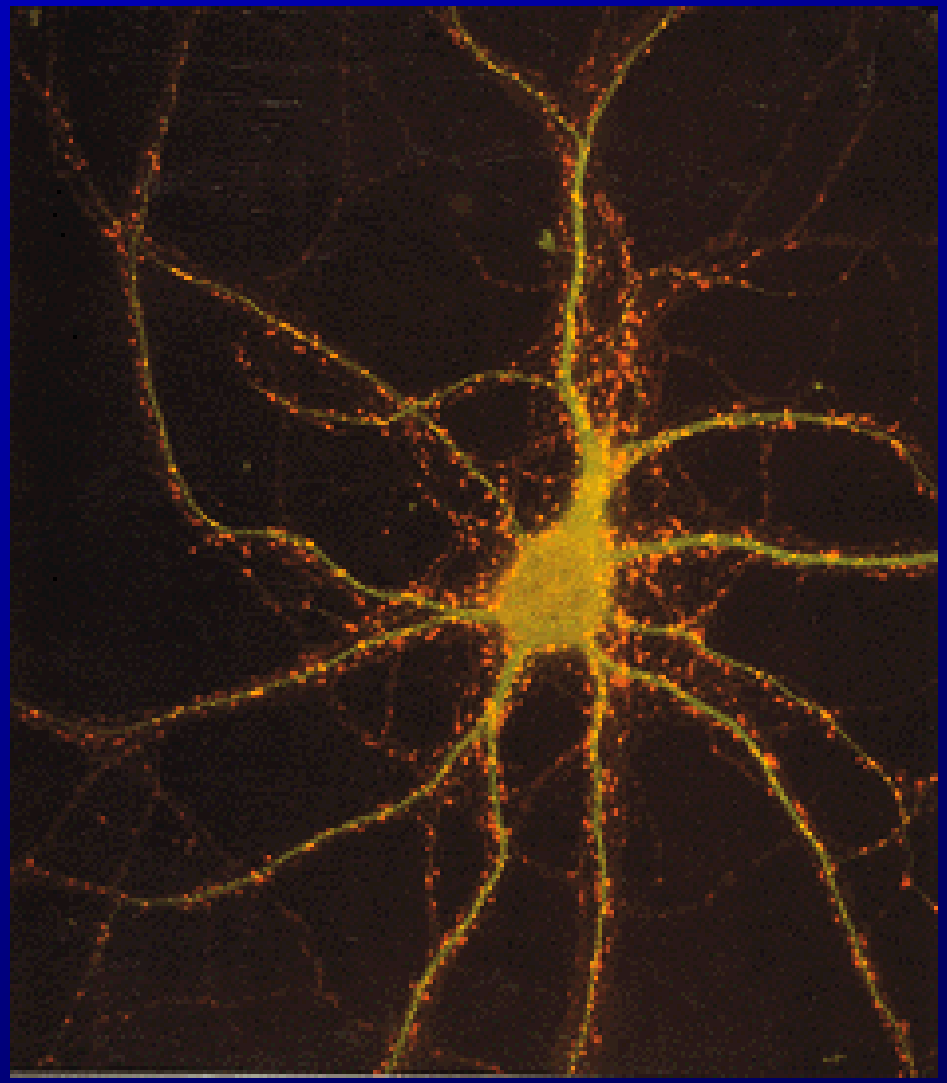
“only 100 years old”



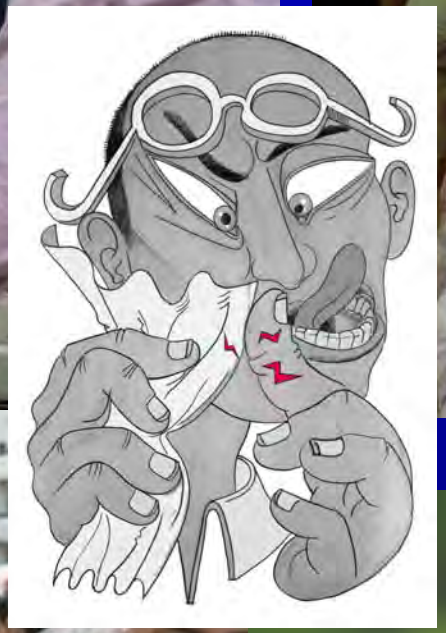
Rejoice in your neurones and synapses

- 100 billion neurones
- Up to 100,000 connections each
- More possible connections than particles in the universe
- Baby makes 3 million synapses per second
- 200,000 km of cabling in the brain

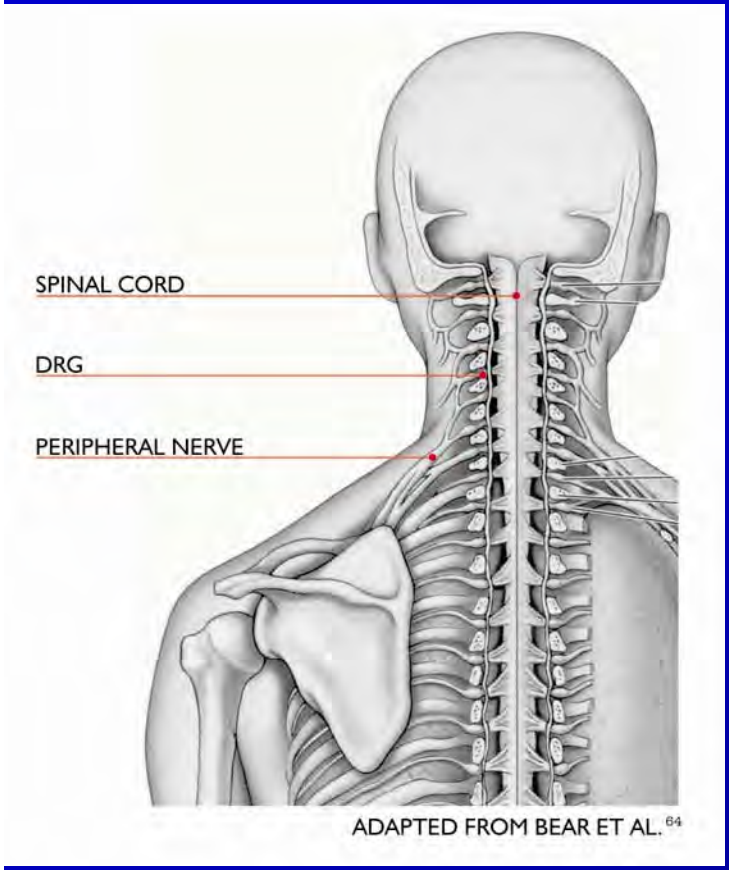
From: Neuron 10 (1993) Front Cover

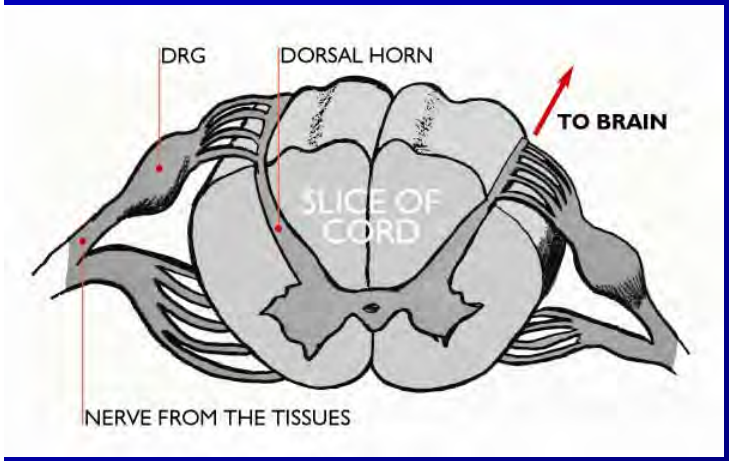


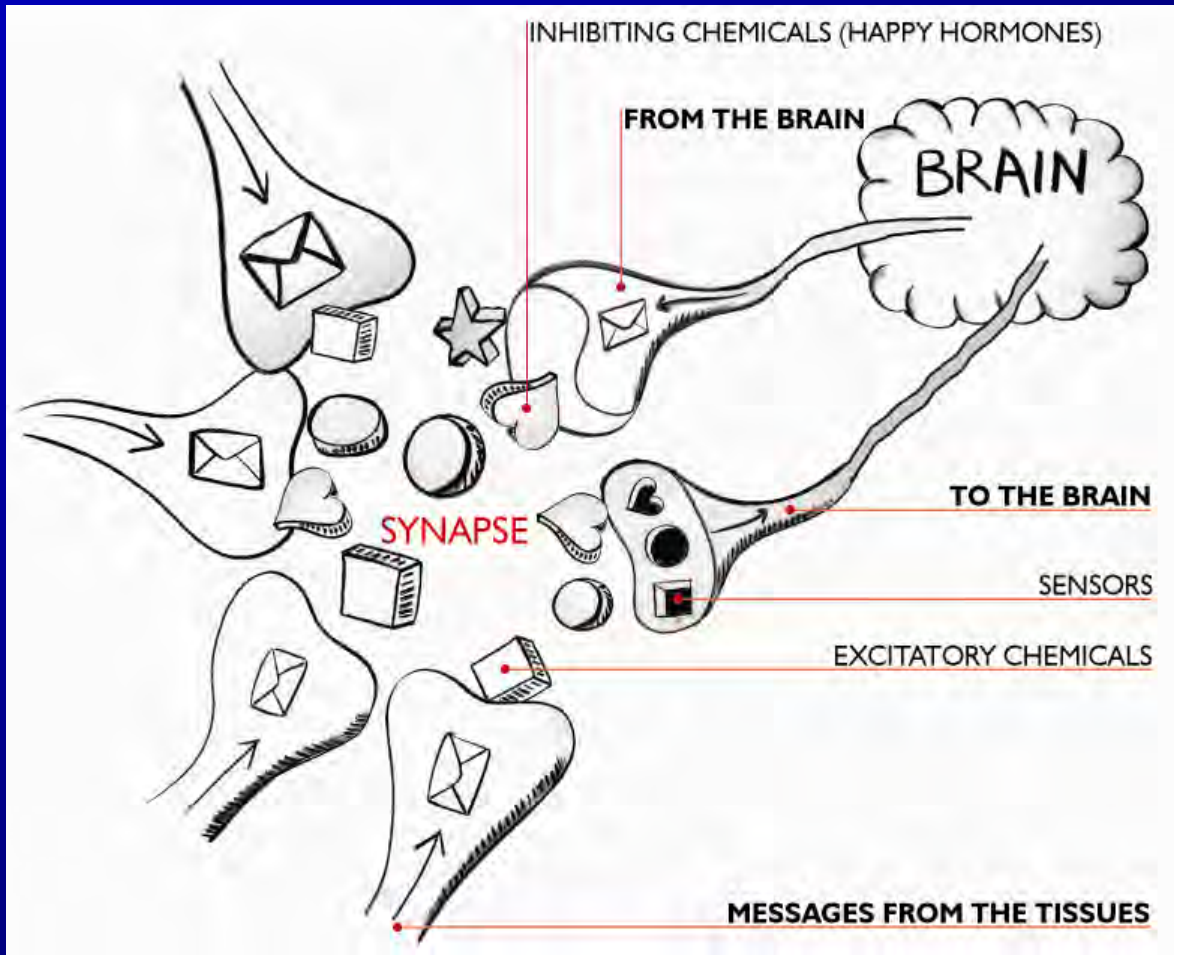
Would this hurt?



An astonishing synapse -the dorsal horn





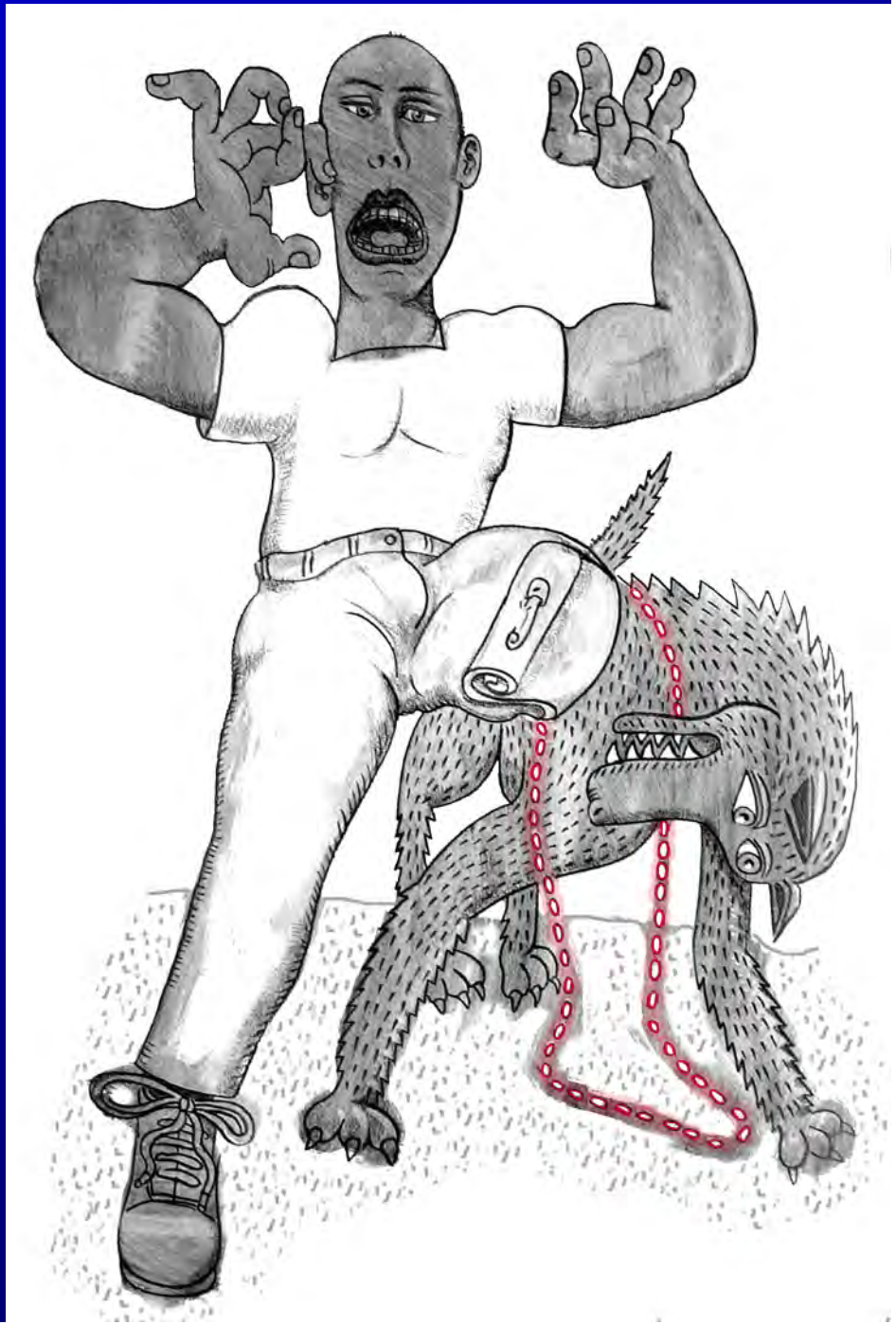


Gift 3 – The neuromatrix paradigm

"about 12 years old"

- Melzack's neuromatrix
  - representation
  - Maps in the brain
  - The virtual body
- Schema – "body of knowledge"

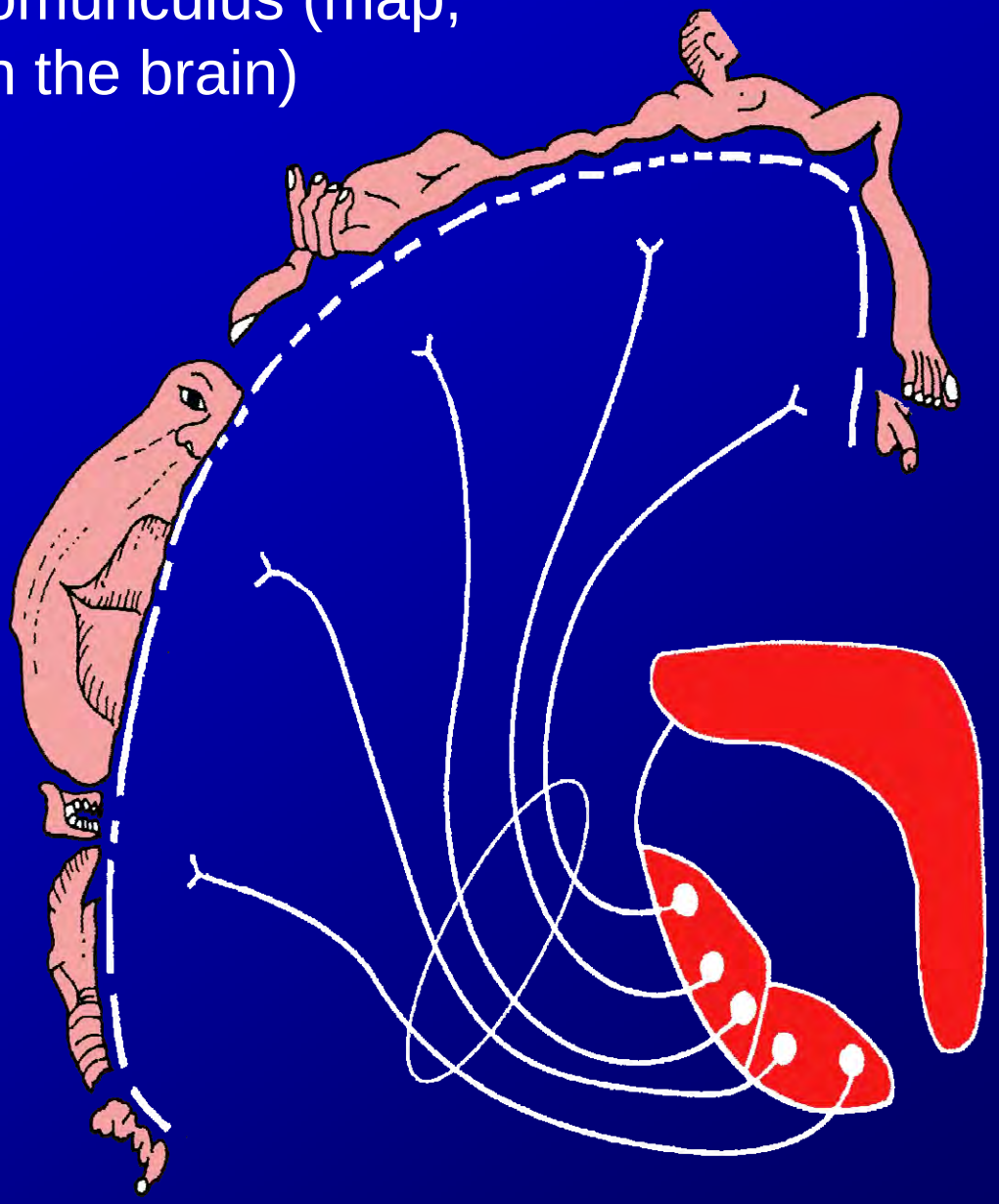
Reflect on the phantom



Butler DS, Moseley GL Explain Pain 2003


THE Sun
20p
Wimbledon sensation
STEFFI IS STUFFED IN FIRST ROUND
See Back Page
£10,000 Keep Playing Your Cards Right
£8,000 Holidays every year for life
How I used a train to chop off my leg
Sun EXCLUSIVE
CHARLES' TRUTH ABOUT ME AND CAMILLA
GEORGE MICHAEL HIT FOR £7M

The outer skin homunculus (map, /representation in the brain)



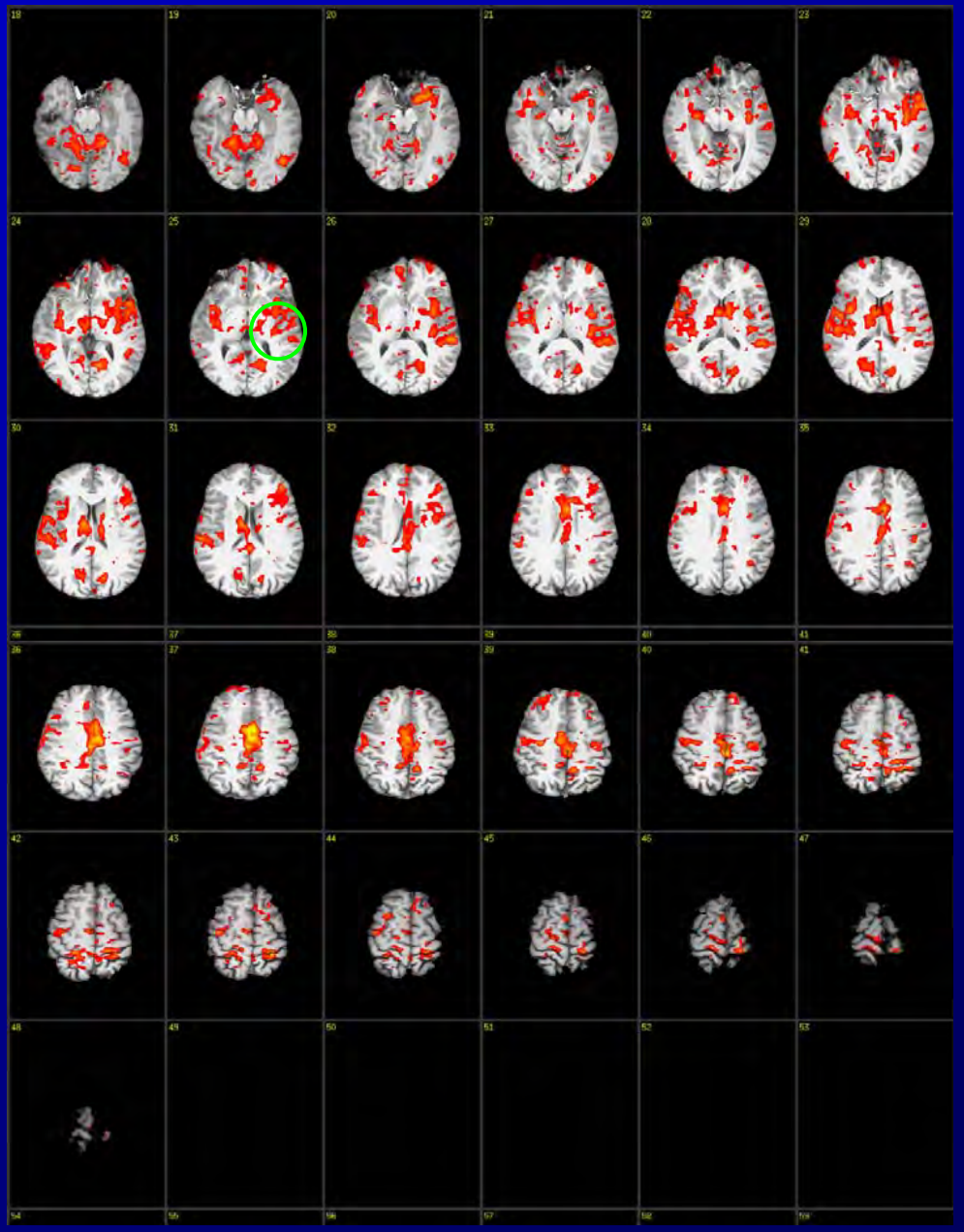
Key elements of the neuromatrix paradigm

Four key points

Key elements of the neuromatrix paradigm

1. Many bits of brain get turned on together

The brain activity which occurs when a person suffering chronic pain experiences pain during an attempt at an abdominal contraction

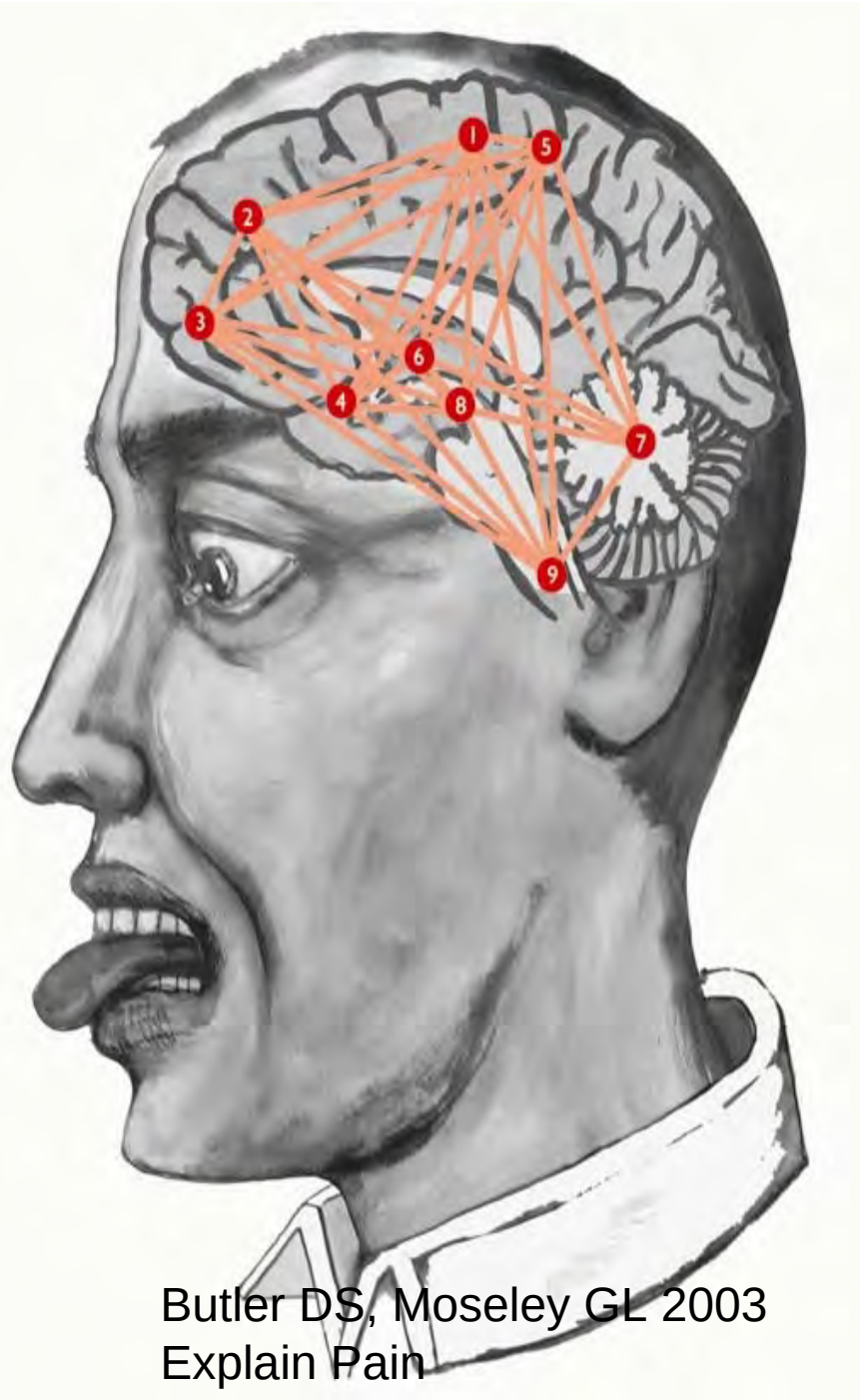


Courtesy Lozza

A possible pain or movement neurosignature

Note:

- No one “hub”
- Common but will vary
- Turned on together

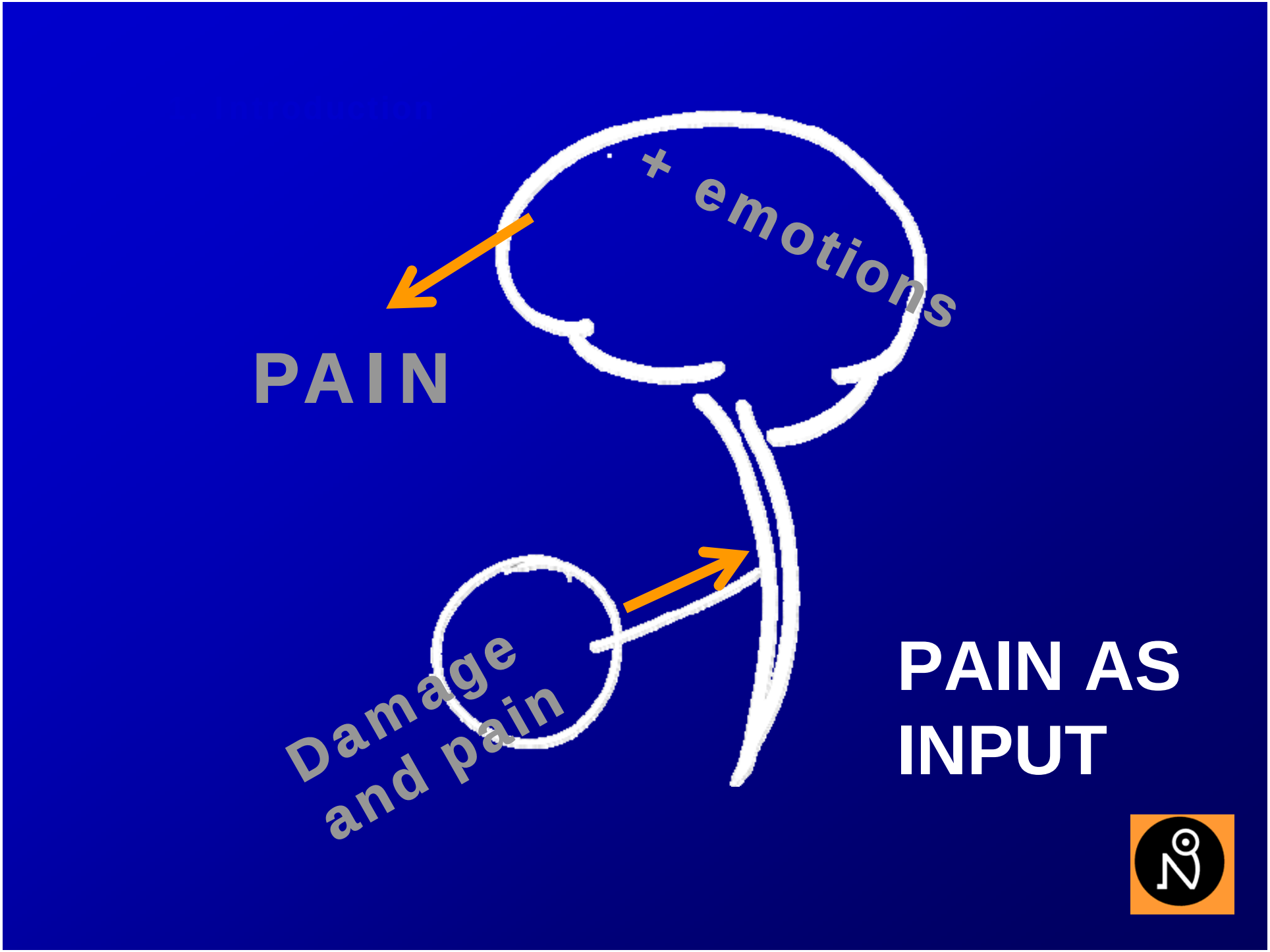


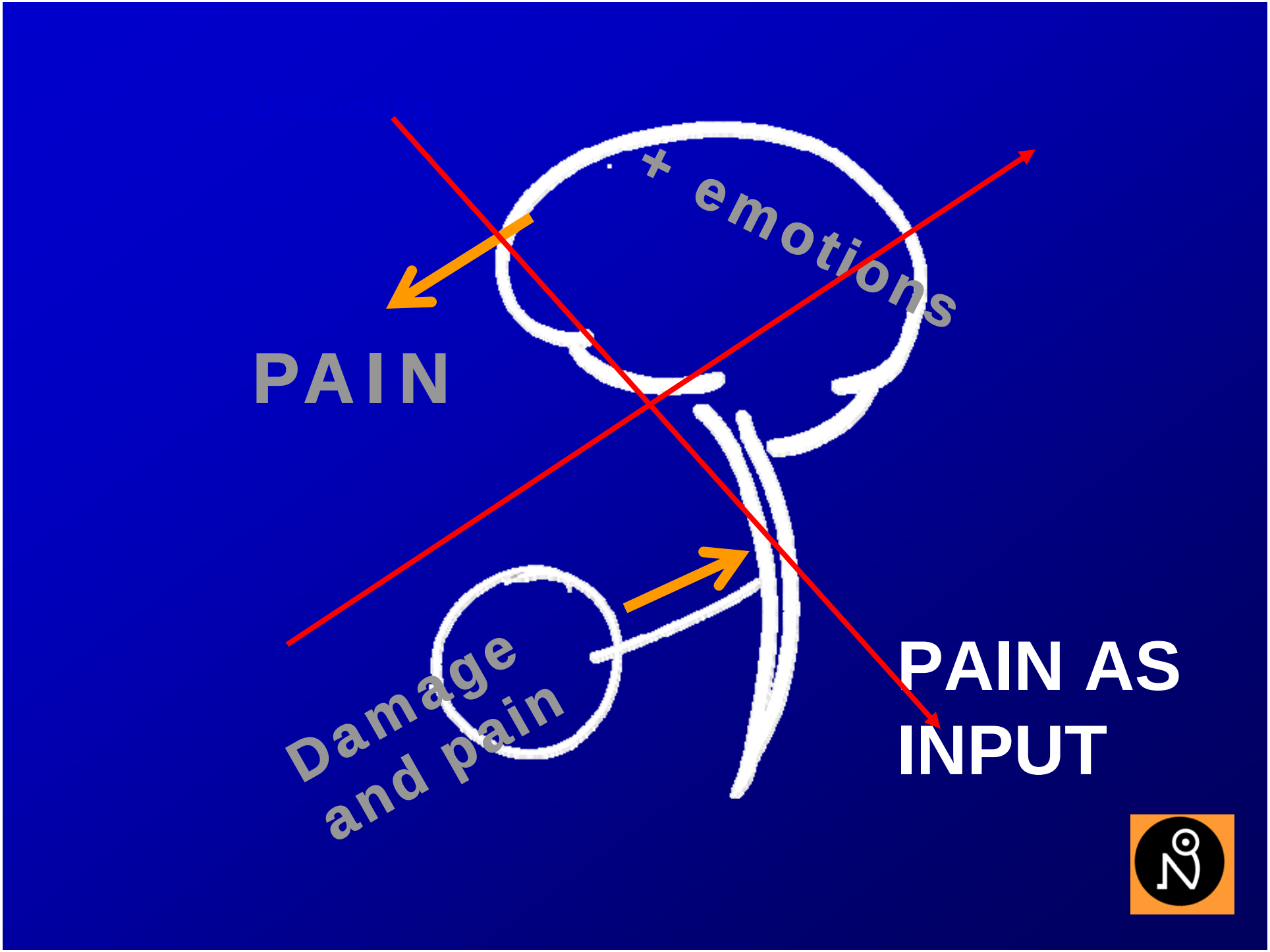
Butler DS, Moseley GL 2003
Explain Pain

Key elements of the neuromatrix paradigm

1. Multiple brain areas ignite together creating neurosignatures
2. The specific tissue injured may not matter for a pain neurosignature

Pain neurosignatures are more related to threat rather than tissue injury


+ emotions
PAIN
Damage
and pain
PAIN AS
INPUT


+ emotions
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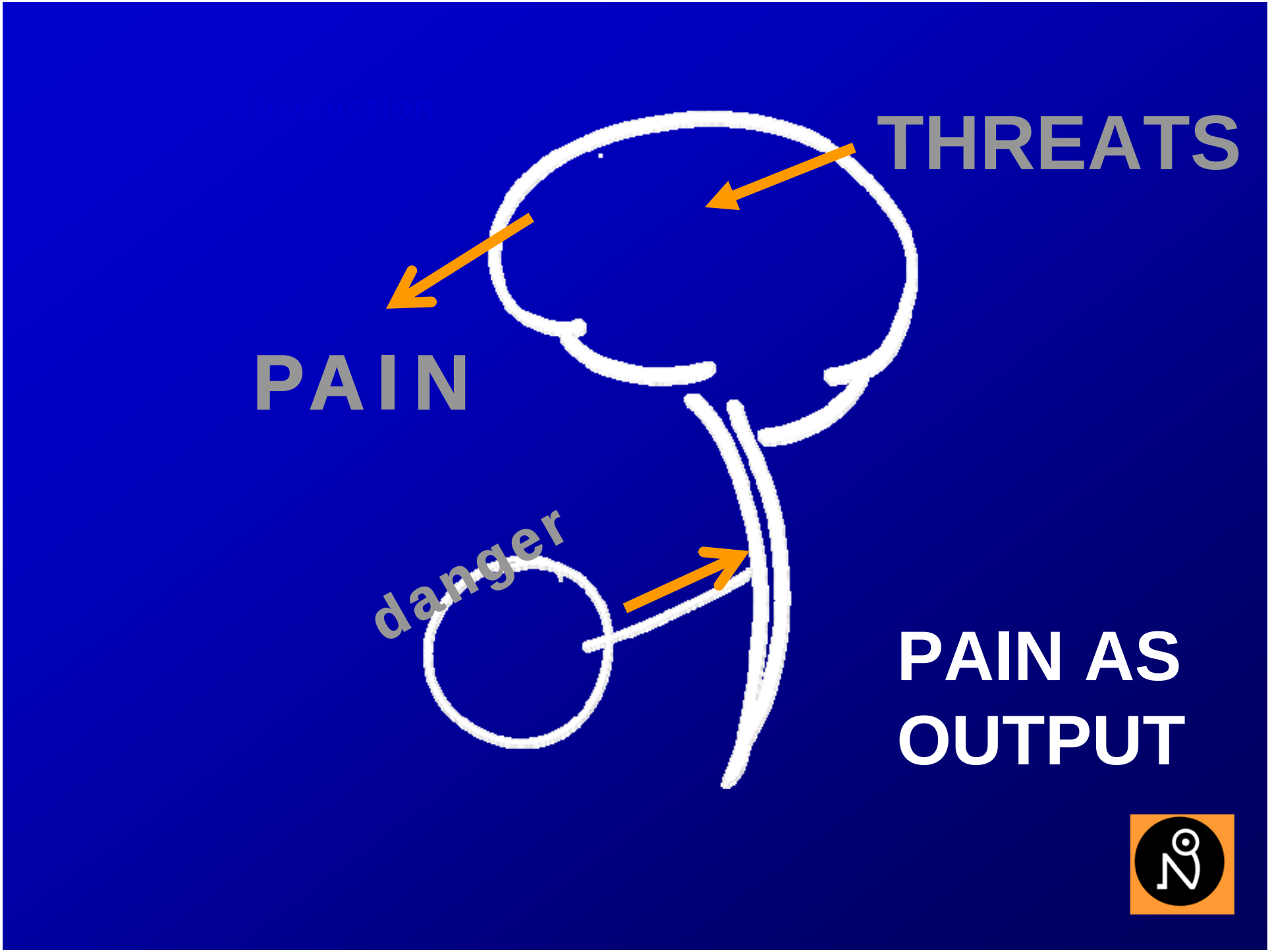
THREATS
PAIN
danger
PAIN AS
OUTPUT

Thoughts are nerve impulses

Key elements of the neuromatrix paradigm

1. Multiple brain areas ignite together creating pain representations
2. The specific tissue injured may not matter for a pain matrix

3. Pain representations are easily modified

The neurosignature can be easily modified:

- turned up
- turned down
- ignited by numerous stimuli including mirror neurones