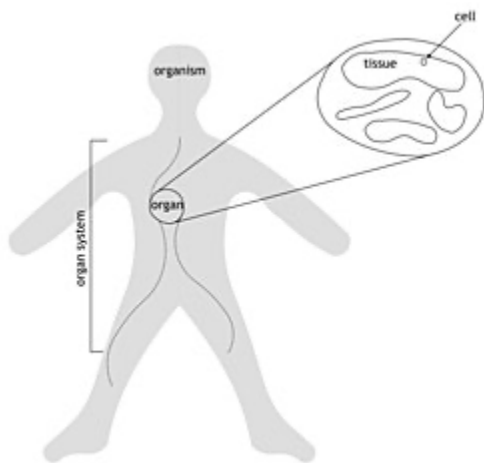


## Anatomy & Physiology

### Introduction

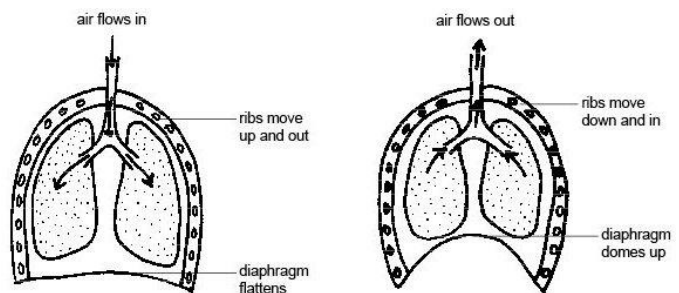
Anatomy and physiology are two subjects within the health sciences that go hand in hand, pencil and paper or soap and water! They essentially provide the **explanations for why the body works the way it does**. Have you ever wondered how your body digests food or how your heart pumps blood? Together, anatomy and physiology can provide you the answer! Body functions depend on its form, and vice versa. Anatomy and physiology also has specific implications in bioengineering (discussed in the [Newsletter 10](#)), in order to create devices and technologies that can improve the function of the human body (i.e.; prosthetic limbs).



**Anatomy** describes the **structure of living things**, from your brain all the way to your toes. The term anatomy comes from Greek origin, with *tomy* meaning cut and *ana* meaning apart. Dissections or cutting apart organisms are the best ways to learn about its body structure and how everything is linked together. There are many different levels to anatomy, beginning at the cells, which is at the microscopic level (not visible to the naked eye). Then we have tissues, which are a group of cells. For example, muscle tissue consists of small muscle cells, allowing for you to contract the muscle. When

there is a collection of tissues, that makes an organ - following the previous example, a group of muscle tissues can lead to a cardiac muscle, like the heart! Lastly we have the organ system, which is essentially a group of organs.

**Physiology**, on the other hand, describes **how living things function**. The image on the right demonstrates the physiology of the respiratory system (which you will learn more about in this week's activity). As you can see,



the picture demonstrates the structural changes that occur in the ribs when air flows in and out of the lungs.

## Northeastern Connections

### Faculty Connection

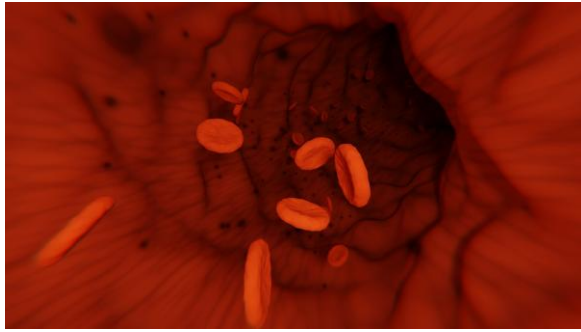
Professor Eugene Bernstein has been at Northeastern University for over 25 years, teaching human anatomy and physiology, as well as other human body related courses, such as cellular physiology, alternative medicine, and physics of anesthesia. With a background in biophysics, physiology, and acupuncture, his research experience is primarily centered around the heart as well as effects of Chinese herbal medicines on the cardiovascular structures.



You might be thinking how this is an untraditional approach taken in the US in terms of medicine. However, the future of medicine has no bounds; alternative medicine is on the rise. The majority of alternative and complementary medical strategies were developed in a specific historical and cultural context, and some of the therapies have had an impact on human health for thousands of years! Professor Bernstein believes that it is important to investigate the ancient medical basis of modern day methods, such as the "Chi" found in Chinese medicine. Overall, he places great emphasis on history in his lectures to ensure students understand the foundations of why medicine is the way it is today.

### Do Now: *Circulatory Sweetness*

The **circulatory system** is one important organ system that allows blood to circulate throughout the body and transport nutrients, oxygen, and hormones. Fun fact time: did you know that if laid an adult's blood vessels end to end, it could circle the Earth about two-and-a-half times?



That's about **62,000 miles of blood vessels!** Now, let's dive deeper and learn about the composition of blood in this delicious activity.

You will need to combine a handful of *red candies* (of your choice), *three marshmallows* (any white candy will also work as a substitute), *sprinkles*, and some *sweet syrup*. Combine all of these ingredients into a jar, and there you have it - candy blood! Now match the ingredients to their biological counterpart, using the word bank below:

<p><b>Plasma:</b> yellowish fluid that has nutrients, proteins, hormones, and waste products</p>	<p><b>Red Blood Cell:</b> tiny reddish cell of the blood that contains hemoglobin and carries oxygen from the lungs to the tissues</p>	<p><b>Platelets:</b> tiny blood cells that help your body form clots to stop bleeding</p>	<p><b>White Blood Cell:</b> cells floating around in your blood waiting to attack invaders, like viruses and bacteria.</p>
--	--	---	--

Red Candy: \_\_\_\_\_

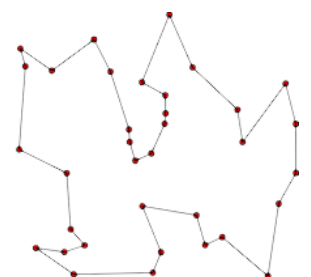
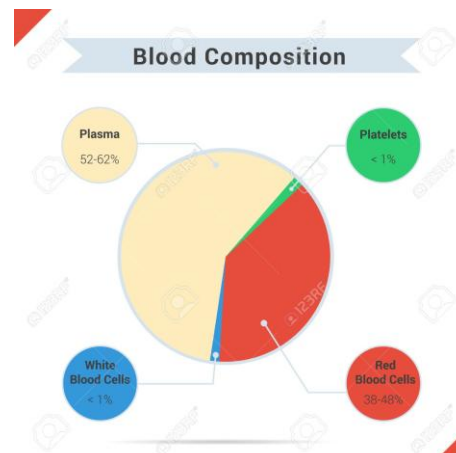
White Candy: \_\_\_\_\_

Sprinkles: \_\_\_\_\_

Syrup: \_\_\_\_\_

Bonus question: The human body consists of **eleven organ systems** (see below for a list). Name two other systems that are connected to the circulatory system.

Hint: think about what organs are involved with blood and what the blood transports!



Circulatory	Nervous
Digestive	Urinary
Endocrine	Reproductive
Integumentary	Respiratory
Lymphatic	Skeletal
Muscular	

Organ System 1:

Organ System 2:

### **Activity: *Breathe In, Breathe Out***

The **respiratory system** is another important organ system in the body and specifically controls gas exchange. The star organ of the respiratory system are the **lungs**, which allow you to take in oxygen and breathe out carbon dioxide. This activity will provide a better understanding of what breathing looks like on the inside!

#### **Materials Needed:**

You can use any materials you want but here are some suggestions:

- Two straws
- Two medium-sized sandwich bags
- Tape

#### **Steps:**

- Tape two straws together halfway (with the bendable portion pointed downwards)
- Extend the bendy part of the straws outwards so that they oppose each other
- Tape two plastic sandwich bags to each bottom portion of the straw

- The upper straw portion will represent the mouth, and the two bags represent the lungs. Feel free to include cut outs for where the mouth and lungs would be.
- The final creation should look like this:



### Discussion Questions:

- When you inhale, do the lungs inflate or deflate?
- What about when you exhale?
- Your lungs contain tiny air sacs. What are they called?
- What are the tiny hairs that keep mucus and dirt out of your lungs?
- What do you think will happen when one lung is damaged, but not the other?

## Share Your Results

We'd love to know how the activity and/or the "do now" turned out! What worked and what didn't work? Please share with us something you learned and/or send us pictures! Email us at [stem@northeastern.edu](mailto:stem@northeastern.edu).

## Related links/Extensions

- [Human Body Systems Video \(38 min\)](#)
- [How do your body parts work? Video \(43 min\)](#)
- [Kids Health videos on how the body works](#)
- [Mr. Nussbaum's Human Body Activities](#)
- [Ubrn Pockets Anatomy App for Kids](#)
- [Science Kids: Human Body for Kids](#)
- [Anatomy Arcade](#)