

Bionic Hand



Key words

- Bionic prosthetics
- Bones
- Muscles
- Tendons

The science behind

Introduction:

In the video, when we pull the strings with our fingers, the cardboard fingers move.

Bionics, is the science of constructing artificial systems that have some of the characteristics of living systems. Bionics is not a specialized science but an interscience discipline; it may be compared with cybernetics. Bionics and cybernetics have been called the two sides of the same coin. Both use models of living systems, bionics in order to find new ideas for useful artificial machines and systems, cybernetics to seek the explanation of living beings' behaviour.

With this experience you will relate the bionic hand to their own hand to understand the function of the fingers and the importance of the thumb, to grab or hold objects with different shapes and forms.

History:

The first prostheses date back to prehistoric times, when people started to stand on their own two feet.

Once they were upright, they only wanted to stay that way. The instinct of survival was paramount, so they had to find something to replace their amputated or crippled limbs.



According to German researchers, the Egyptians were able to amputate and design prosthetic limbs.

They base their theory on a mummy of a woman who died about 3,000 years ago. She had her right toe amputated and replaced with a carved wooden prosthesis.



Explanation of the phenomenon:

To understand the movement of our bionic hand we need to understand what our body is made of.

a) The bones:

Human beings are vertebrates, meaning that we have a spinal column, or backbone.

In addition to that backbone, we also have an extensive skeletal system that's made up of bones and cartilage as well as tendons and ligaments. In addition to providing a framework for your body, bones also serve many other important biological functions, such as protecting your internal organs from harm and storing essential nutrients. Bone provides a rigid framework as well as support for other parts of your body. Bones also play an important role in the movement of your body, transmitting the force of muscle contractions.

The many cells of your blood — red blood cells, white blood cells, and platelets are formed within your bones. This process is called haematopoiesis, and it occurs in a part of your bone marrow called the red marrow.

Your bones also protect many of your internal organs. Good examples



of this include the way your rib cage surrounds organs such as your heart and lungs or how the bones of your skull surround your brain. Important minerals, such as calcium and phosphorus, are stored within your bones.

Pupils will also learn that it would not be possible to move the human hand if it was only composed of bones.

b) The tendons

Tendons are cords attached to the parts of the skeleton that provide a grip for the muscles. They are white in colour, rather wide and thick in appearance, and have a strong resistance due to their structure of collagen fibres. They function to intermittently stabilise bony joints (whereas ligaments provide permanent stability) with the help of the muscle to which it is attached. It also allows muscle forces to be transmitted to the bony parts. The tendon and the muscle form a dynamic component that allows movement.

c) The muscles

There are more than 640 muscles spread throughout the human body. When attached to the bones through tendons, they allow the movement of different parts of the body by extending or contracting. Muscles can also stabilise joints, maintain posture and keep the body at an adequate temperature by the heat they give off when contracted.

All these organs will allow the movement of the hand, in our bionic hand, the tendons are replaced by strings, the bones by straws, and the muscles by our fingers which will allow to contract all that.



Every day life

>>> Humanoid robots are planned to replace humans in dangerous jobs that may cause injury or even death. Space is probably one of the most dangerous and damaging environments, in fact many robots are already used for exploration and exploitation of space. In a near future, it is expected that crews of astronauts and humanoid robots will work together to exploit space. They will both most likely make use of bionic hands.

Bionic hands allow robots to handle objects more smoothly as this procedure can be quite draining by using spacesuit's gloves.

nowadays many types of prosthesis exist:

>>> Prostheses come in a variety of forms, including:

- Non-functional limbs that serve a cosmetic purpose.
- Body-powered limbs that use cables or pulleys.
- Traditional prosthetics that require manual intervention to work.
- Bionic prosthetics called myoelectric prostheses, which have a custom socket with sensors that contact the skin and detect electrical signals from muscles, converting those signals to motorized movement.
- Bionic prosthetics called Osseo integrated prostheses, which go a step further and have mounts and wiring surgically attached to the bone and nerves. This is an emerging technology. Current Osseo integrated prostheses connect to the bone but are being developed to connect to the nerves under the skin.