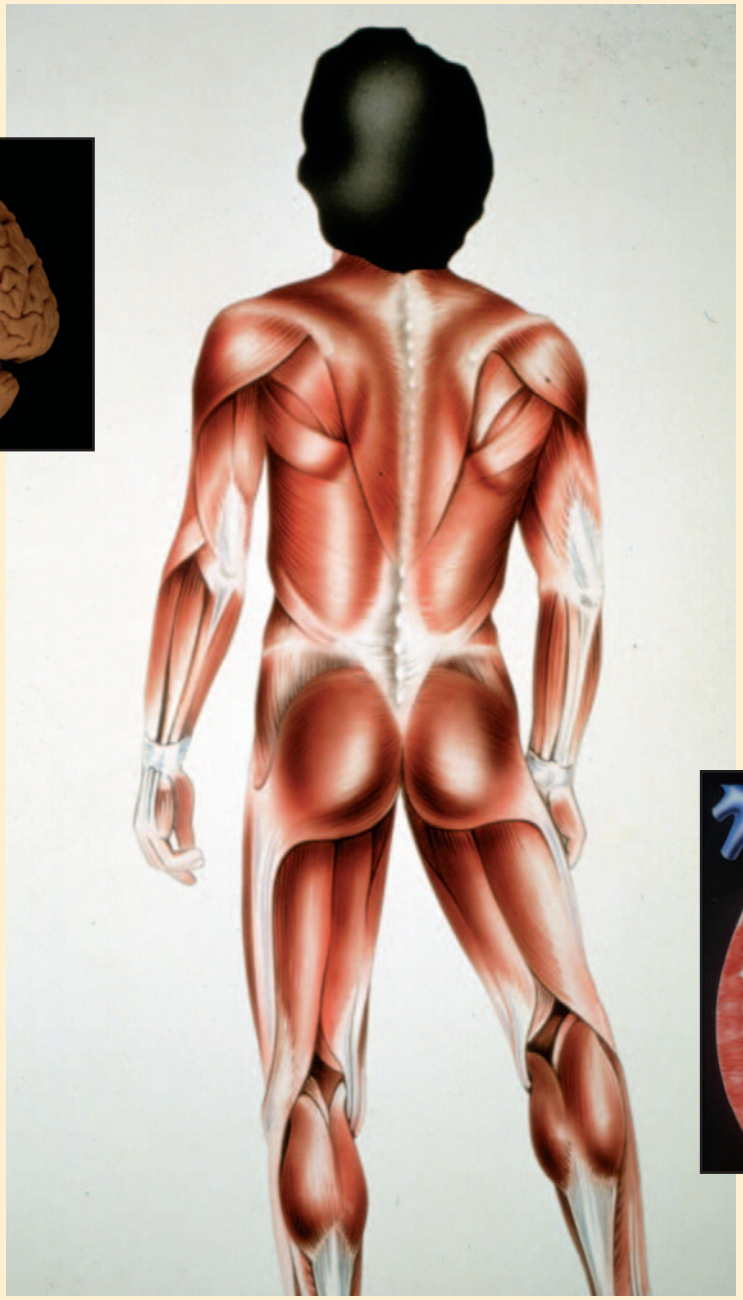
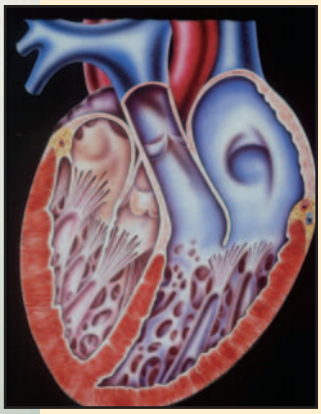
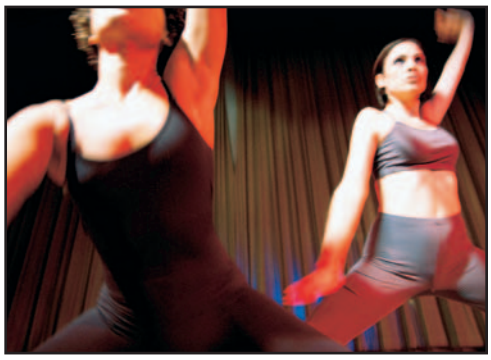




The Living BODY

FILMS FOR THE HUMANITIES & SCIENCES®

Moving Parts



Summary

This program focuses on several key mechanisms and processes that coordinate to produce the often complex and fluid movements of the body. The camera follows people enjoying a day at the beach and engaging in a variety of activities, including exercising, dancing, and waterskiing. The program analyzes the movements, concentrating on the functions of the joints, cerebellum, and sense of balance.

Joints can be relatively simple, like the ball and socket of the hip joint, or more complex, like the elbow. They can support heavy weights but allow delicate movements. They can move in three dimensions, or just two, and each joint has a unique interior design. X-ray images of the elbow and shoulder joints in motion clarify how arm movement takes place.

To support the strains of movement in the body, many of the most stressed joints, like the knee, have a natural form of hydraulic suspension. The camera explores the interior of the knee, showing the seaweed-like tissue that produces lubricating fluid, a cartilage pad set between the bones, and connecting ligaments. A different type of joint is found in the spine. The vertebrae are separated by cushiony disks of cartilage that act as shock absorbers.

Certain patterns of movement seem to be inborn, as illustrated by an infant's mimicking its mother's lip and tongue movements, performing walking patterns with its legs, and tightly grasping adult fingers.

To move effectively, the body needs two kinds of crucial information. The first is feedback, or messages from muscles and joints to the brain, which provide a picture of the position, speed, and acceleration of body parts. Special receptors in the muscle relay its length, degree of tautness, and the speed at which it changes length. The brain uses this information to make fine adjustments in movement. The second is the sense of balance—knowing up from down, the angle of the head, and its direction of movement. This is located in the vestibular apparatus in the inner ear. This apparatus is a complicated set of hoops and chambers with organs that can detect subtle changes in balance and movement. Models demonstrate how the delicate balance mechanism operates.

Once a decision is made to act, it is the cerebellum that organizes movement. The cerebellum also processes the information pouring in from the muscles, joints, and organs of balance. A model of the brain shows the cerebellum to be an outcrop on the brainstem located at the rear base of the brain; it organizes and monitors the nervous activity going up and down between the brain and muscles, and stores all the patterns of movements learned in a lifetime.

Objectives

1. To show the unique interior construction of different joints and how they work.
2. To explain how feedback provides the brain with information on the position, speed, and acceleration of body parts.
3. To describe the functioning of the vestibular apparatus for the sense of balance.
4. To examine the workings of the cerebellum in organizing impulses to move and monitoring the activity of the body in motion.

Recall Questions

1. Describe the workings of the natural form of hydraulic suspension found in the knee.
2. Give some examples of automatic patterns of movement.
3. How does the body detect the angle of the head?
4. Why are the three bony hoops in the inner ear at roughly right angles to each other?
5. Why do people feel dizzy for a short time after they stop spinning around?
6. Explain why the cerebellum contains many more nerve cells than the much larger, main section of the brain.

Interpretive Questions

1. Give examples of how feedback works in everyday movements.
2. People whose joints are especially limber are sometimes said to be "double jointed." Why is this term a misnomer?
3. Why do you think the vestibular apparatus is located in the inner ear? Why is it not located, say, closer to the body's center of gravity?
4. The body detects the angle of the head with a gelatinous substance that responds to gravity, and is contained in tiny chambers in the inner ear. How would a zero gravity environment affect this element of a person's sense of balance?

Vocabulary Required for Effective Viewing

- arthritis
- brainstem
- cartilage
- cerebellum
- collagen
- hydraulic suspension
- joints
- ligament
- vertebrae
- vestibular apparatus