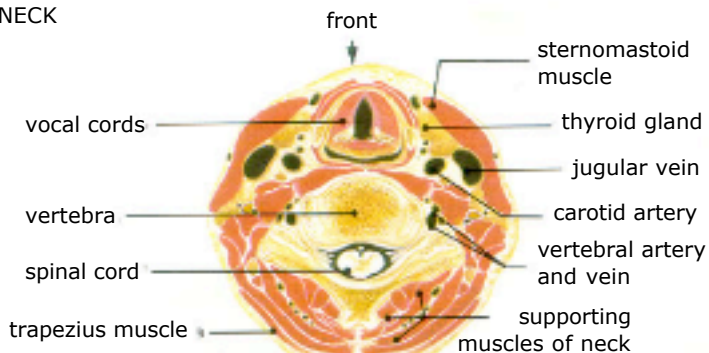


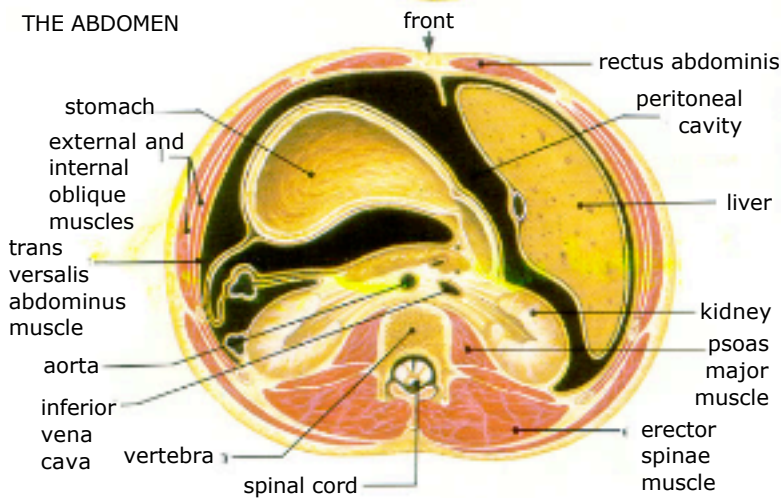
The Muscles 1

Muscle is a tissue with a unique property; it can shorten (contract) when stimulated by a supplying nerve. There are three types of muscle in the body: skeletal or voluntary muscle (the 'meat' of the body), smooth or involuntary muscle (found in the digestive tract, blood vessels and elsewhere) and cardiac muscle (found only in the heart). Skeletal muscles are attached at both ends by bones, cartilage, ligaments, skin or other muscles. When a muscle contracts, one attachment will remain static, and the other will therefore move. Muscle fibres do not increase in number with use, but each fibre becomes thicker, causing the muscle to swell and bulge.

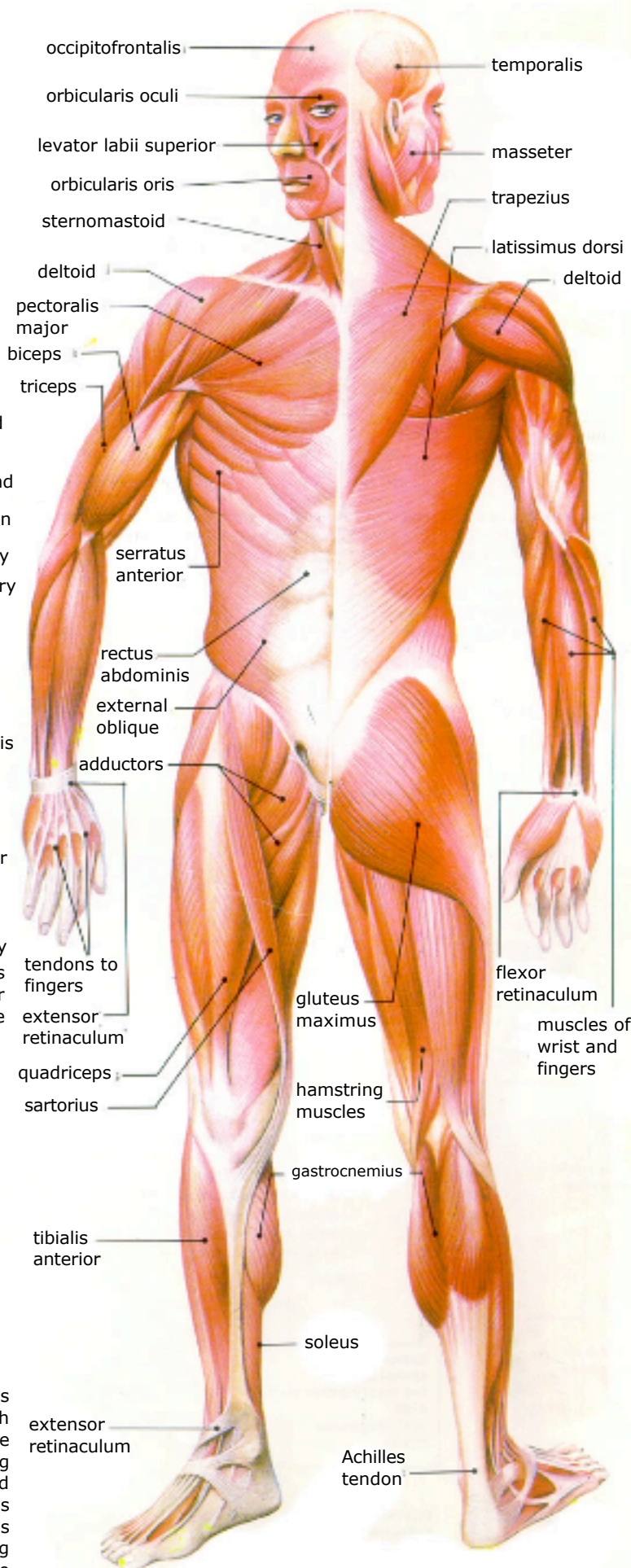
A CROSS SECTION THROUGH THE NECK



THE ABDOMEN

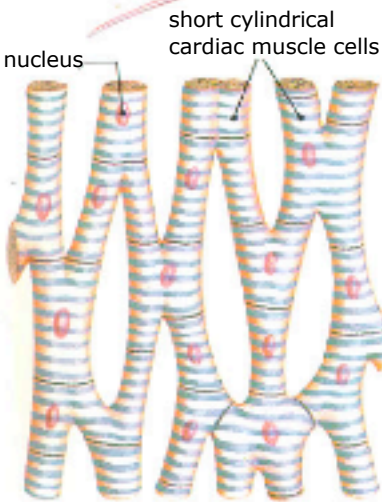
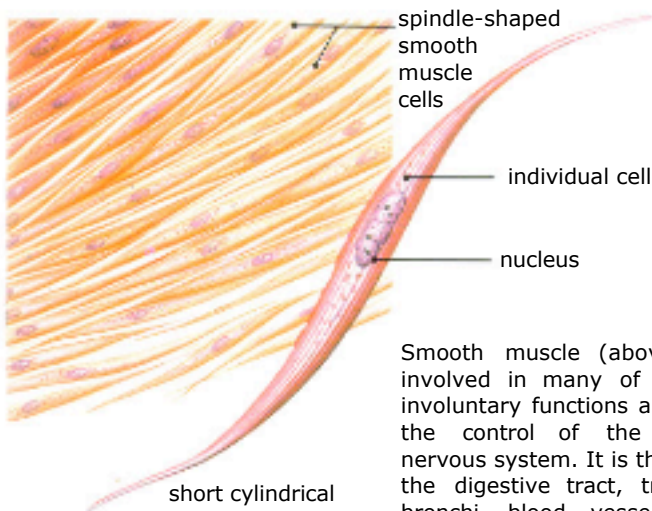


THE UPPER ARM

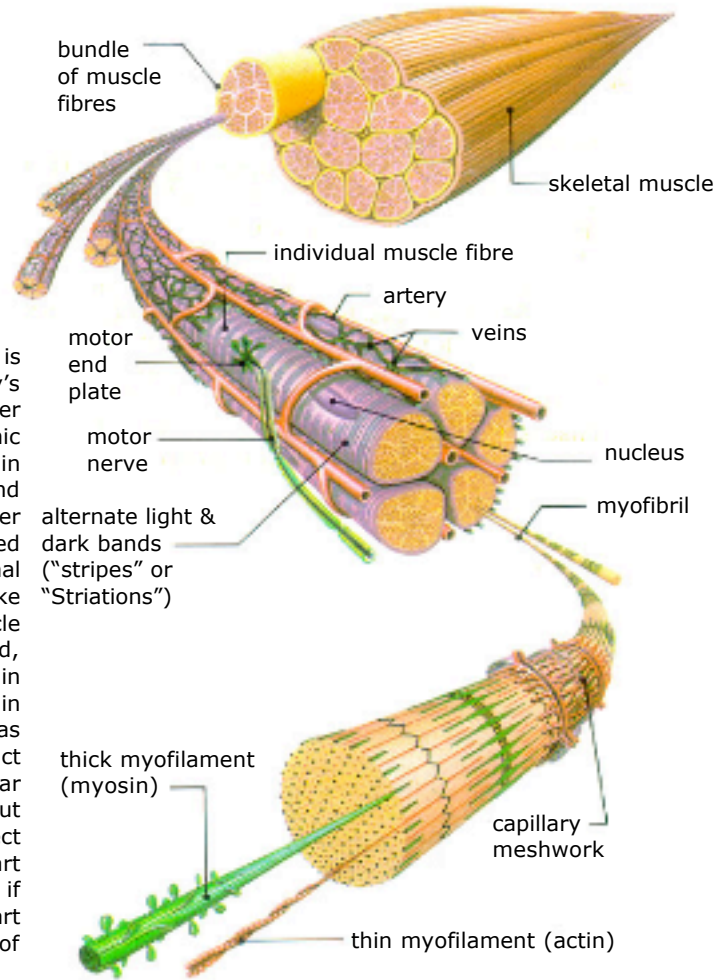


The arrangement of skeletal muscles in different parts of the body is shown by the cross sections above. The neck is crowded with important structures passing from the trunk to the head, including the windpipe, oesophagus, spinal cord and major blood vessels supplying the brain. The many different muscles allow for a wide range of head movements. The abdomen has three layers of superficial muscles giving support to the abdomen contents. Several important muscles support the spine and govern its movements which aid in maintaining our upright posture. The section through the upper arm shows the arrangement of muscles around the humerus.

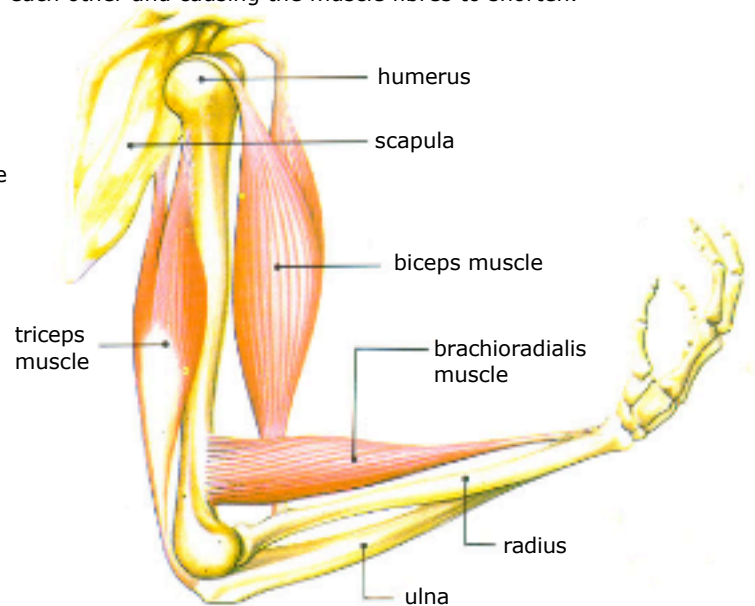
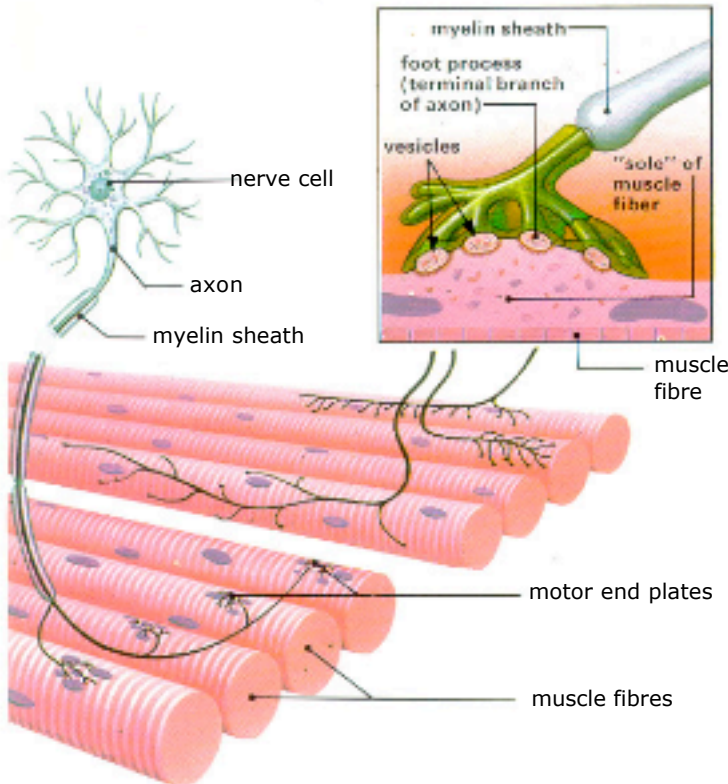
The Muscles 2



Smooth muscle (above left) is involved in many of the body's involuntary functions and is under the control of the autonomic nervous system. It is thus found in the digestive tract, trachea and bronchi, blood vessels, bladder and uterus. The spindle-shaped cells are made of a longitudinal fibres called myofibrils. Like skeletal muscle, smooth muscle can enlarge in response to need, as is shown in the increase in muscle bulk of the uterus in pregnancy. Cardiac muscle has the special ability to contract rhythmically. The fibres are similar to those of skeletal muscles, but the cells are short and connect with adjacent fibres. Heart muscles cannot regenerate, and if it is damaged, as in a heart attack, there is some degree of function loss.



Skeletal muscle (striated muscle) is made up of bundles of muscle fibres grouped together. Motor nerves, which stimulate the muscle to contract, are attached to the fibres at motor end plates. There is a rich blood supply which is able to cope with the enormous demand for blood during vigorous activity. The fibres themselves are made up of myofibrils which in turn contain two types of myofilament; thick and thin. During contraction, these interact, sliding between each other and causing the muscle fibres to shorten.



A motor end plate is the junction between a motor nerve and skeletal muscle fibres. The nerve terminates in several "feet" attached to a "sole" on the muscle fibre. The nervous signal is relayed to the fibres by a biochemical "transmitter" substance, thought to be stored in vesicles near the junction.

Movement of joints usually involves some contraction of muscles and relaxation of others (skeletal muscles generally work in pairs). Thus flexing the elbow to raise the forearm involves contraction of the biceps and brachioradialis and relaxation of the triceps. To straighten the elbow, the process is reversed.