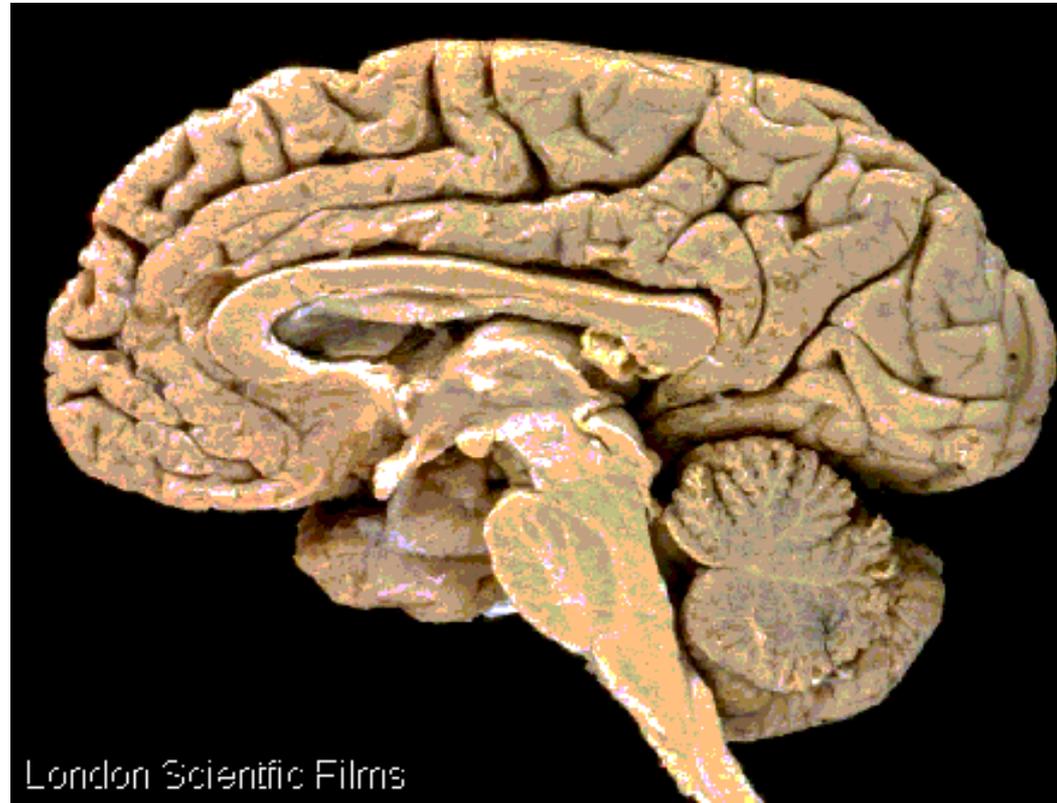


Integration & Control:

The Brain



I. Introduction (1)



⌘ A. Some Facts

1. Weighs about 3 lbs (1.4kg) - has consistency of semisoft cheese.
2. Made up of both white and gray matter.
 - (a) white matter - axons with myelin sheaths
 - (b) gray matter - nerve cell bodies and glial cells

I. Introduction (2)



⌘ A. Some Facts

3. Our brain is the most complex and highly organized structure on the planet.
4. Males have a 10% larger brain than females.
5. With that said, there is no correlation between brain size and intelligence.

I. Introduction (3)



⌘ B. Structural Organization of the Brain

1. During embryological development the brain starts out as 3 hollow bulges at the top of spinal cord.
2. The bulges are called ventricles and are filled with cerebrospinal fluid (csf).
3. The 3 areas are called:

I. Introduction (4)



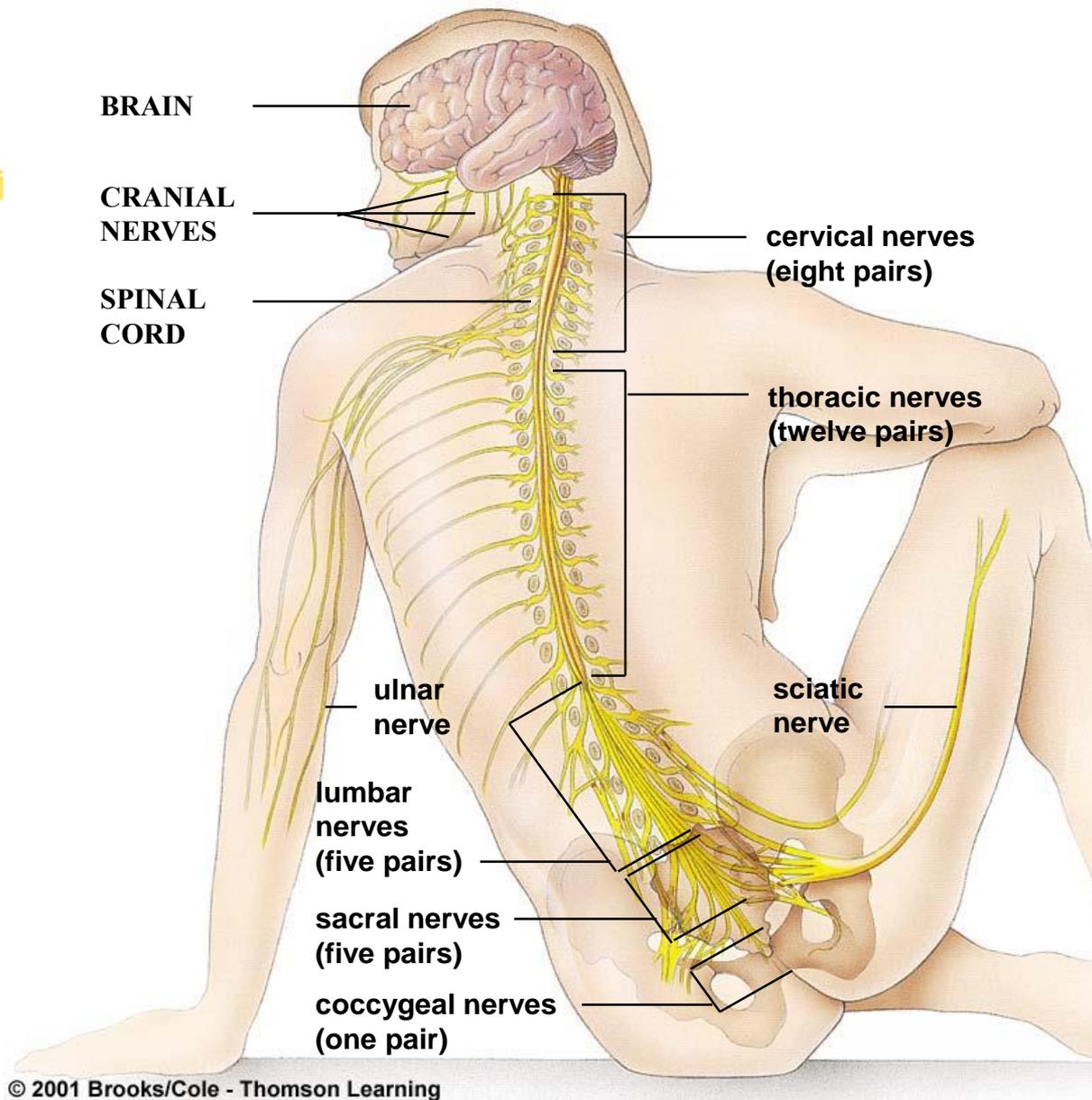
⌘ B. Structural Organization of the Brain

3. The 3 areas are called:

(a) forebrain (prosencephalon)

(b) midbrain (mesencephalon)

(c) hindbrain (rhombencephalon)



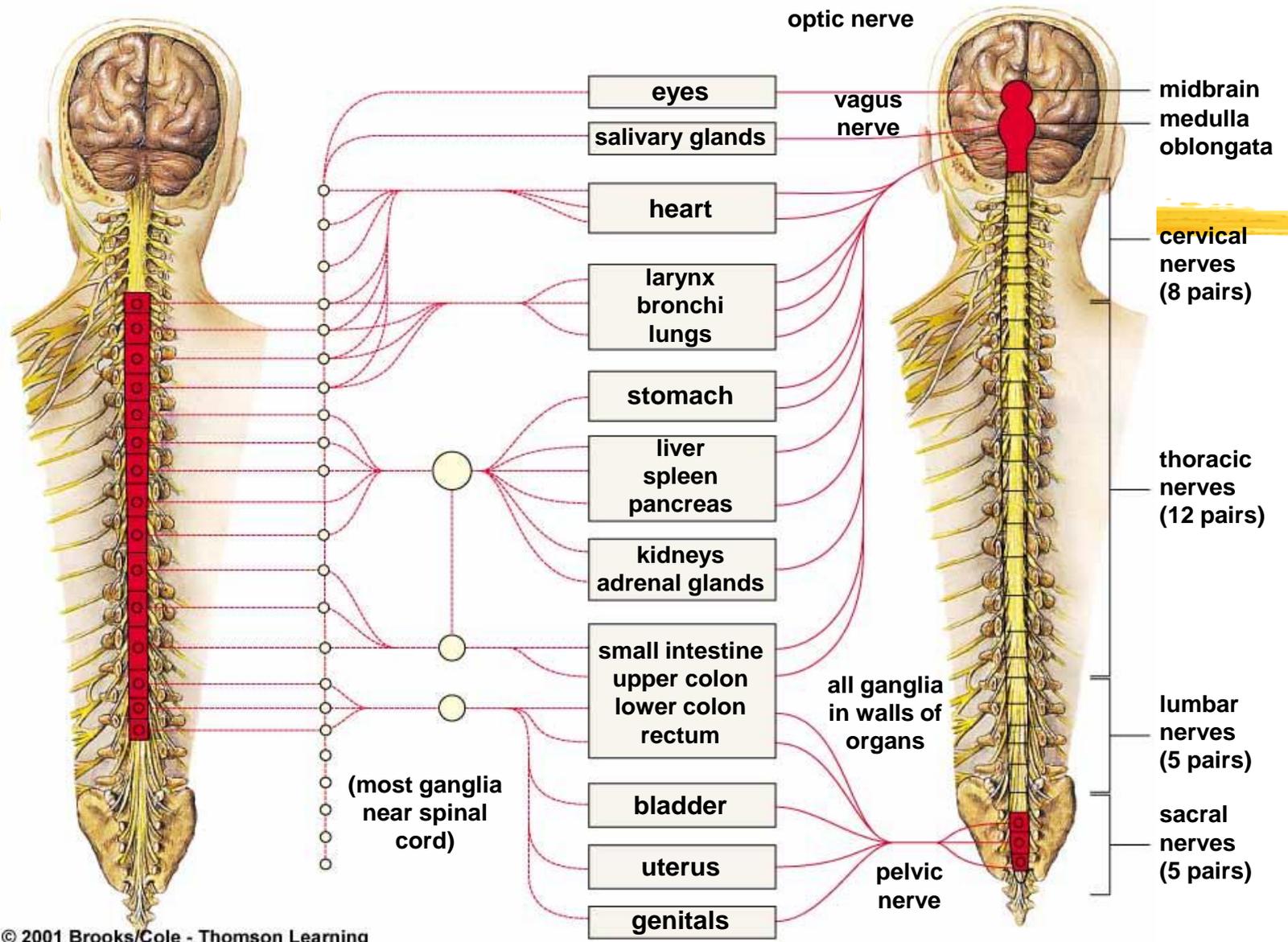


Fig. 35.7, p. 592

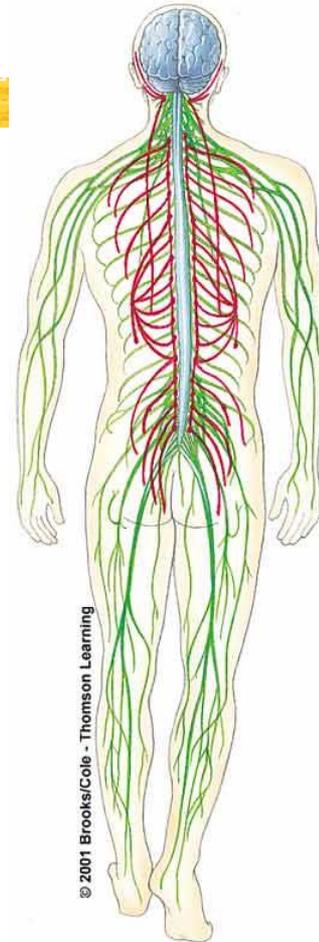
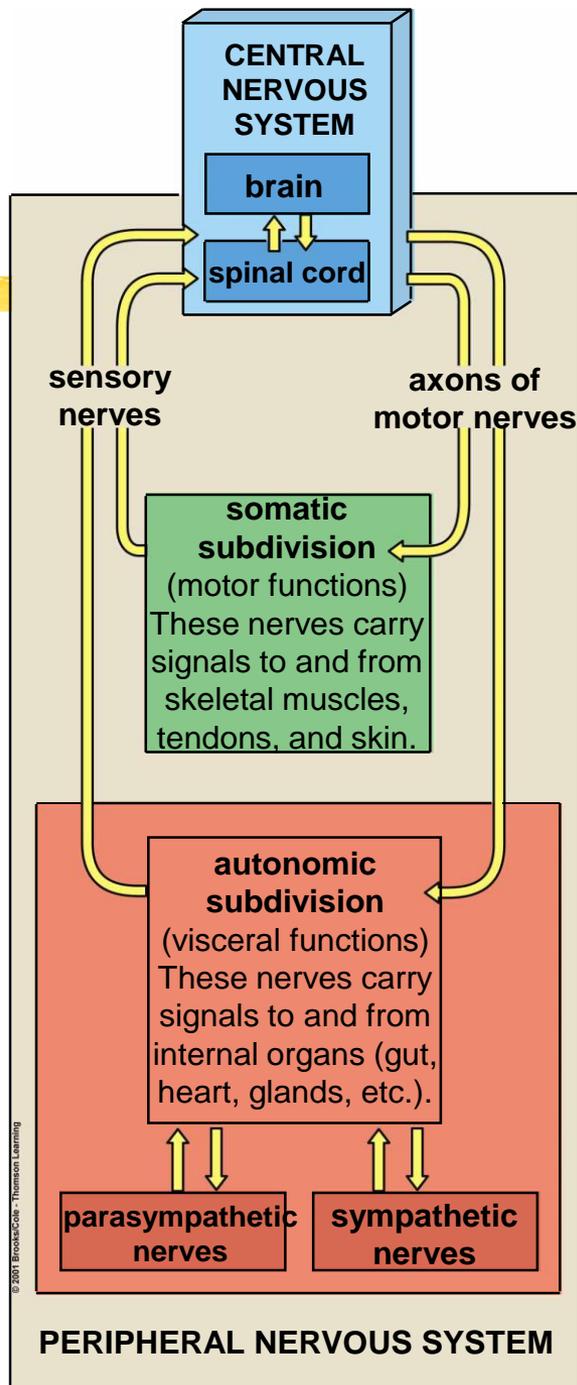


Fig. 35.6, p. 591

BRAIN

FOREBRAIN

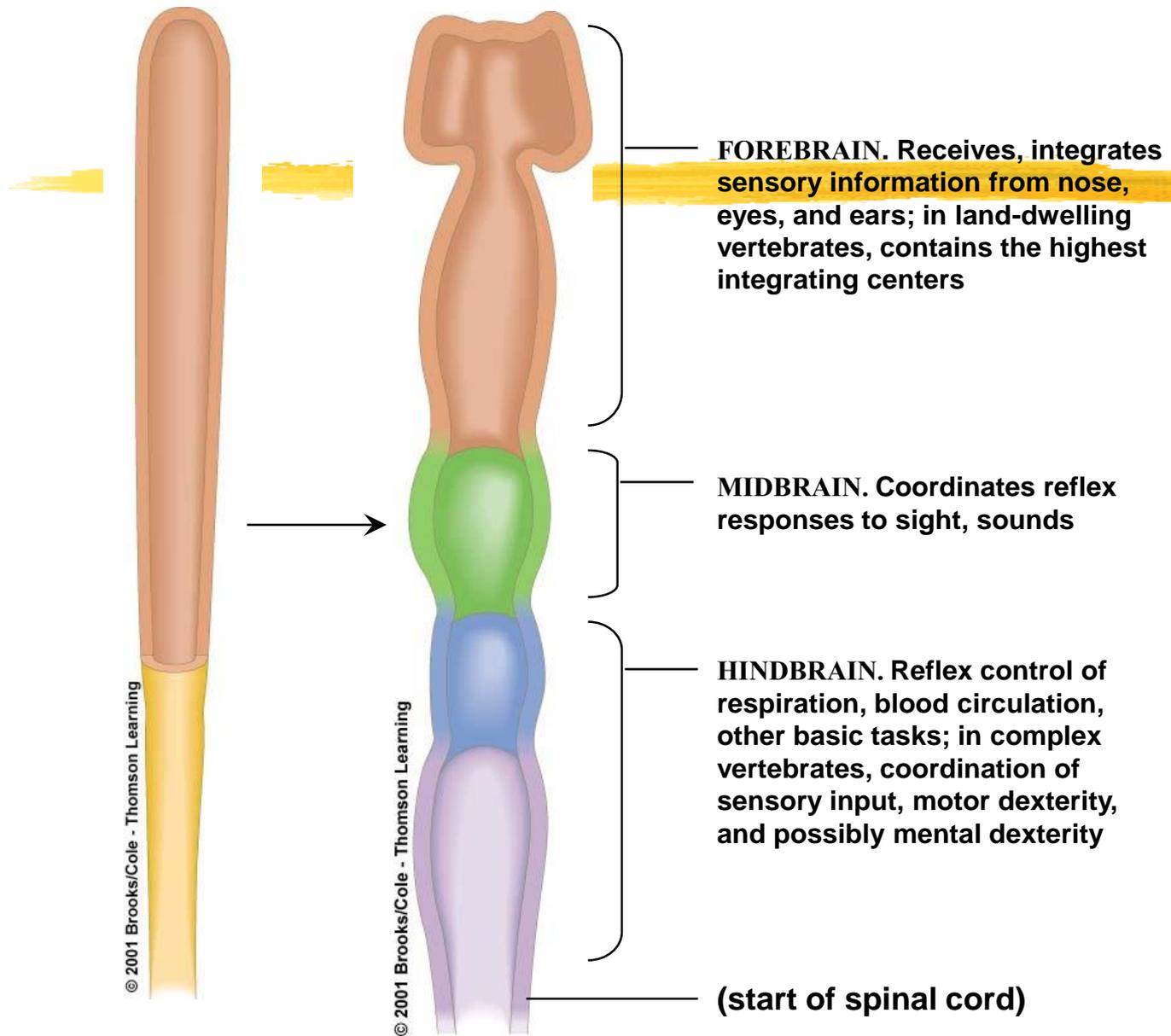
PROSENCEPHALON

MIDBRAIN

MESENCEPHALON

HINDBRAIN

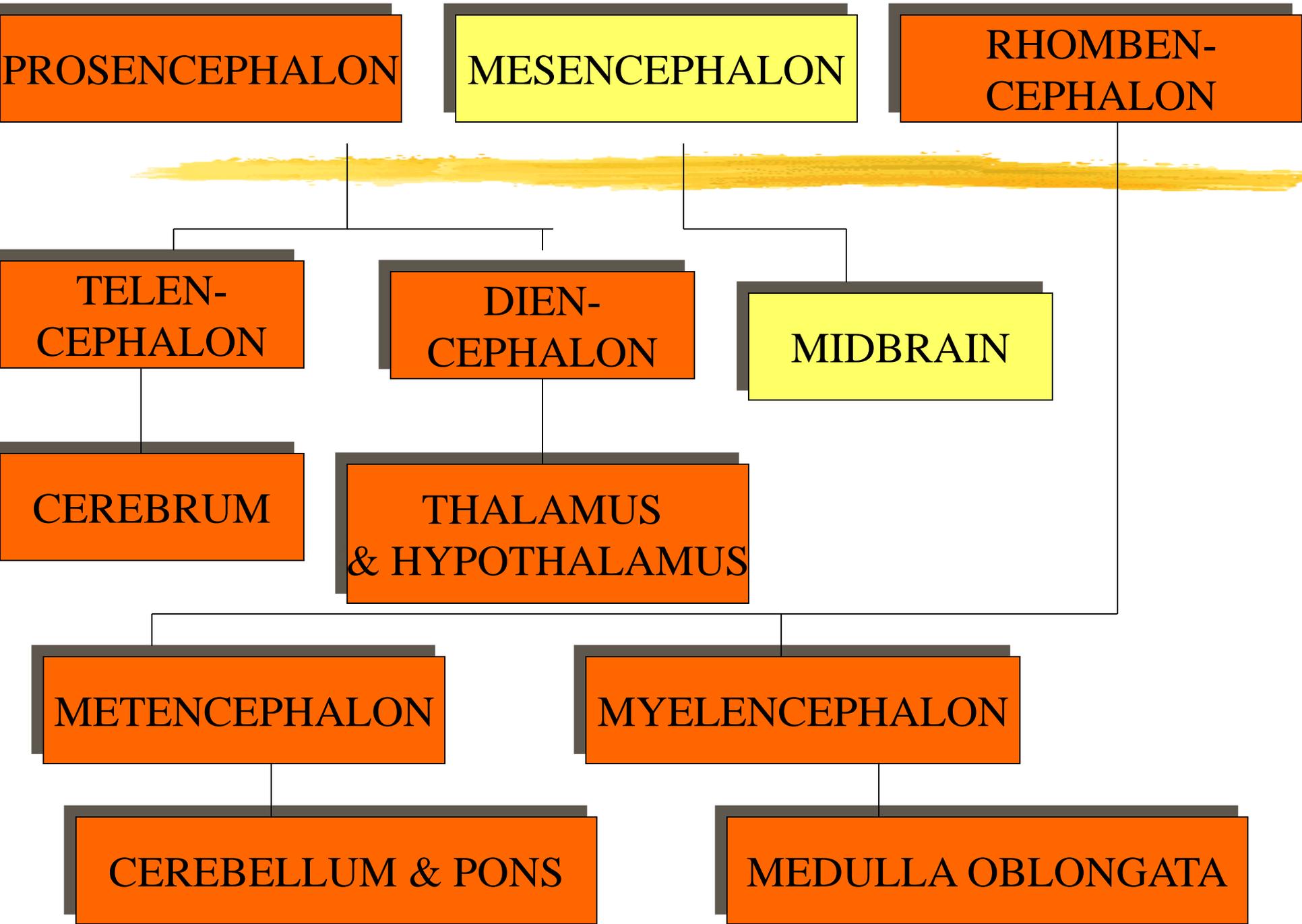
RHOMBENCEPHALON



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Fig. 35.4a, p. 590



PROSENCEPHALON

MESENCEPHALON

RHOMBEN-
CEPHALON

TELEN-
CEPHALON

DIEN-
CEPHALON

MIDBRAIN

CEREBRUM

THALAMUS
& HYPOTHALAMUS

METENCEPHALON

MYELENCEPHALON

CEREBELLUM & PONS

MEDULLA OBLONGATA

PROSENCEPHALON

```
graph TD; A[PROSENCEPHALON] --> B[TELENCEPHALON]; A --> C[DIENCEPHALON]; B --> D[CEREBRUM]; C --> E["THALAMUS & HYPOTHALAMUS"]
```

TELENCEPHALON

DIENCEPHALON

CEREBRUM

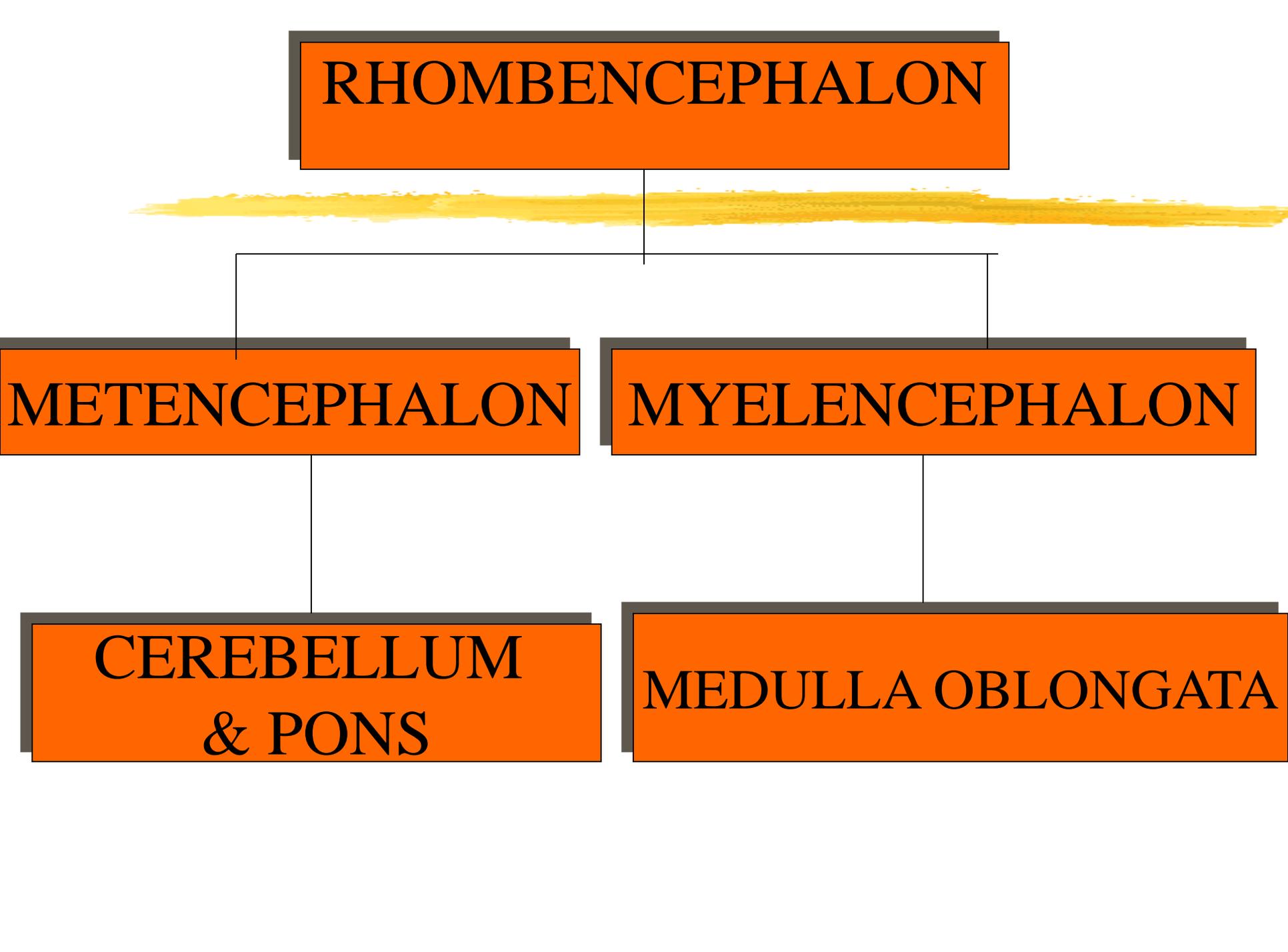
THALAMUS
& HYPOTHALAMUS

MESENCEPHALON

```
graph TD; A[MESENCEPHALON] --- B[MIDBRAIN]
```

MIDBRAIN

RHOMBENCEPHALON



```
graph TD; A[RHOMBENCEPHALON] --> B[METENCEPHALON]; A --> C[MYELENCEPHALON]; B --> D["CEREBELLUM & PONS"]; C --> E[MEDULLA OBLONGATA]
```

A hierarchical flowchart showing the division of the Rhombencephalon. The root node is 'RHOMBENCEPHALON', which branches into 'METENCEPHALON' and 'MYELENCEPHALON'. 'METENCEPHALON' further branches into 'CEREBELLUM & PONS', and 'MYELENCEPHALON' branches into 'MEDULLA OBLONGATA'. A yellow brushstroke is present behind the top horizontal line of the diagram.

METENCEPHALON

MYELENCEPHALON

**CEREBELLUM
& PONS**

MEDULLA OBLONGATA

Major Regions – by Size (1)

⌘ Cerebrum: the most advanced in humans, the “thinking” part of the brain. Has all the folds and convolutions.

☑ Divided into two large areas called the **cerebral hemispheres**.

☑ Covered by the **neural cortex**, a thin layer of gray matter.



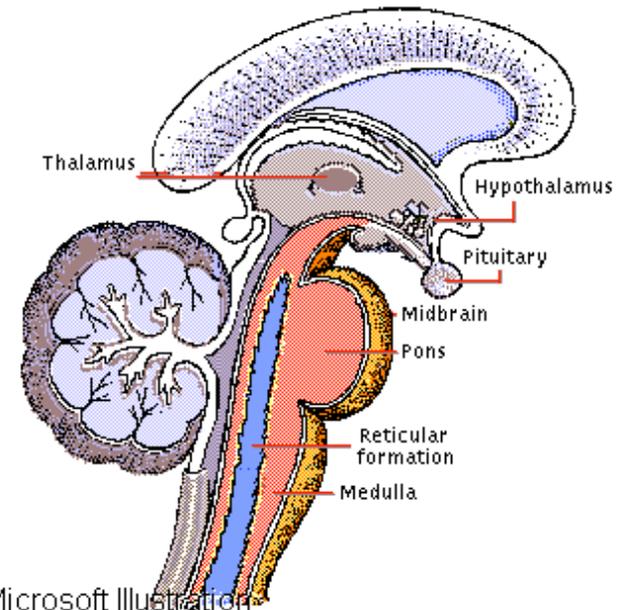
Major Regions – by Size (2)

- ⌘ Cerebellum: execution and fine-tuning of complex patterns of muscular movement - biggest in birds.
- ⌘ Diencephalon: composed of the left and right **thalamus**. Is a relay center for sensory input. The diencephalon is connected to:
 - ⊞ **Hypothalamus:** control center for emotion, automatic functions & hormone production
 - ⊞ **Pituitary gland:** Control center of the endocrine or gland system.



Major Regions – by Size (3)

- ⌘ The diencephalon links the cerebral hemispheres with the brain stem.
- ⌘ The brain stem is made up of the:
 - ☑ Mesencephalon
 - ☑ Pons
 - ☑ Medulla oblongata



hypothalamus thalamus pineal gland location

corpus callosum

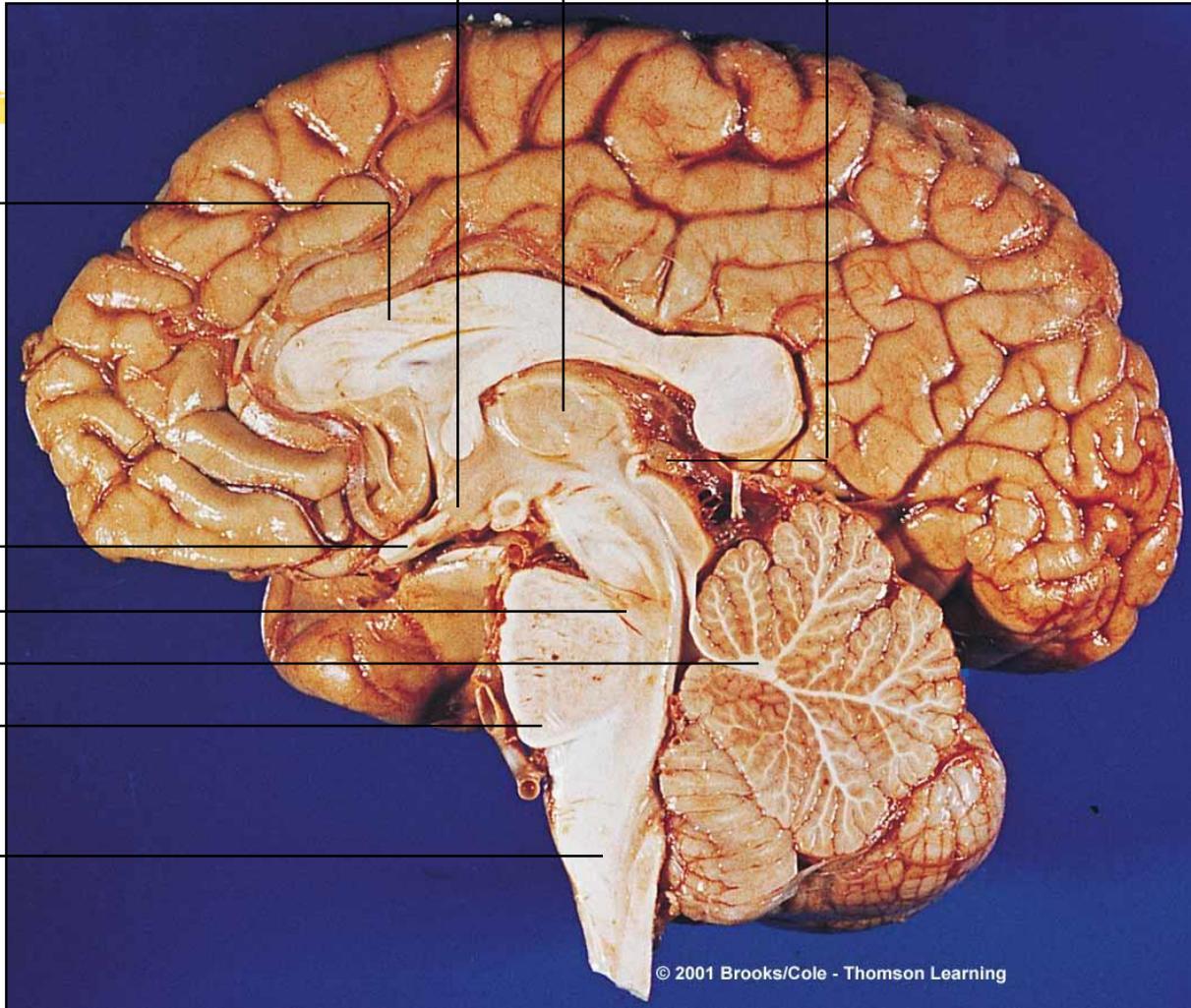
part of an optic nerve

midbrain

cerebellum

pons

medulla oblongata



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Fig. 35.12, p. 596

Mesencephalon



- ⌘ Is part of the midbrain.
- ⌘ Handles visual and auditory info.
- ⌘ Responds to loud noises as well as eye and head movements.

Pons



- ⌘ It creates a “bridge” between the cerebellum and the brain stem.
- ⌘ Involved in some muscle motor control.

Medulla Oblongata



- ⌘ The spinal cord connects to the brain at this point.
- ⌘ Controls autonomic functions like:
 - ☑ Heart rate
 - ☑ Blood pressure
 - ☑ digestion

Brain Ventricles



- ⌘ There are 4 ventricles or chambers in the brain.
- ⌘ These chambers are filled with cerebrospinal fluid, a fluid that protects and nourishes the brain and spinal cord.
- ⌘ Numbers 1 & 2 are in each hemisphere, # 3 is in the diencephalon. #4 is between the pons and the cerebellum.

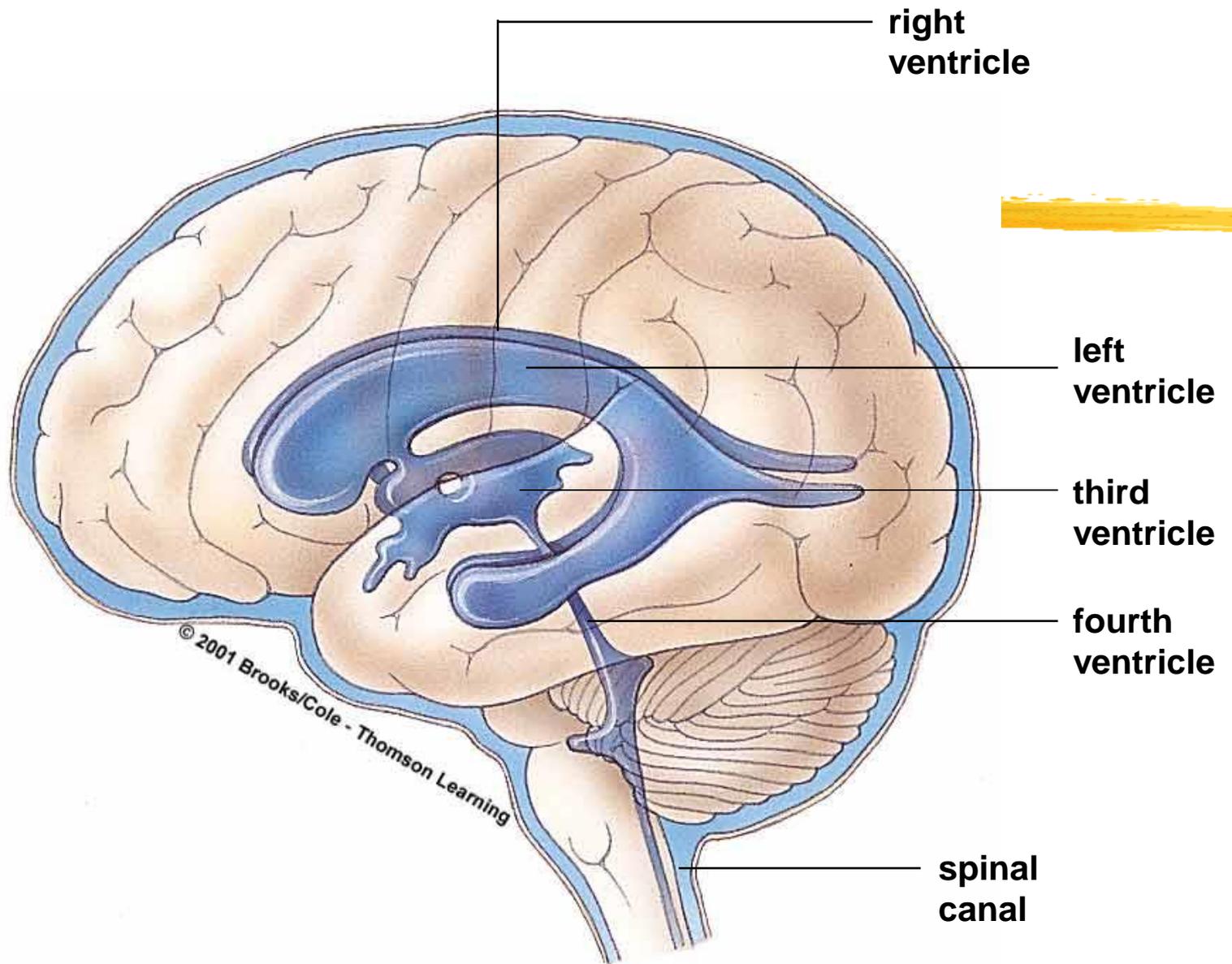


Fig. 35.11, p. 595

Brain Protection & Support



⌘ The brain is protected by:

☑ The skull

☑ The meninges: layers of tissue surrounding the brain

☑ The cerebral spinal fluid (CSF)

☑ The blood brain barrier

The Meninges



- ⌘ Dura mater: The outer layer. Literally means “tough mother.”
- ⌘ Arachnoid: A smooth middle layer.
- ⌘ Pia mater: Actually touches the brain or sticks to it.

CSF



- ⌘ Produced by the choroid plexus, which is found in the 3rd ventricle.
- ⌘ You make about 500ml/day. Enough to replace your CSF every 8 hours.
- ⌘ Check out what happens when you can't remove CSF, especially in an infant.

Blood – Brain Barrier



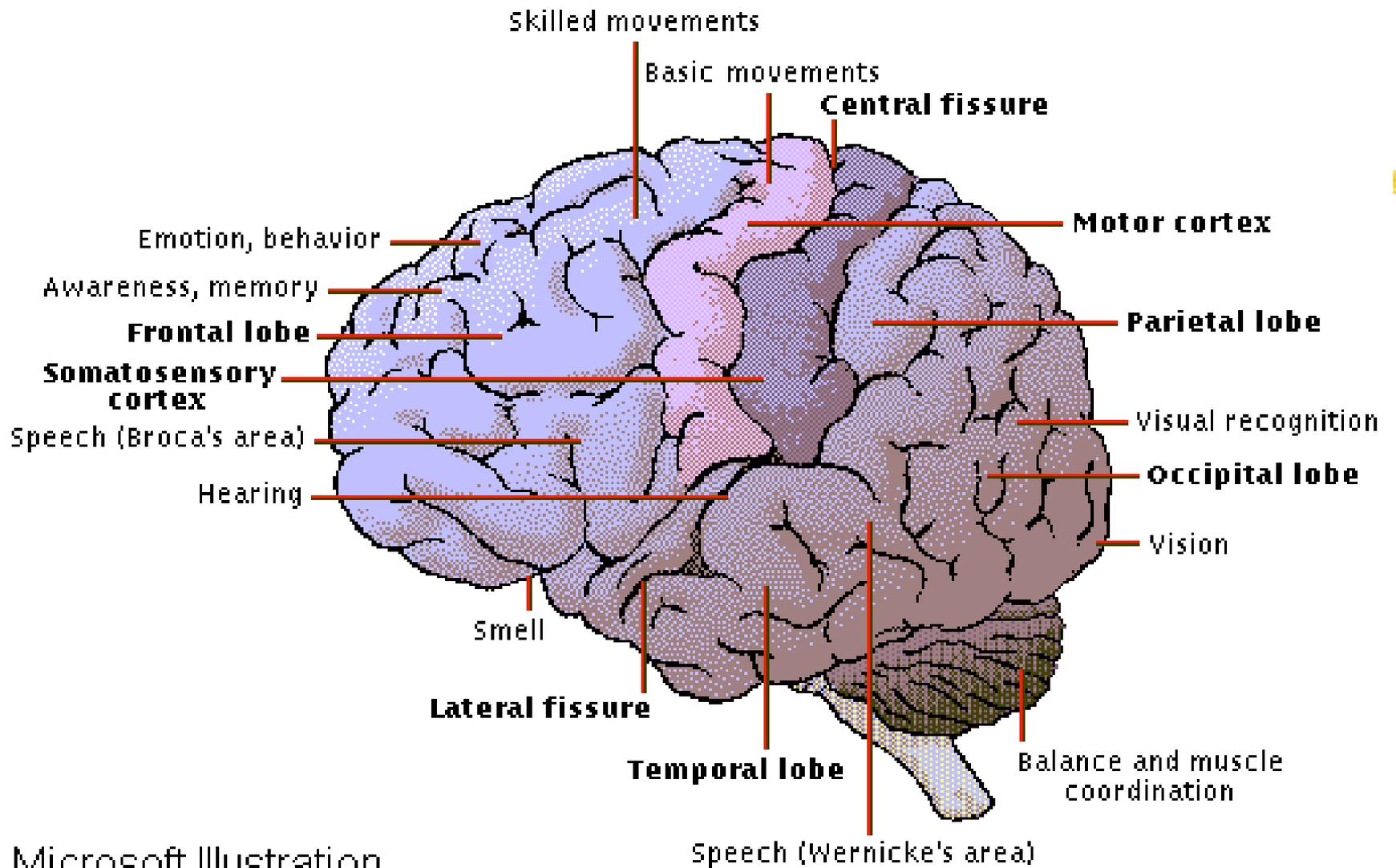
- ⌘ This barrier stops regular diffusion and osmosis to the brain.
- ⌘ This tends to inhibit toxins or poisons from reaching the brain.

Structures you need to Know



1. The Cerebrum *
2. The Limbic System
3. The Diencephalon
4. The Thalamus
5. The Hypothalamus
6. The Mesencephalon
7. The Cerebellum *
8. The Pons
9. The Medulla Oblongata

* Covered by you



Microsoft Illustration

The Limbic System



⌘ The “Lizard Brain.” Found deep in the cerebrum.

⌘ Controls...

☑ Emotional states; joy, rage, sex drive, hunger, fight or flight, heart rate

☑ Links your conscious thoughts with your unconscious thoughts

☑ Memory storage & retrieval

Limbic System Structures



1. Limbic lobe of cerebral hemisphere
2. Corpus callosum
3. Fornix
4. Mammillary bodies

Find these structures during dissection

The Diencephalon



- ⌘ The Pineal Gland: Produces the hormone **melatonin**. Handles are day/night cycles and reproductive functions. May prolong life.
- ⌘ Makes up the Thalamus

The Thalamus



- ⌘ Is part of the Limbic system
- ⌘ Handles incoming sensory information and sends it to the cerebrum.

The Hypothalamus



- ⌘ Found near the center of the brain
- ⌘ Some functions of the hypothalamus...
 1. Control of autonomic function (heart rate, blood pressure, respiration, digestion).
 2. Secretion of hormones
 3. Emotions and drives for thirst and hunger
 4. The body's temperature regulator

The Mesencephalon



⌘ Parts to find in dissection...

1. Superior colliculus
2. Inferior colliculus
3. Cerebral peduncles
4. Reticular activating system: Keeps you alert and attentive

The Pons & Medulla Oblongata



- ⌘ The pons connects the cerebellum with the spinal cord.
- ⌘ The M.O. controls the reflex centers, the cardiovascular center, the respiratory center.