SI A&P - Full Discipline Demo - Biodigital

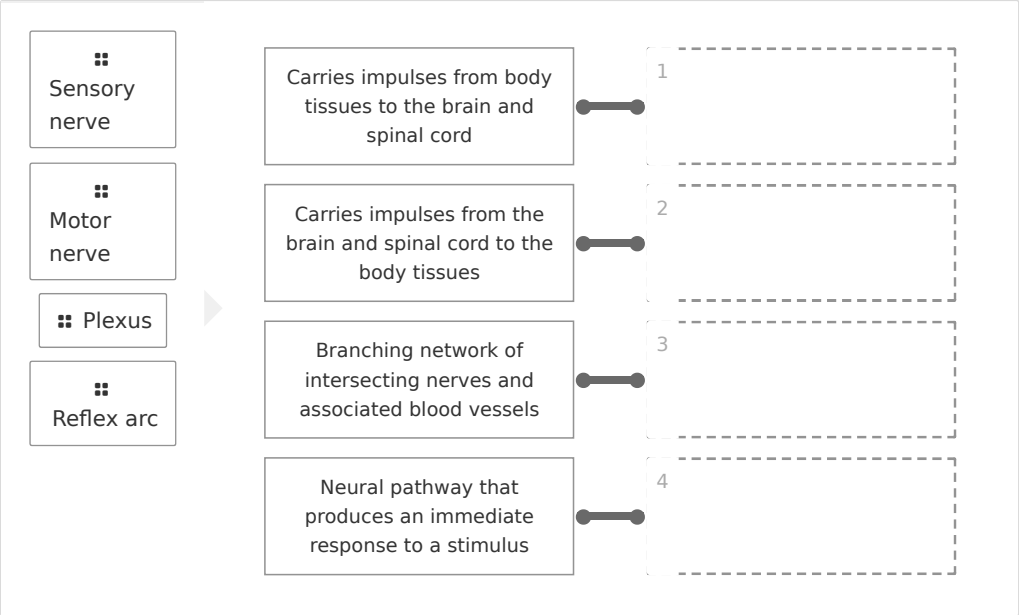
The Peripheral Nervous System - BioDigital

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI A&P - Full Discipline Demo - Biodigital
Course	SI A&P - Full Discipline Demo - Biodigital
Instructor	Sales SI Demo

Test Your Knowledge

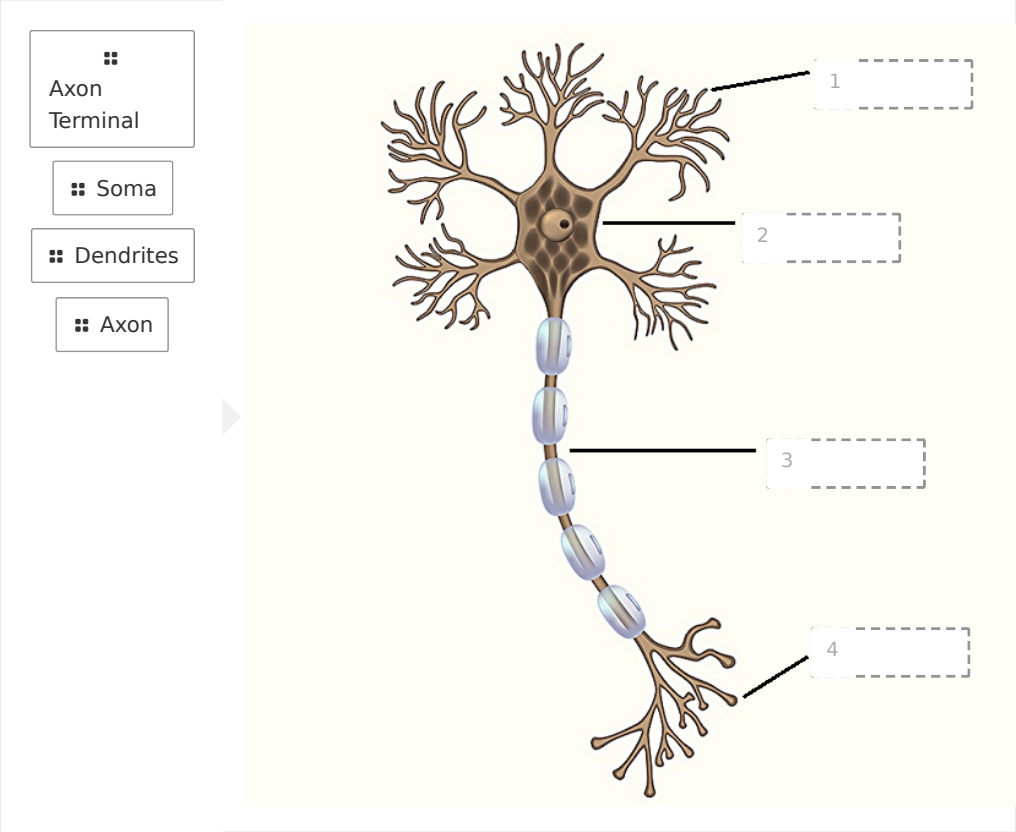
Match each component of the peripheral nervous system with the best description.



Correct answers:

1 Sensory nerve 2 Motor nerve 3 Plexus 4 Reflex arc

Label the parts of a motor neuron.



Correct answers:

1 Dendrites 2 Soma 3 Axon 4 Axon Terminal

Exploration

All nerves originating from the spinal cord are classified as _____ nerves because they contain bundles of both afferent and efferent fibers.

- sensory
- motor
- plexus
- mixed ✔

The _____ of a motor neuron contains the nucleus and organelles.

- dendrites
- soma ✔
- axon
- axon terminal

A neuromuscular junction is the site where the terminal end of a motor neuron dendrite meets the motor end plate of a muscle fiber.

- True
- False ✔

Reflex arcs synapse in the spinal cord.

- True ✔
- False

Exercise 1

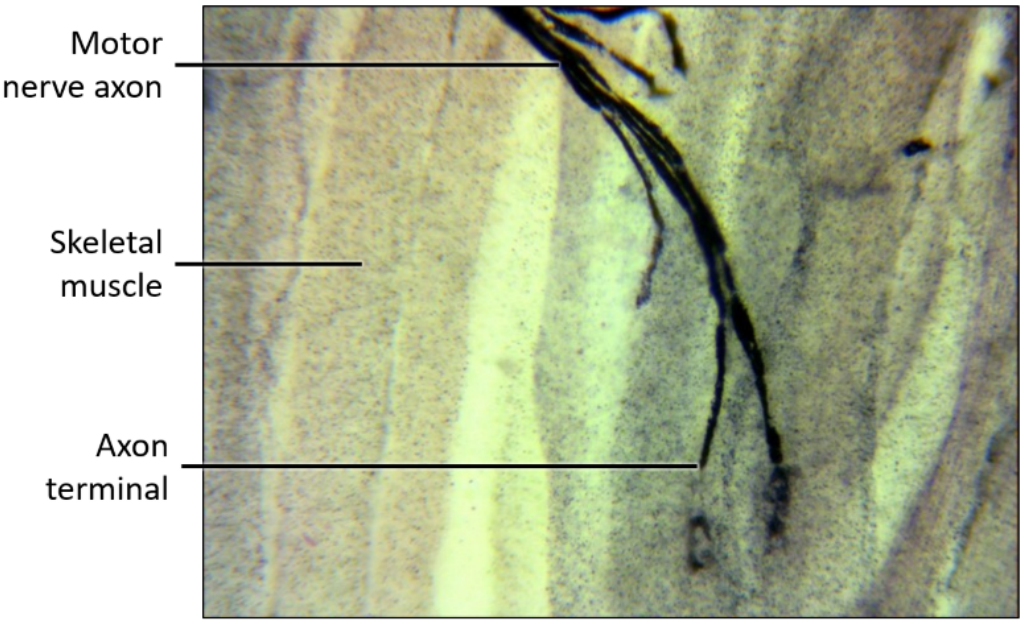
How do the structures examined in this exercise function to produce a muscle contraction?

. Stimulation of a neuron causes an action potential that travels down the axon to the axon terminal resulting in the release of the neurotransmitter acetylcholine (ACh) into the space between the axon and the muscle cell, called the synaptic cleft. The neurotransmitter then diffuses across the synaptic cleft and binds to the receptors on the muscle cell membrane resulting in muscle fiber contraction.

Which structures of a motor neuron were not visible in the neuromuscular junction examined in this exercise? What are the functions of these structures?

The dendrites and soma of the motor neuron were not visible in the prepared slide of a neuromuscular junction. Motor neuron dendrites receive the impulses from other nerve cells. Motor neuron soma are the cell bodies that contain the nucleus and organelles.

Photo 1: Neuromuscular Junction
(SAMPLE ANSWER BELOW)



Panel 1: Neuromuscular Junction Magnification
(SAMPLE ANSWER BELOW)

600X total magnification. Students will only record a comment if they could not identify or label a structure required for Photo 1.

Exercise 2

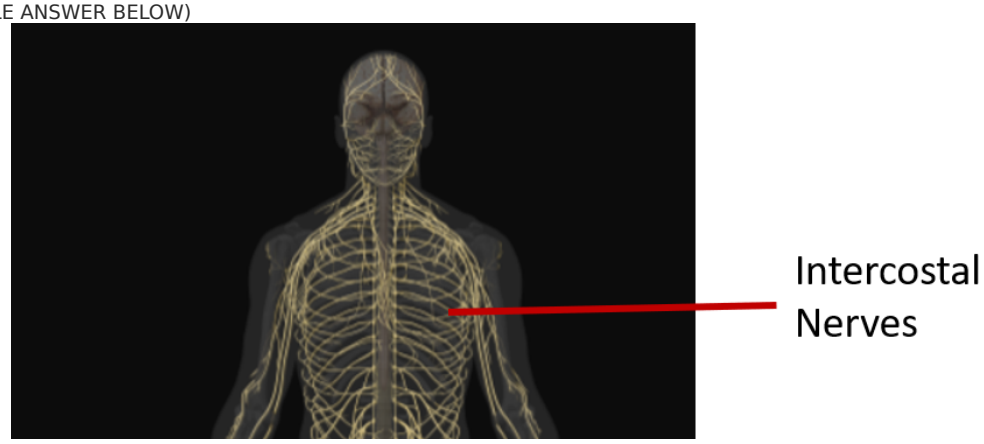
What is the structural composition of the nerves identified on the virtual model in this exercise?

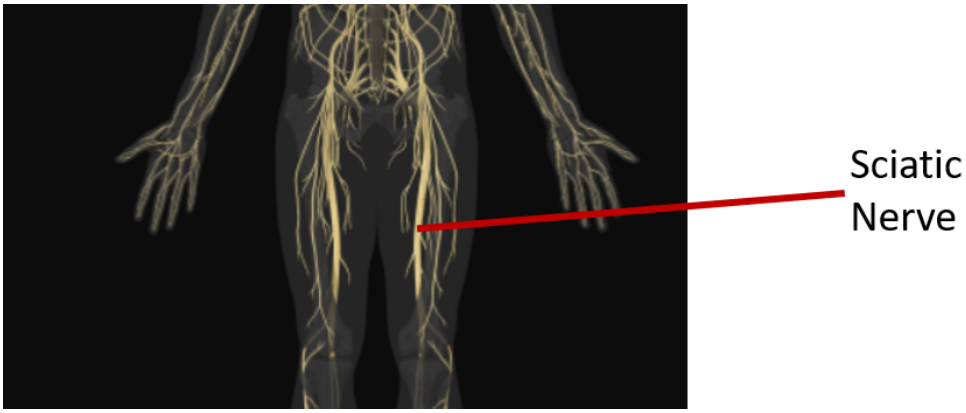
A **nerve** is formed from bundles of nerve fibers surrounded by a protective sheath. Blood vessels may be present in some nerves.

What is a nerve plexus and which plexus does the sciatic nerve arise from? Reference Photo 2 in your explanation.

A nerve plexus is a branching network of intersecting sensory and motor nerves as associated blood vessels that enter and exit the same region of the spinal cord. The sciatic nerve labeled in photo 2 arises from the sacral plexus.

Photo 2: Virtual Model Peripheral Nervous System
(SAMPLE ANSWER BELOW)





Exercise 3

How does the reflex arc involving the patellar reflex demonstrated in this exercise function?

The patellar reflex (knee-jerk reflex) is an example of a two-neuron reflex arc that activates when a stimulus stretches the patellar tendon. The stretching of the patellar tendon also stretches the quadriceps tendon and the quadriceps muscle spindles. The muscle spindles create afferent signals that travel to the spinal cord via sensory neurons where they are transmitted directly to motor neurons. The motor neurons then send the efferent signals to the quadriceps muscles for contraction, causing the leg to extend (kick outward).

What, if any, changes occurred when the volunteer was reading while demonstrating the patellar reflex? Reference your results in Data Table 1 in your explanation.

Students should reference their results recorded in Data Table 1. The reflex should not be affected by the mental distraction because the reflex does not involve any conscious control. However, the students may observe an increase in the reflex response with the mental distraction if the participant was focused too much on the reflex during the first test and tensing their leg muscles.

Data Table 1: Patellar Reflex
(SAMPLE ANSWER BELOW)
Test

	Observations
Right Leg without Distraction	A slight kick was observed.
Left Leg without Distraction	A slight kick was observed.
Right Leg with Distraction	A slight kick was observed.
Left Leg with Distraction	A slight kick was observed.

Exercise 4

What is the function of the radial nerve?

The radial nerve provides motor innervation to most extensor muscles of the arm and forearm. Provides sensory information from the dorsal forearm and lateral aspect of hand.

What is innervated by the sciatic nerve?

Almost all of the skin of the leg, the muscles of the back of the thigh, and the muscles of the leg and the foot.

What part of the neuron did you examine in this dissection?

The axon.

Photo 3: Nerves of the Brachial Plexus
(SAMPLE ANSWER BELOW)

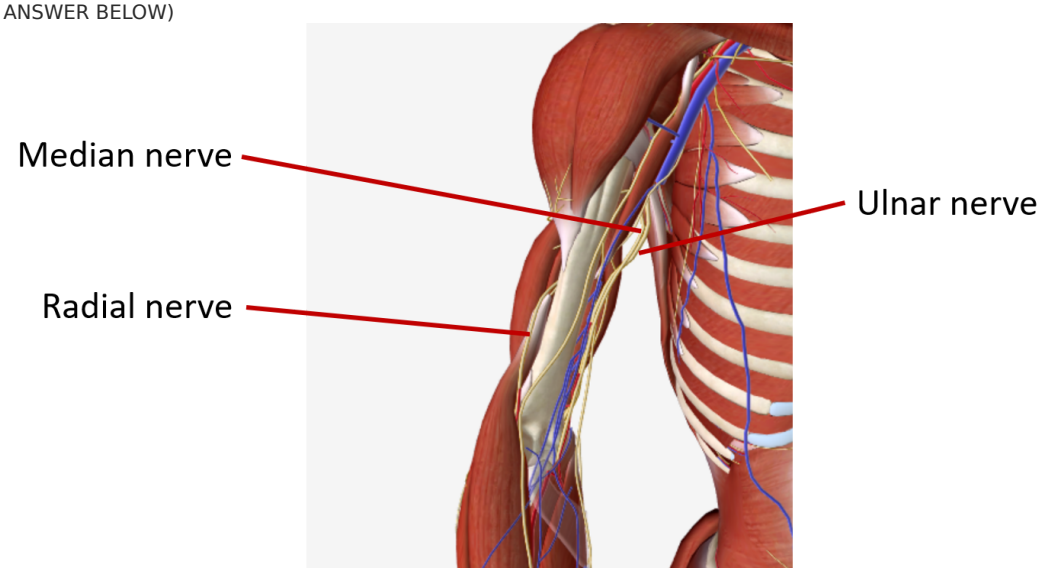
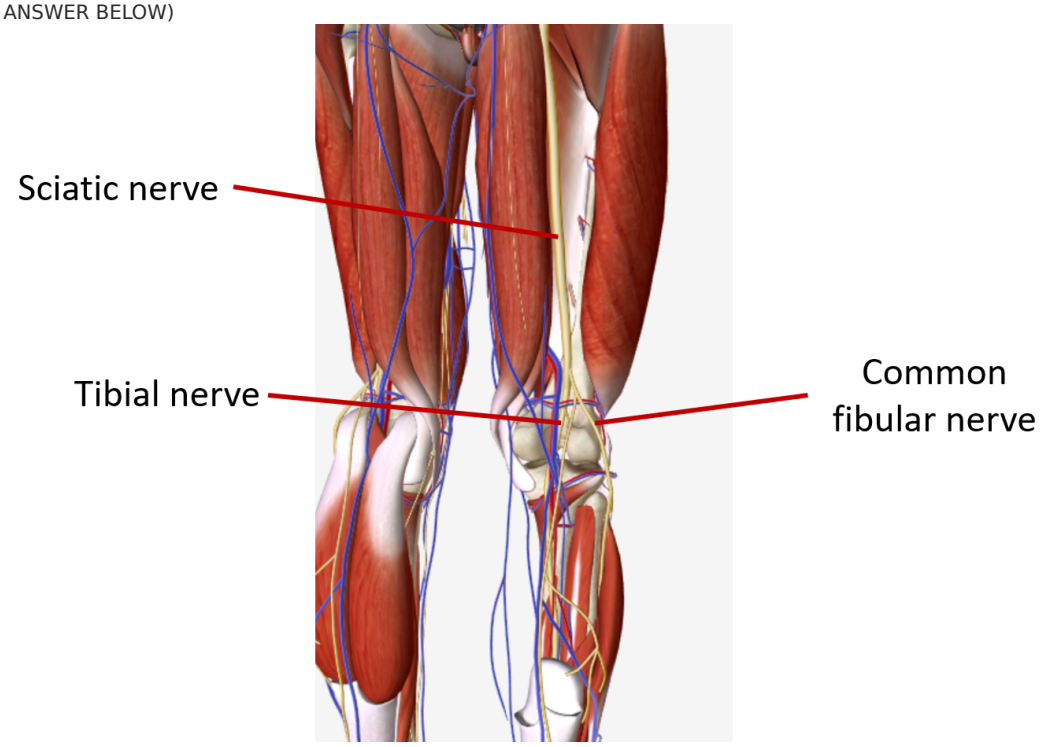


Photo 4: Nerves of the Sacral Plexus
(SAMPLE ANSWER BELOW)



Competency Review

A nerve _____ is a branching network of intersecting sensory and motor nerves and associated blood vessels that enter and exit the same region of the spinal cord.

- fascicle
- plexus ✔
- soma
- synapse

Motor nerves carry impulses from the brain and spinal cord to the body tissues.

- True ✔
- False

Motor neurons are _____, possessing a single axon and many dendrites.

- multipolar ✔
- unipolar
- bipolar
- nonpolar

The neurotransmitter acetylcholine (ACh) is released by the _____ of a motor neuron.

- dendrites
- soma
- axon terminal ✔
- nucleus

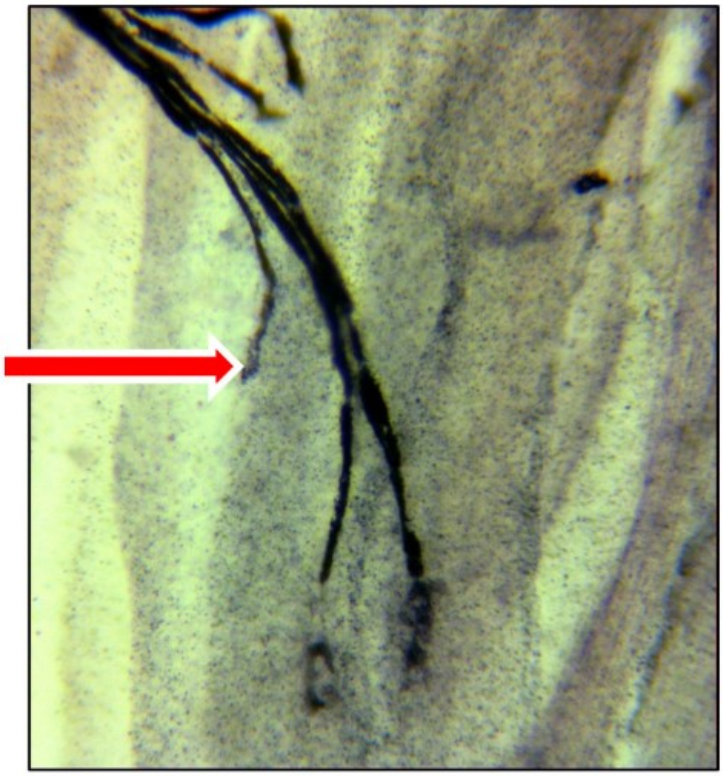
Many reflex arcs consist of a _____.

- sensory neuron
- interneuron
- motor neuron
- All of the above ✔

Reflex arc neurons synapse in the _____.

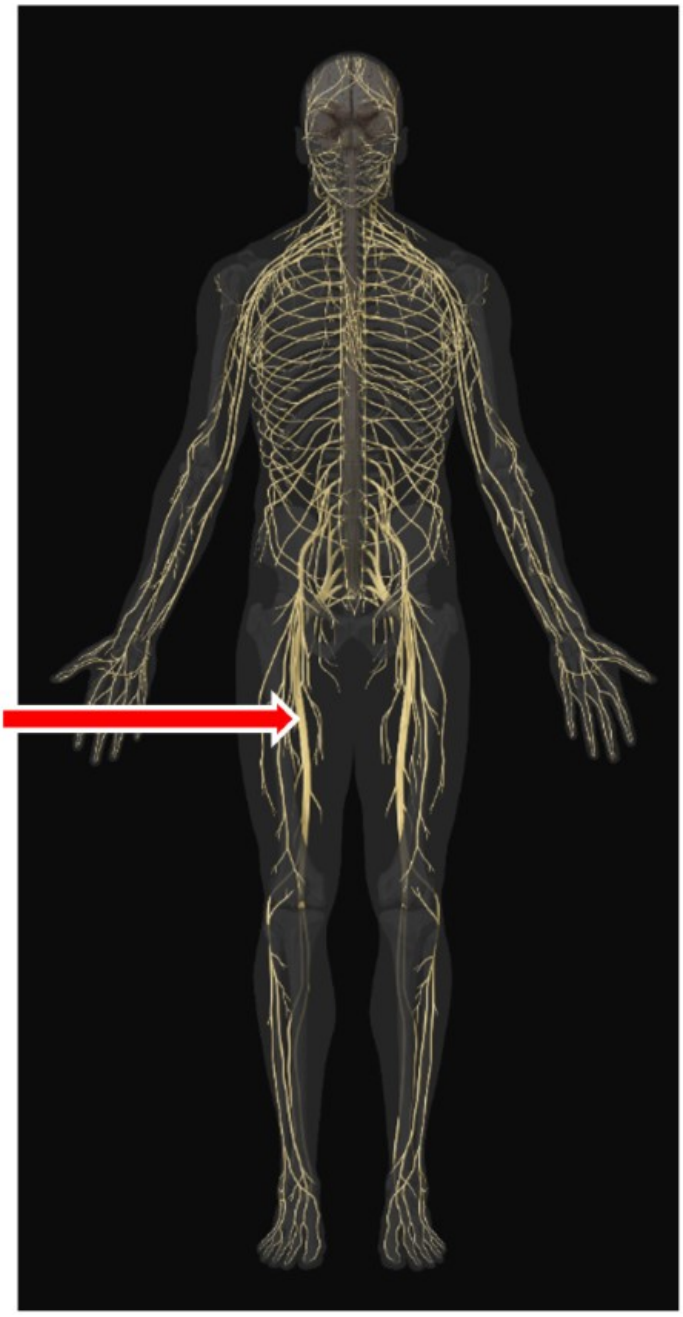
- spinal cord ✔
- cerebrum
- hypothalamus
- thymus

The arrow in the micrograph of a neuromuscular junction below is indicating a(n) ____.



- dendrite
- soma
- axon terminal ✔
- muscle fiber

The _____ is indicated by the arrow in the image of the virtual human model below.



- sciatic nerve ✔
- brachial plexus
- lumbosacral trunk
- buccal nerve

The patellar reflex is activated by striking the middle of the patellar tendon of a seated volunteer.

- [x] True
- [ ] False

Extension Questions

Carpal tunnel syndrome (CTS) is a common neurological disorder that occurs when the median nerve, which runs from the forearm into the palm of the hand, becomes pressed or squeezed at the wrist. Apply your knowledge of the peripheral nervous system to predict the effects of CTS related to motor nerves of the hand. (SAMPLE ANSWER BELOW)

Carpal tunnel syndrome (CTS) is a common neurological disorder that occurs when the median nerve, which runs from the forearm into the palm of the hand, becomes pressed or squeezed at the wrist. Apply your knowledge of the peripheral nervous system to predict the affects of CTS related to motor nerves of the hand.