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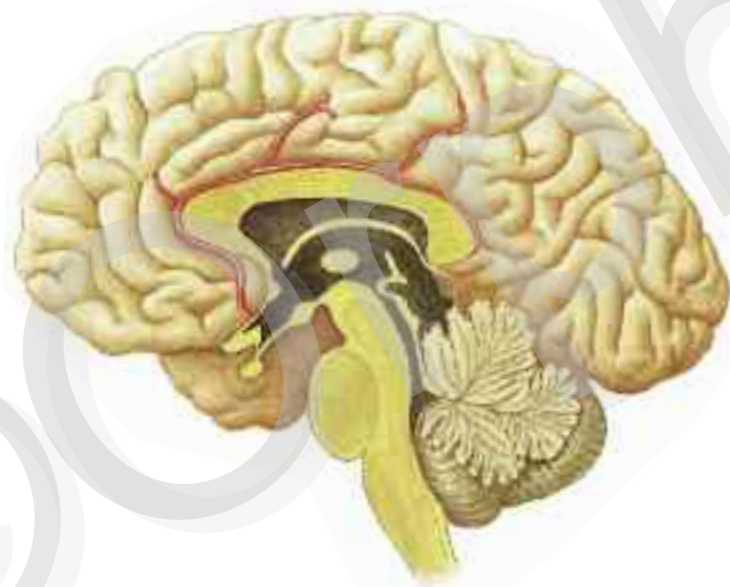
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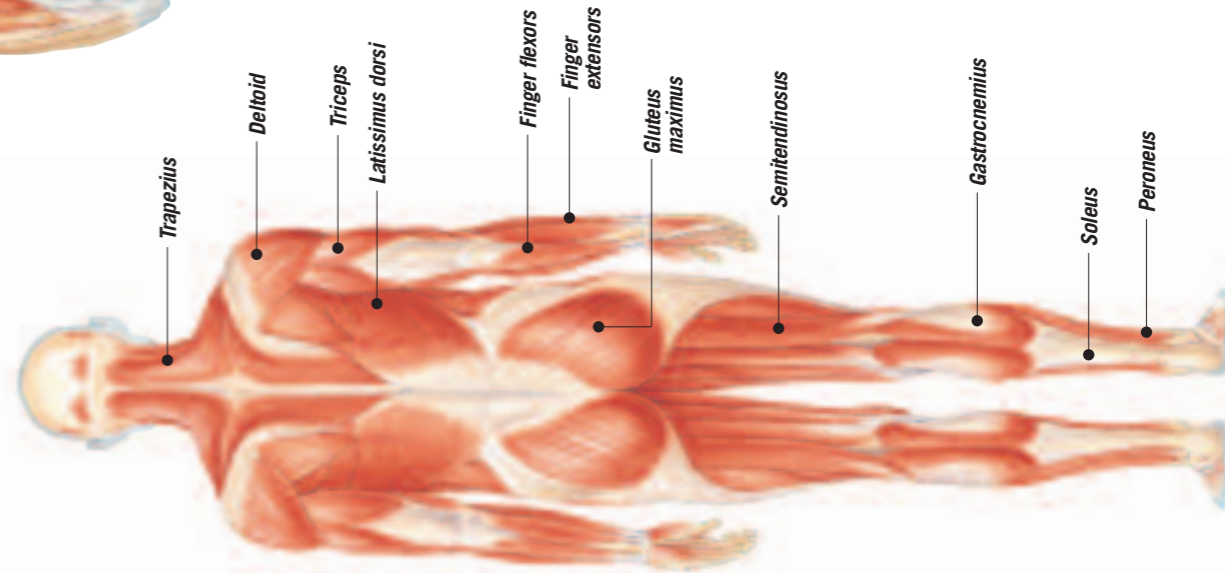
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# MUSCLES

**A**BOUT TWO-FIFTHS of the body's weight is made up by its muscles—some 640 of them. Most are attached to the bones of the skeleton and pull on them to make the body move. In each part of the body the muscles are in two main layers. There are superficial muscles just under the skin and deep muscles lying below them next to the bones.

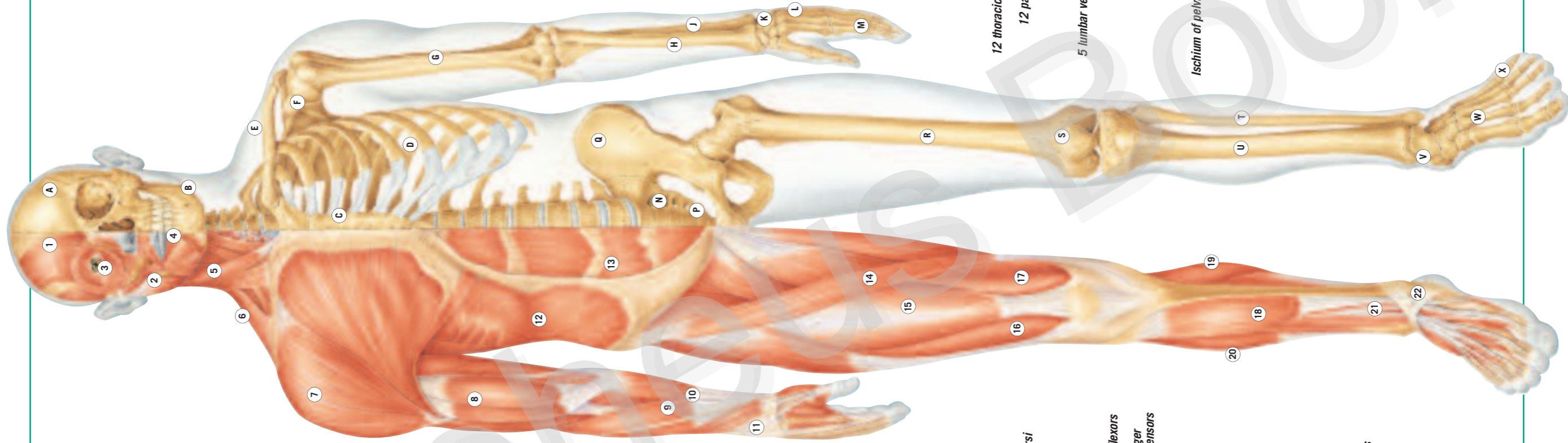
MUSCLE KEY	
1 Frontalis	13 Rectus abdominis
2 Masseter	14 Sartorius
3 Orbicularis oculi	15 Rectus femoris
4 Orbicularis oris	16 Vastus lateralis
5 Sternocleidomastoid	17 Vastus medialis
6 Trapezius	18 Tibialis anterior
7 Deltoid	19 Gastrocnemius
8 Biceps brachii	20 Peroneus longus
9 Brachioradialis	21 Toe extensors
10 Finger flexors	22 Tarsal sheath
11 Carpal sheath	
12 External oblique	



# SKELETON

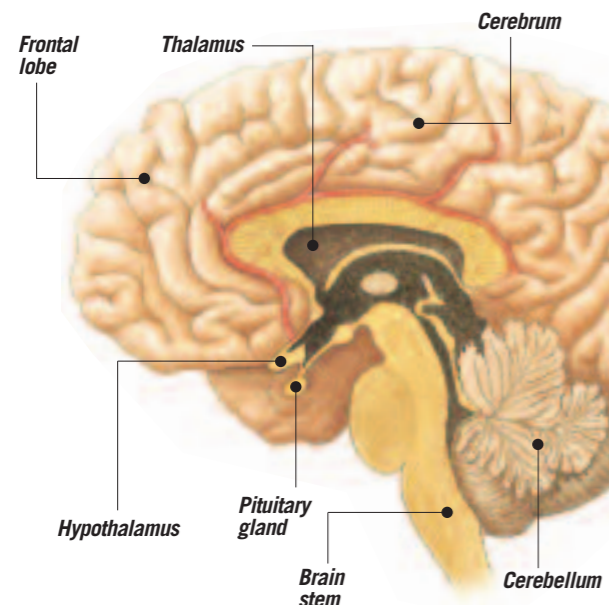
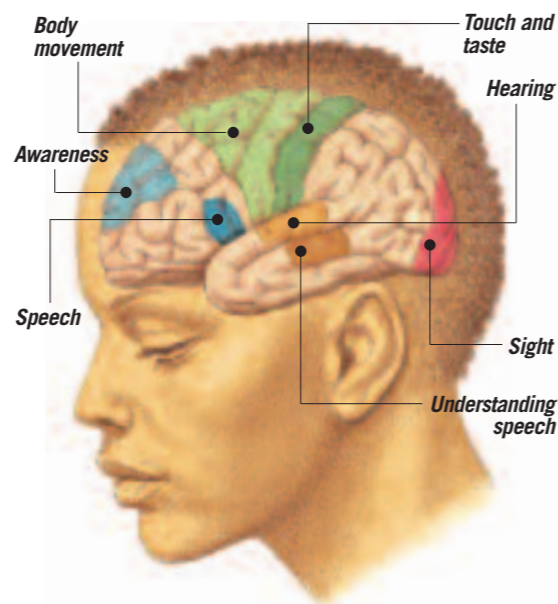
**T**HE 206 BONES of the skeleton form a strong inner framework for the rest of the body, which is soft and floppy. Different parts of the skeleton work in different ways. The skull is a domed protective case for the brain. The backbones, or vertebrae, are a strong yet flexible central support. The long bones of the limbs work like levers.

SKELETON KEY	
A Cranium (skull)	M Phalanges of fingers
B Mandible (lower jaw)	N Sacrum
C Sternum (breastbone)	P Coccyx
D Ribs	Q Pelvis (hip bone)
E Clavicle (collar bone)	R Femur
F Scapula (shoulder blade)	S Patella (knee cap)
G Humerus	T Fibula
H Radius	U Tibia
J Ulna	V Tarsals (ankle bones)
K Carpals (wrist bones)	W Metatarsals
L Metacarpals	X Phalanges of toes



# THE BRAIN

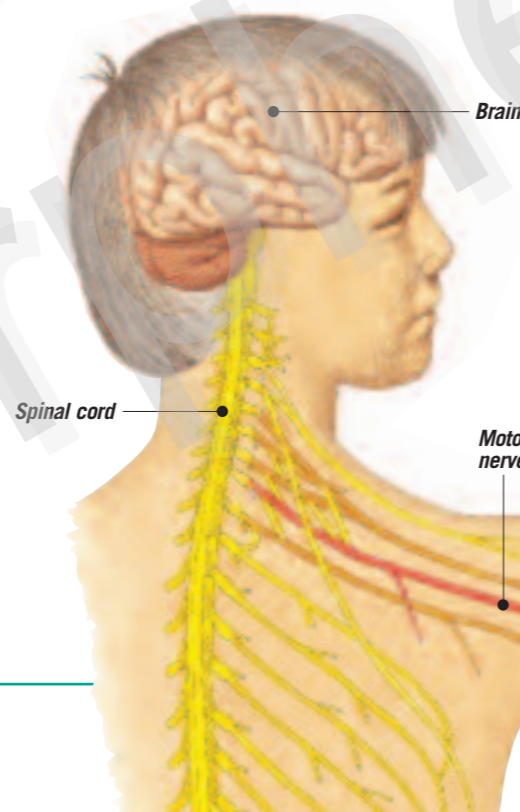
EVERY THOUGHT and idea, every wish and want, every emotion and feeling, happens inside the brain. The brain fills the top half of the head, well protected within the domed skull bone. It looks like a large, wrinkled lump of pink-grey jelly. It contains some 50 billion nerve cells, or neurones (see opposite). Each nerve cell is linked to many thousands of others. Tiny electrical nerve signals pass through this vast network, representing your thoughts and memories. Nerve signals also come into the brain from nerves all over the body, and go out to the muscles.



The large, wrinkled cerebrum makes up four-fifths of the brain's bulk. Its outer layer, about 3 to 5 millimetres thick, is called the cerebral cortex. This is where most thoughts and ideas occur. The cortex has different areas called centres that deal with nerve signals coming from and going to different body parts (above). For example, signals from the eyes are sorted and analysed in the sight centre at the lower rear of the brain. A slice through the brain shows its inner parts (left). The hypothalamus monitors conditions within the body, such as the level of oxygen in the blood. It sends signals to the pituitary gland just below it, which controls the body's hormone system (see page 23).

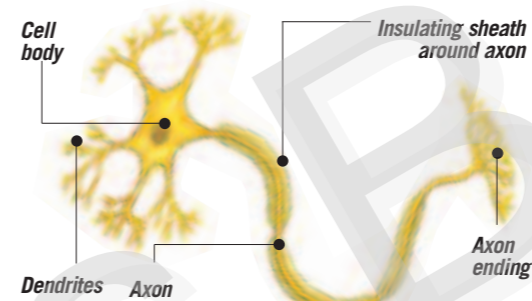
## INSIDE THE BRAIN

The brain has four main parts. The brain stem at the base tapers into the spinal cord (see opposite). It controls automatic bodily activities such as heartbeat, breathing and digestion. The mid-brain just above has close links with the hormone system (see page 23). One of its parts, the thalamus, controls the level of awareness, from wide awake and alert to drowsy or asleep. The third part is the cerebellum, a wrinkled lump at the rear. It deals with muscle control to make movements smooth and coordinated. The fourth part is the cerebrum, where thinking happens.



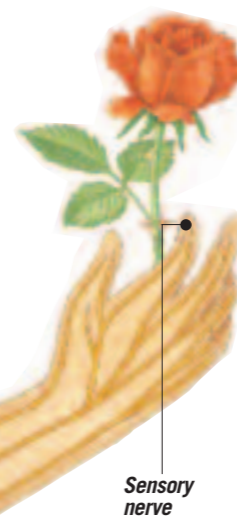
# NERVE CELLS AND SIGNALS

A nerve signal is a tiny pulse of electricity that travels very fast, almost 100 metres per second, along a nerve cell. A nerve cell (below) has a normal-shaped cell body surrounded by thin, spidery parts called dendrites. It also has a very long, thin part like a wire, called the axon. Dendrites collect nerve signals from other nerve cells and pass them on, via the axon, to other nerve cells. Nerves contain bundles of hundreds or thousands of nerve cells.



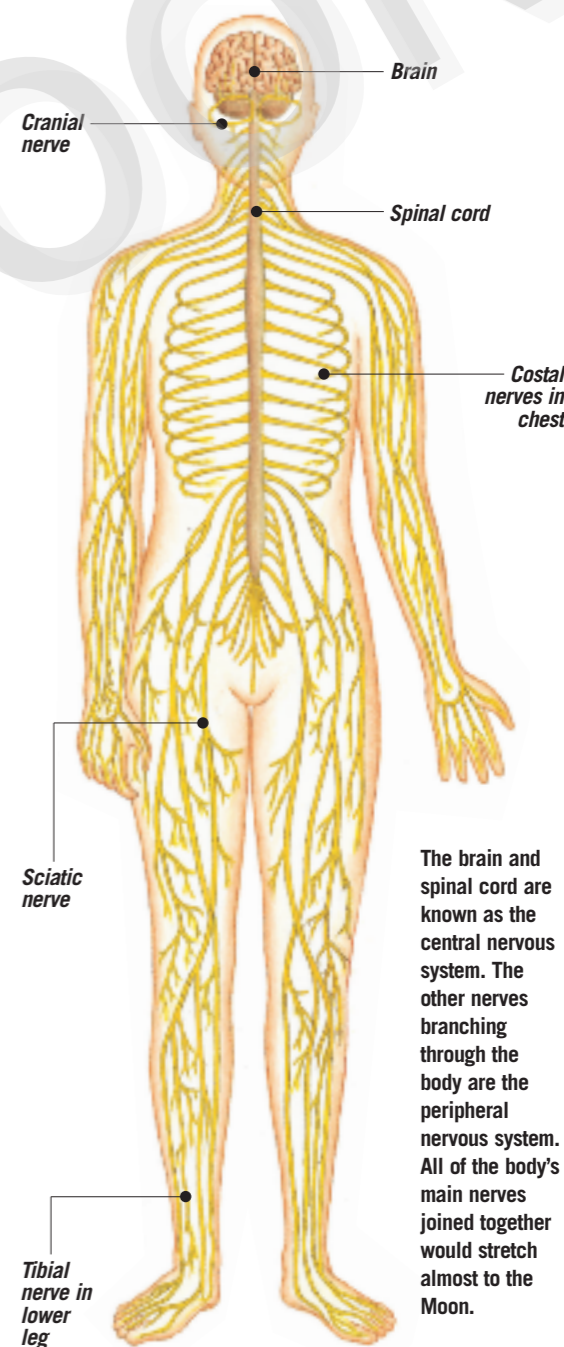
The brain's thoughts, ideas and memories consist of nerve signals flashing to and fro around the unimaginably vast network of billions of nerve cells. New connections between nerve cells are constantly being made as old ones are lost. A new memory may form as a new pathway or route around certain cells. If you recall this memory often, you "refresh" the pathway and keep it active. If not, the memory fades.

A reflex is a fast, automatic movement that your body makes by itself, without your brain having to think about it. If you touch something sharp, pain sensors in the skin send nerve signals along sensory nerves in the arm to the spinal cord in the back. Signals go straight out again along motor nerves to the arm muscles, to make your arm pull away. A split second later signals go up to the brain, so that you become aware of what has happened.



# THE NERVOUS SYSTEM

The base of the brain merges into the **spinal cord**. The cord has nerve branches that reach out to every body part, down to the fingertips and toes. The spinal cord carries nerve signals to and fro between the brain and all of these body parts. In addition, there are nerves that branch directly from the brain, into the head, face, neck and chest. These are cranial nerves.



The brain and spinal cord are known as the central nervous system. The other nerves branching through the body are the peripheral nervous system. All of the body's main nerves joined together would stretch almost to the Moon.