


The *Brain and Behavior*


A "tulip head" insane man is tricked into thinking his madness "stone" has been removed by a "doctor," actually a con-artist, magician, or a quack, via a hole drilled in his skull called trepanation.



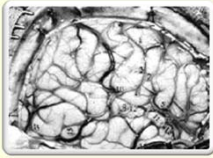
"The Extraction of the Stone for Madness" also called "The Cure of Folly," by Hieronymus Bosch, c. 1480

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Sensory and Motor Association Areas

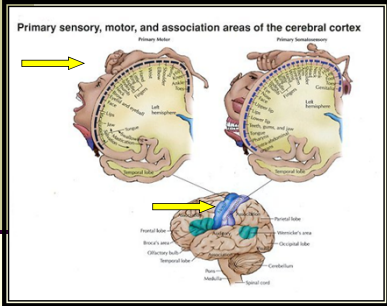


- Wilder Penfield, a pioneering neurosurgeon, mapped the cerebral cortex using mild electric currents.
 - ...in a procedure to treat patients with epilepsy.
- Since his patients were awake during the operations, they could tell Penfield what they were experiencing.
- Probing some areas triggered whole memory sequences.
- During these operations, ...
 - Penfield also observed body movements when current was applied to the back part of the frontal lobes.
- From this information, he was able to map what has come to be called the **primary motor association area**.



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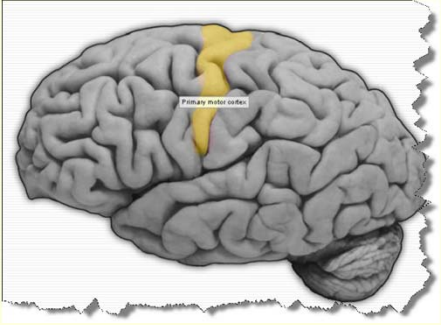
Sensory and Motor Association Areas



- What Wilder Penfield discovered was that there were bands of cortex in both hemispheres **at the back most part of the frontal lobes...**
 - ... which controlled muscular movements subsequently called...
 - the **primary motor association area**.
 - He could induce motor movements simply by stimulating an area with mild electricity.
- The drawing at far left shows the proportion of cortex devoted to muscles in different parts of the body.

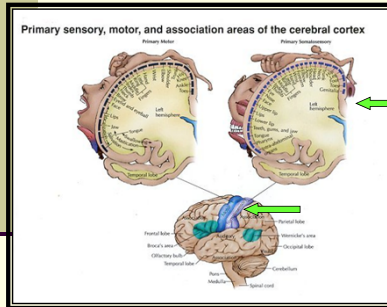
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Primary Motor Cortex



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Sensory and Motor Association Areas



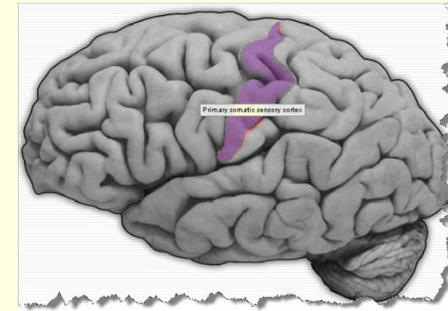
- A **primary somatosensory area** also exists in the **front-most portion of the parietal lobe** where shown.
- In a comparable manner, a disproportionate amount of cortical area is devoted to the receipt of sensory input from the hands and face.
- The drawing at near left shows the proportion of cortex devoted to the receipt of sensory information from different parts of the body.

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Primary Somatic Sensory Cortex

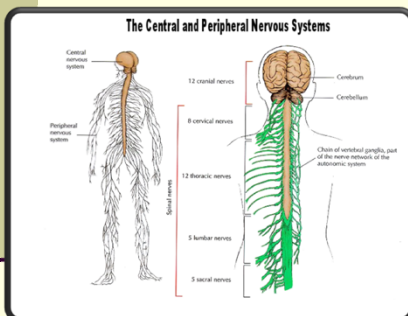


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The Autonomic Nervous System



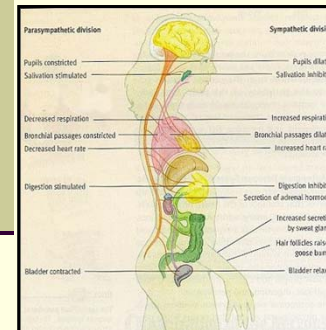
- The human nervous system is divided into:
 - the **central nervous system (CNS)**
 - consisting of the **brain** and **spinal cord**; and,
 - the **peripheral nervous system (PNS)**
 - consisting of the **somatic nervous system**; and,
 - the **autonomic nervous system**
 - the **autonomic nervous system** is further subdivided into
 - the **parasympathetic** and
 - **sympathetic** divisions.

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The Autonomic Nervous System



- Within the autonomic nervous system . . .
 - . . .the **parasympathetic division** is active when we are going about our normal daily affairs free of tension or threat;
 - . . .the **sympathetic division** kicks in when we confront tension-filled situations or threats.
 - It prepares the person to either . . .
 - fight the threat; or,
 - flee.

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The Autonomic Nervous System

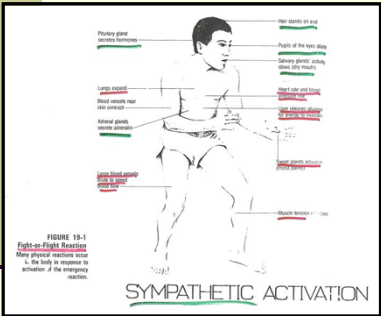


FIGURE 19-1
Fight-or-Flight Reaction
Many physical reactions occur in the body in response to activation of the emergency reaction.


SYMPATHETIC ACTIVATION

"Fight or Flight"

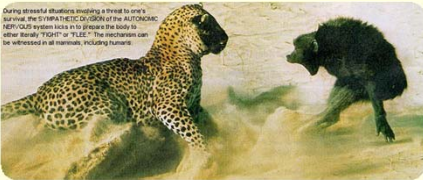
- The "fight or flight" reaction basically prepares the body to defend itself.
- It is a state of heightened arousal that propels the person to act.
- Apart from the **physiological signs** and **symptoms** it produces, however,
- ..it also produces very distressing **cognitive symptoms**.

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The Autonomic Nervous




A **parasympathetic nervous system** moment on an African savannah.



A **sympathetic nervous system** moment elsewhere in Africa.

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The Autonomic Nervous System



"Fight or Flight"

- Being "on alert" constantly in high stress occupations can reek havoc on health.
- Also, having a multitude of stressors impact your life over the course of a year can in an additive fashion reek havoc on your health as well.



Air Traffic Controller

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The Holmes-Rahe Social Readjustment Rating Scale

The Holmes-Rahe Social Readjustment Ratings Scale

To measure your stress level... for the last year of your life, add up the number of "Life Change Units" (see below) that apply to events that you have experienced. The score you receive will give you an idea of how stressed you are.

The scale you need to use depends on your age: Over 18 use the **Adult Scale**, directly below and Under 18 use the **Child Scale** at the bottom of this page.

SCALE FOR ADULTS (18 AND OVER)

Life Event.....	Life Change Units
Death of a Spouse.....	100
Divorce.....	73
Marital Separation.....	65
Imprisonment.....	63
Death of a Close Family Member.....	63
Personal Injury or Illness.....	53
Marriage.....	50
Dismissal from Work.....	47
Marital Reconciliation.....	45
Retirement.....	45
Change in Health of Family Member.....	44
Pregnancy.....	40
Sexual Difficulties.....	39
Gain a New Family Member.....	39
Business Readjustment.....	39

- The idea behind the Holmes-Rahe scale is that stressors are accumulative over time.
- Persons who accumulate over 300 points in a year are at extreme risk for serious illness.
- Persons who accumulate 150-299 points are at moderate risk.
- Less than 150 is a good thing but earning virtually no risk factors is best.

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Psychosomatic Illnesses



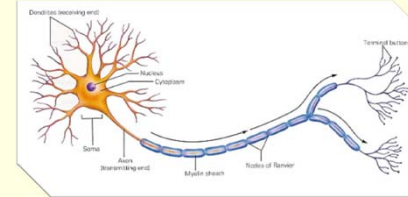
- Persons under continuous stress are prone to *psychosomatic illnesses*.
- Stress can *cause* and *worsen* such conditions as:
 - high blood pressure
 - migraine headaches
 - back ache
 - asthma
 - hiccups
 - eczema

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Neuron Anatomy



Major Components of a Neuron

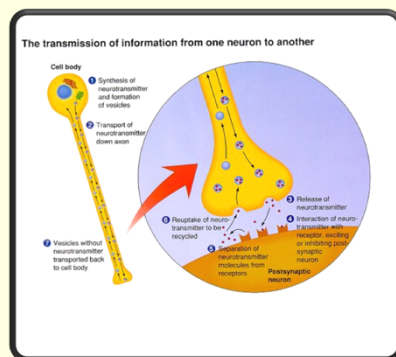
- SENSORY NEURONS**, also called **AFFERENT NEURONS** bring information in to the central nervous system from sense receptor cells.
- MOTOR NEURONS**, also called **EFFERENT NEURONS**, carry messages away from the central nervous system to the muscles and glands.
- INTERNEURONS** relay messages from sensory neurons to other interneurons or motor neurons.

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Neuron Action at the Synapse



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Illustrative Neurotransmitters

- **Dopamine** ~ contributes to the control of voluntary movement.
 - Decreased levels are associated with **Parkinson's disease**.
 - Overactivity at dopamine synapses are associated with **schizophrenia**.
- **Serotonin** ~ involved in the regulation of sleep, wakefulness, eating, and aggression.
 - Deficiencies are associated with **depression** and **obsessive compulsive disorder (OCD)**.
 - Excesses with **mania** as in bipolar disorder.
- **Endorphins** ~ resemble opiate drugs in structure and effects.
 - Endorphins contribute to pain relief and are...
 - ...also associated with the "runner's high."

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More on Serotonin, an SSRI

The transmission of information from one neuron to another

Serotonin - involved in the regulation of sleep and wakefulness, eating and aggression.

- Deficiencies are associated with depression.
- Prozac (Fluoxetine)** is a member of a class of selective **serotonin reuptake inhibitors (SSRIs)** designed to treat this condition.
- It is now widely prescribed for other conditions as well, e.g., OCD, anxiety disorders, eating disorders, even ICB (irritable bowel syndrome).

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The “Reflex Arc”

- The expression **“reflex arc”** refers to the purely spinal cord based unlearned physiological event associated with:
 - An external stimulus, sometimes painful, sometimes not...
 - ...sending a message to the spinal cord eliciting...
 - ...an immediate motor response.
- In the example here the **“reflex arc”** involves:
 - A nail stimulating pain receptors in the foot** which then...
 - ...send a message to the spinal cord on a **sensory neuron** which...
 - ...then communicates with an **interneuron** which in turn...
 - ...communicates with a **motor neuron**...
 - ...which activates the muscles of the leg causing the foot to be withdrawn.

Only after the reflex is completed is a message sent to the somatosensory cortex.

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Astonishing Brain Function

Savant Syndrome

Derek Paravicini

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