

CAMBRIDGE

Teacher's Book

# Science Path 6



Better

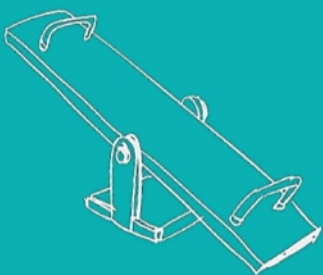
Learning



# WELCOME TO CAMBRIDGE SCIENCE PATH

## Course objectives

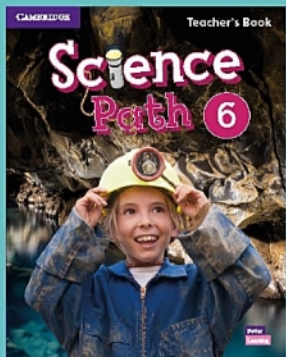
- *Cambridge Science Path* takes students on a journey as they discover the wonders of biology, chemistry, and physics. Students are introduced to topics at a manageable pace, so they can engage with, enjoy, and fully assimilate new concepts.
- Students learn about and cement their understanding of new concepts through **projects**. There is an *Investigate* project that runs through each unit, in which students review and expand upon the concepts presented in the unit. Each individual stage of the *Investigate* project feeds into the project finale, in which students present or produce something to demonstrate their understanding of the topic.
- Students also engage with Science in a **hands-on** way by conducting **experiments**. This practices **critical-thinking skills** and promotes collaborative learning.
- Students learn about new concepts through discovery. In *Cambridge Science Skills*, **learner autonomy** is encouraged through the inclusion of interesting facts and thought-provoking questions. Our aim is for students to be inspired by the fun and wondrous world of Science.
- **Collaborative learning** is also encouraged through the *Investigate* projects that students carry out in pairs, in groups, and as a class.
- The course provides students with the **linguistic support** that they require to study Science in a second language. The course helps students develop their speaking, listening, reading, and writing skills. The unit projects give students practice of a range of skills and sub-skills.
- *Cambridge Science Path* provides students with practice of the **Cambridge English Qualifications for young learners**. Level 6 provides practice of *Pre-A1 Starters* question types.
- **Mixed-ability assessment** provides teachers with support for students of different levels within the same class. They focus on lower- and higher- order thinking skills, as well as critical thinking.
- *Cambridge Science Path* aims to help students develop the following key competences: linguistic competence; mathematical competence and basic competences in science and technology; digital competence; learning to learn; social and civic competences; initiative and entrepreneurship; and cultural awareness and expression.





## Course components

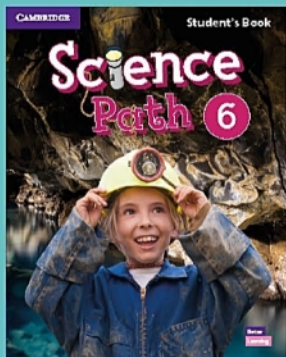
**Student's Book:** each unit includes a project, experiments, mixed-ability assessment and practice of the Cambridge English Qualifications for young learners.



**Class audio:** provided through Presentation Plus, as well as being available to download at [www.cambridge.org/scienceaudio](http://www.cambridge.org/scienceaudio).



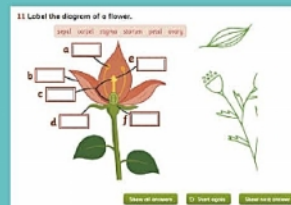
**Teacher's Book:** includes useful suggestions for activities at each stage of the lesson, answer keys, audio scripts, and track numbers for the audio.



### Science Path Presentation Plus:

includes an interactive, digital version of the Student's Book with a variety of features to help students cement their understanding of key concepts:

- flashcards in digital format
- answer keys
- audio with scripts available
- mixed-ability tests
- documentary videos for each unit to engage students in a visual way and allow them to see Natural Science in action!



### Classroom materials:

include posters and a full bank of flashcards to be used across levels. The posters consolidate learning by helping students engage with Science vocabulary and concepts in the classroom.



# WELCOME UNIT

## PAGES 4–5

See description on cards.

### Objective

Students will be encouraged to reflect on the usefulness of science and learn about scientists who have contributed to the improvement of our society.

### Key vocabulary

curiosity, discover, experiment, famous, important, improve, scientist

### Warm up

- Make two lists on the board. On the left-hand side write: *Scientists* (header), *Buck*, *Hodgkin*, *Franklin*, *Curie*, *Pasteur* and *Ørsted*, and on the right-hand side write: *Contributions* (header), *fermentation*, *DNA structure*, *understanding our sense of smell*, *connected electricity to magnetism*, *structure of penicillin*, *radium*. Ask if any of the information is familiar and discuss students' responses. Afterwards, they should match the scientist with their contribution to science.

### Main concepts

- Discuss the topics students will study this year (body systems, reproduction, mixtures, chemical reactions, electricity, magnetism). Elicit answers to questions about their scientific curiosity. Encourage students to write down what they are curious about.

## WHO ARE THESE GREAT SCIENTISTS?

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These scientists have used science to improve our lives, but science is easy for anyone to use, including you. The most important quality to have is curiosity!

Before reading the text, can you guess what each scientist did?

1

Linda B. Buck



She worked out how the receptors in our noses enable us to sense so many different smells. You should think of her the next time you smell something delicious!

2

Dorothy Crowfoot Hodgkin



She used X-rays to determine what certain molecules look like, e.g. penicillin, vitamin B12, and insulin.

3

Rosalind Franklin



She carried out the first X-rays of genetic material, which allowed other scientists to discover the structure of DNA. Now we know that DNA is arranged in a spiral!

Which scientist is being described? Listen and guess.

Did you know ... discovered ... ?

Their work was important because ...

4

PET Listening Part 1.

Dorothy Crowfoot Hodgkin

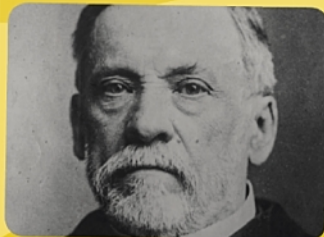
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**Marie Curie**

She discovered and studied the radioactive elements radium and polonium. These became important in other scientific experiments and in medicine, to treat tumors.



5

**Louis Pasteur**

The vaccines he developed have saved many lives and protected millions of people. He found ways to make our food safer to eat.



6

**Hans Christian Ørsted**

He demonstrated the relationship between electricity and magnetism, using an electrical circuit to move a magnetized compass needle. This is now known as the Ørsted experiment and it's so easy you can do it at home!

**You!**

Starting with the fascinating topics you will learn about this year, how can you use your curiosity to contribute to science?



**Welcome to the amazing world of science!**  
In this book, you will:

- create a comic book.
- record a podcast about advances in science.
- plan a sustainable city.
- write a scientific article.
- design a magnetism experiment.
- create a geography wall chart.
- make a model of the geosphere.

5

Can you name any other famous scientists?

What discoveries have they made?

Example answers: Albert Einstein, theory of relativity; Isaac Newton, gravity; Galileo Galilei, astronomer/inventor; Charles Darwin, evolution; Linnaeus, botany; Stephen Hawking, general relativity; Gregor Mendel, genetics

- Read about the scientists and how they have improved our lives.
- Play the audio for the listening activity. Discuss the reasons for students' answers.
- In small groups, students create trading cards of famous scientists to share with classmates. They can create one with their own picture and ambition, too.

**Learn more**

- Have students create a mural of famous scientists. You can choose to focus on women in science or a specific field of science.
- Students can reflect on a discovery or a way in which a scientist has improved their life, then write a thank you letter to them.

**Tip**

**Introduce concepts over one or two lessons. Spend time getting students interested in scientists and how they have contributed to our society by placing pictures or posters around the classroom.**

**Track 02**

Page 4, *Who are these great scientists?*

**Track 03**

Page 4, Listening activity

# 1

## INTERACTION

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### Learning objectives

By the end of this unit, students will have achieved a greater understanding of the following concepts:

- the characteristics of human interaction
- the organs and systems of the nervous system
- the organs and systems of the musculoskeletal system.

### Competences

This unit covers the following competences:

- Cultural awareness and expression
- Digital competence
- Learning to learn
- Linguistic competence
- Mathematical and basic competences in science and technology
- Social and civic competences

### Key vocabulary

**Senses:** hearing, receptors, sense organs, sight, smell, stimuli, stimulus, taste, touch

**Nervous system:** axon, brain, brain stem, central nervous system, cerebellum, cerebrum, dendrite, impulse, interneuron, involuntary, motor neuron, nerve, nervous system, neuron, peripheral nervous system, reflex, reflex arc, response, sense, sensory neuron, spinal cord

**Musculoskeletal:** abdominal, cardiac, contract, deltoid, effector, femur, humerus, fixed, flexible, gluteus, joint, muscle, musculoskeletal system, patella, pelvis, quadriceps, relax, ribs, scapula, semi-flexible, skeletal, skeleton, skull, smooth, spine

### Cambridge English Qualifications practice

You will find **B1 Preliminary for Schools** activity types in the following exercises:  
Student's Book, Page 16, Activity 3 – Listening Part 3

Throughout this unit, you will find the following **B1 Preliminary for Schools** vocabulary:  
activate, appreciate, athlete, contract, control, danger, fixed, flexible, indent, interact, interpret, involuntary, knee, react, reaction, receive, relax, respond, response, smooth, voluntary





## Materials needed for *Find out more*

- table or desk
- your hand

## Materials needed for other activities

- construction paper
- bag or box
- blind spot image test
- blindfold
- bowls
- cotton balls
- modeling clay
- noise maker
- picture of the patellar tendon
- poster paper roll
- rubbers
- sensory items for sense bag
- smell experiment: coffee, orange, vanilla, chocolate, boiled egg, etc.
- taste test: sugar, mint candy, honey, pickles, plain yogurt, salt, crisps, parmesan cheese, dark chocolate, decaffeinated coffee, grapefruit, etc.
- toothpicks
- tracing paper
- transparent object, e.g. goggles/sheet of plastic
- water: hot, cold, room temperature

## Explore

The *Explore* project encourages students to invent a superhero and create a comic book about the nervous system, relating to a sense and a reaction. Students will learn how humans detect and respond to stimuli, understand the nervous system pathways and develop empathy for others.

The different *Explore* stages focus on the following skills:

- brainstorming ideas and making decisions
- producing creative written and visual elements
- autonomous research
- understanding others and accepting differences
- giving feedback about personal creations.

## Other resources

- Interactive activities
- Flashcards: *The human body*
- Song: *See, hear, touch, smell, taste*
- Video documentary: *Sensing our world*

# UNIT 1

## PAGES 6-7

### Objective

Students will be introduced to human interaction and prior knowledge of the senses will be activated.

### Key vocabulary

appreciate, danger, interact, interpret, nervous system, react, sense

### Warm up

- Write the five senses (*sight, hearing, smell, taste, touch*) horizontally across the board, leaving space to write underneath. Show students the documentary. Then, have students take turns to write words on the board relating to each sense. Discuss students' choices.

### Main concepts

- Students guess which sense is being used in each picture and describe how it is being used.
- Give students two minutes to list how they have used their senses in the past hour. Have them share their lists in small groups and award points each time a unique example is given.
- Create a sense bag. Each students could bring in an item of their choice and take turns feeling, describing and guessing.

# 1 INTERACTION

**Look and discuss ...**  
Which senses are being used? How?

Our senses allow us to appreciate and interact with our environment. We could not survive without them! Our nervous system enables us to interpret the information from the senses and react.

1  2 

We use our ... to ...  
... is being used to ...

3  4 

1 taste; 2 sight; 3 smell; 4 sight and hearing; 5 sight and touch; 6 hearing

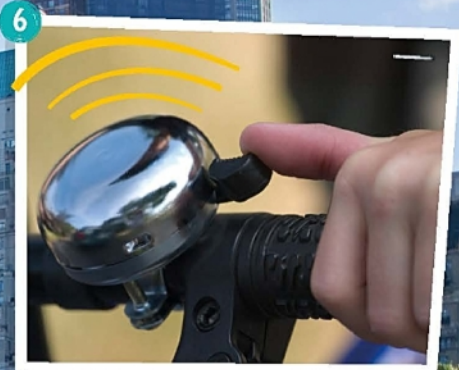
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5

**Song** 104  
See, hear, touch, smell, taste



6

I'm Super Sensational Girl! I'll help you learn how we interact with our environment and how our nervous system works.



Can you think of ways our senses help us escape danger?

**DOCUMENTARY**  
Sensing our world

# Investigate

In this unit, you will invent a superhero and make a comic book about the nervous system. To do this, you will:

- learn how our bodies detect and respond to stimuli.
- understand the pathways of the nervous system.
- imagine life without one of your senses and develop empathy and respect for others.
- create a visual and written comic book relating to a sense and a reaction.

Unit 1 7

Touch reflexes prevent us from touching sharp or hot objects; hearing loud noises and seeing warning signs keeps us away from danger (sirens, alarms, danger, warning); smelling rotten food prevents us from eating it.

**For next lesson...** blind spot image test, blindfold, bowls, noise maker, smell experiment materials, taste test materials, water (hot, cold, room temperature)

## Learn more

- Guessing game: Students describe a place for their classmates to guess. For example, *I hear the waves, I see fish, the sand feels warm on my skin. Is it the beach? Yes, it is.*
- Students create a sense poem. They choose a place they like, then reflect on how they use their five senses in that place. They can read their poems to the class.

**Song**  
This song focuses on the five senses. It can be used on pages 10–11 for consolidation. You could create actions for the song.

**Documentary**  
The documentary explores human interaction through the senses. It can be used in this lesson and on pages 10–11 to introduce the main concepts. You could have students comparing and contrasting positive and negative senses shown in the documentary.

**Tip**  
Spend one or two lessons exploring the senses on this spread and the next. Encourage students to pay more attention to information they receive from their senses.

# UNIT 1

## PAGES 8–9

### Objective

Students will learn to identify and locate the receptors and organs involved in the senses.

### Key vocabulary

hearing, nervous system, receptors, sense organs, sight, smell, stimulus, taste, touch

Chemicals in food cannot reach the receptor cells in our nostrils when we have a blocked nose, which affects our sense of taste.

### HOW DOES A COLD AFFECT YOUR SENSE OF TASTE?



Interaction begins with our **sense organs**. These contain **receptors**, which are specialized cells that collect information, known as **stimuli**, from all around us. This information is then passed on to the **nervous system**.

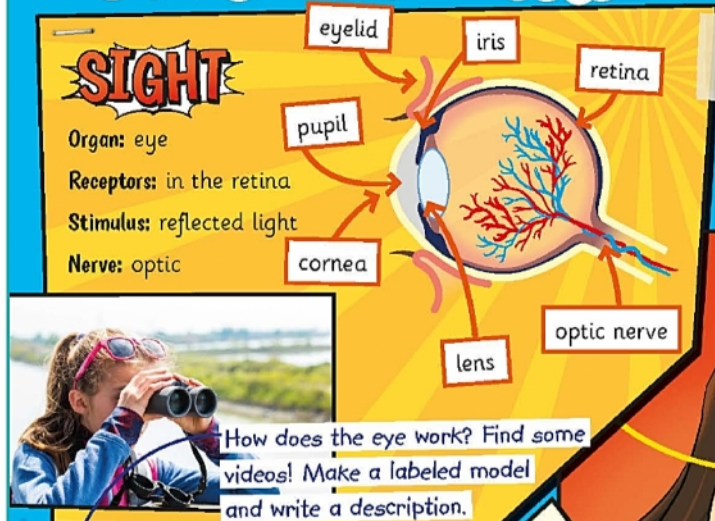
By the end of this lesson, you will be able to identify and locate the receptors and organs related to the senses.

### Warm up

- Students sit in silence, eyes closed. Lead a meditation, focusing on each sense: smell, taste, touch (rocking side to side, flexing muscles) and sound (ticking clock, distant voices). Towards the end, they should open their eyes and focus on the details of something visual. Discuss new discoveries.
- Students may not be familiar with vocabulary like *nerve*, *sensory nerves* and *peripheral nervous system*, but these will be explained in the following lesson.

### Main concepts

- Set up experiment stations, for each sense.
- Sight: Students find their blind spots (where the optic nerve is attached so there are no photoreceptors) with an image test.
- Smell: Students use blindfolds and smell the different items. Can they identify each smell?



Humans have five main sense organs. Each one is sensitive to a different type of **stimulus**.



Reflected light passes through the cornea and student; the muscular iris controls the amount of light allowed in; the lens focuses the light onto the retina at the back of the eye, which collects it, and passes the information to the optic nerve.

Sound waves enter the auditory canal, vibrating the eardrum and travelling through three small bones in the middle ear. These vibrations reach the cochlea and are transformed into an electrical signal at the auditory nerve.

Students should be blindfolded. They should eat similarly scented and textured foods with their nose plugged, for example, apple, potato, pear, etc. They should guess which foods they are, then repeat with their nose unplugged to see the difference.

## HEARING

**Organ:** ear  
**Receptors:** in the cochlea  
**Stimulus:** sound waves  
**Nerve:** auditory

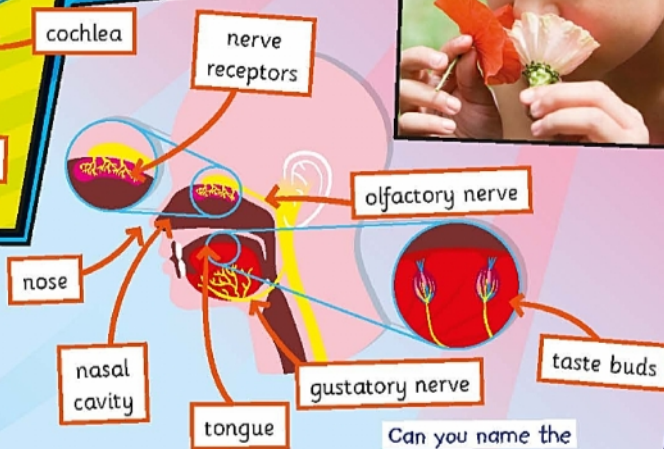


Investigate how sound waves reach the nervous system through the ear.



## SMELL

**Organ:** nose  
**Receptors:** cells inside nostrils  
**Stimulus:** chemicals in the air  
**Nerve:** olfactory



Can you name the different types of taste?

## TASTE

**Organ:** tongue  
**Receptors:** cells in taste buds  
**Stimulus:** chemicals in food  
**Nerve:** gustatory



A lot of what we taste comes from smelling our food. When our nose is blocked, the chemicals cannot reach the receptor cells in our nostrils, which affects our sense of taste as well.

Design and do an experiment to test this!

## Investigate

STAGE 1

- Choose a stimulus for your superhero. For example, they see something dangerous or hear someone shouting from far away. This will be their *super sense*.
- Find out how humans detect this stimulus. What receptors and organs are used?
- Create the first scene for your comic book. Draw and write about the sense, receptors, and organs involved.

Brainstorm stimuli and different sensations that humans can sense. Have students choose one for their comic. Support students while they research facts. Remind students that the first scene should introduce their superhero and their super sense. For students who struggle to draw, encourage them to use pictures and pictures from magazines instead.

Primary tastes: salty, sweet, sour, savoury. Some people also include bitter, fatty and umami (which means delicious in Japanese).

- **Touch:** To understand temperature perception, students put one hand in hot water and the other in cold, leaving them for 30 seconds. Then, they put both hands into room temperature water at the same time to see how each hand feels.
- **Taste:** Are girls more sensitive to taste than boys? Use blindfolds and experiment with the different food items.
- **Hearing:** Blindfold one student, who stands in the center of the room. Approach them with a noise maker. The blindfolded student advises when they can hear the noise and where it is coming from. Repeat, approaching from different angles and directions.

## Learn more

- Discuss the differences between the words *see*, *look* and *watch*, and *hear* and *listen*. Give examples of how each word is used.
- Students find out about sense idioms (sixth sense, a taste of one's own medicine, smell the roses, etc.) and draw a picture of what they think each one means.

### Extra Activity, page 100:

Students use toothpicks to experiment with sensory receptors. It is not necessary to press hard to observe a result.

# UNIT 1

## PAGES 10–11

### Objective

Students will learn to identify and locate the organs and processes involved in the nervous system.

### Key vocabulary

axon, brain, brain stem, central nervous system, cerebellum, cerebrum, control, dendrite, impulse, interneuron, motor neuron, nerve, neuron, peripheral nervous system, response, sensory neuron, spinal cord

### Warm up

- Quick quiz: On a piece of paper, with books closed, students write the names of as many nerves as they can in 30 seconds. Remind them that they learnt about nerves on the previous page. Award points for correct answers.

### Main concepts

- Demonstrate that neurons cannot send and receive a message at the same time. Students form a line in small groups and join hands ('neurons'). The first student begins by squeezing the hand they are holding, and the squeeze is passed along the line. Students can only pass a squeeze when they have received one. Repeat with the first student adding in more squeezes at a faster rate. Check understanding with questions: *Which 'neuron' (hand) receives (sensory) / sends (motor) the message?*

They can travel quickly because of an insulating layer, called the myelin sheath, that covers the axons. They must do so to achieve functions such as keeping us out of danger.

Yes. The cerebrum, cerebellum and brain stem all have different functions. See below.

## DO PARTS OF OUR BRAIN CONTROL DIFFERENT THINGS?

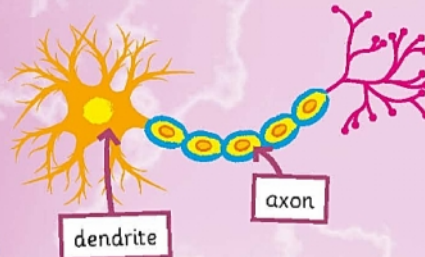
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Discover ...

how the nervous system works.

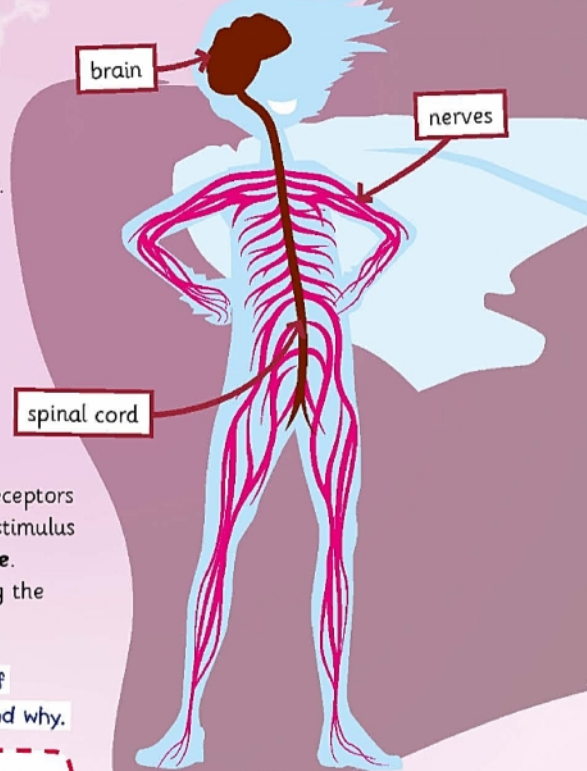
Our nervous system is our body's control center. It interprets all the information we receive and tells our body what to do.

Like other systems, the nervous system is made up of cells, tissues, and organs. The smallest part is a nerve cell, or **neuron**.

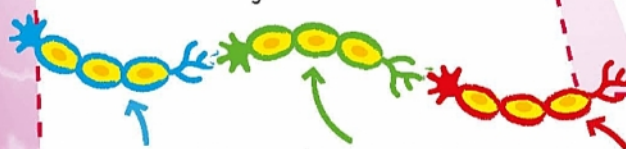


The **dendrites** in neurons are often the receptors from our sense organs. They transform a stimulus into an electrical signal, called an **impulse**. Once an impulse is started, it is sent along the **axons** of the neurons, through the body.

Nerve impulses can travel at speeds of 70 meters per second! Find out how and why.



There are three main types of neuron within the nervous system:



**sensory neurons:** carry signals from receptors to the spinal cord and brain.

**interneurons:** carry signals between the different parts of the central nervous system.

**motor neurons:** carry signals from the central nervous system to effectors.

Where in the body can you find each type of neuron?

10

Sensory neurons: in the peripheral nervous system (dendrites connect to the surface of organs, bodies are found in the spinal cord, axons reach into the brain); Interneurons: only in the brain and spinal cord; Motor neurons: in the peripheral nervous system (begin in the spinal cord and connect to effectors).