

# Science 10/24/19

EQ: How Does Our Light Model Apply to  
What Happens in Optical Fibers?

CW: Reading 8.6 - Using light in optical  
fibers

HW: No HW

# Agenda

1. Question of the day
2. Reading 8.6 Using Light in Optical Fibers
3. Reading 8.6 Quick Check

# Open Ended Question

**Write silently for three minutes: Make a list of 30 things that make you smile.**

# *Highlighting main ideas*

As we read, we will highlight the main idea of each paragraph.

# Pg. 90 - Reading 8.6 Using light in Optical Fibers

## Getting Ready

Have you ever seen a lamp like this one? The lamp has hundreds of thin plastic fibers coming out of it. The ends of the fibers glow with a tiny light. These tiny strands are called optical fibers. Optical fibers are used to make fun lamps, but they are also used in other ways to make your life easier. Every time you go on the Internet, you send and receive information using optical fibers. Optical fibers also make it possible for a television to get hundreds of channels. In this reading, you will learn about optical fibers and how they work. They are one of the ways that scientists create new things, because they understand light.



Based on this first paragraph, what do you expect



**Collaborate!**

**Based on this first paragraph, what do you expect this**

## How Do Optical Fibers Work?

Look around your house for a piece of clear plastic. You might find a CD case, a soda pop bottle, or plastic wrap from the kitchen. Notice that you can see through the clear plastic. Explain how it is possible to see something on the other side of the plastic, even though the plastic is blocking the path between the object and your eye.



A rounded rectangular box with a green border, containing a small pencil icon in the top-left corner, intended for a student's response.

Look carefully at the plastic surface. Explain how it is possible for it to transmit light and for you to also see your reflection.



A larger rounded rectangular box with a green border, containing a small pencil icon in the top-left corner, intended for a student's response.



# *What Does Plastic Have to Do with Optical Fibers?*

Read the entire section silently to yourself.

As you read, highlight the main ideas

Be prepared to share a simple summary

## What Does Plastic Have to Do with Optical Fibers?

Optical fibers work because light is reflected and transmitted by materials in the fiber. Most optical fibers are made of glass surrounded by other materials. Light travels into the core because clear glass transmits light easily. What makes optical fibers special is what happens when the transmitted light hits the side of the clear glass core—it is reflected like it would from a mirror. Because the light is reflected, it can follow along the fiber, even when the fiber is bent. This is why optical fibers are sometimes called “light pipes.” People can direct light down an optical fiber much like they can direct water through a water pipe. Note the picture of a bee looking into a thick piece of optical fiber. While it looks like there is another bee coming out of the optical fiber, you are really just seeing light that has been scattered from the bee, transmitted, and directed along the bent fiber.

# *Stand, Share, Sit*

Stand Up

Share what you just read

Sit down after you have shared

# *How Does Our Light Model Apply to What Happens in Optical Fibers?*

Read the entire section silently to yourself.

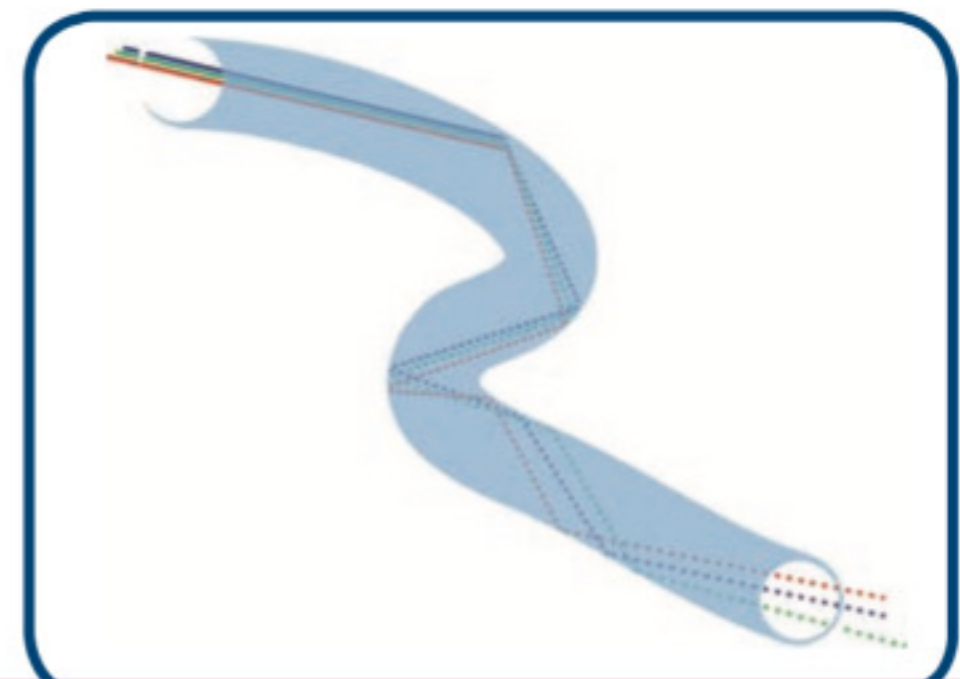
As you read, highlight main ideas

Be prepared to share

### *How Does Our Light Model Apply to What Happens in Optical Fibers?*

In class, you created a consensus model to describe how light helps you see. In this model, you drew light as straight lines that go out in all directions from a light source. If light bounces off an object, it changes directions and then travels in a straight line again. You drew light as straight lines because when light travels through the air, it moves in a straight line. Light also moves in a straight line in an optical fiber. Light does not bend; it just seems to bend as it changes direction when it is reflected at the sides.

If you shine a flashlight in the air, the light will follow a straight path until it hits an object. If you shine a flashlight into one end of an optical fiber, the light will follow the path of the cable and come out the other end. Go back and look at the picture of the lamp at the beginning of this reading. The ends of the fibers are bright, because light from the lamp has followed the fibers and is leaving them at the other end.





# *Stand, Share, Sit*

Stand Up

Share what you just read

Sit down after you have shared

# *How Are Optical Fibers Useful?*

Read the entire section silently to yourself.

As you read, highlight main ideas



# How Are Optical Fibers Useful?

You may already know that computers communicate with each other using electrical wires. Computers can also communicate by shining light down optical fibers. Why would people prefer to send signals down a fiber using light instead of down a wire using electricity? One reason is that optical fibers can be much thinner than electrical wires. Both the wire bundle and a single fiber can do the same job. A single fiber can do the work of many electrical wires.



Have you ever tried to load a webpage and had to wait a long time? This happens because many computers are trying to send signals down the same wires. Trying to send many signals down the same wire is like trying to drive a lot of cars on the same road. If there are too many cars on the road, there will be a traffic jam. Because optical fibers are smaller but can carry more signals at once, they can help to prevent traffic jams that happen on the Internet. This is why some people call the Internet the *information superhighway*.

New ways of communicating are everywhere. Television has changed a lot since your parents or grandparents were young. Ask a parent, grandparent, or another older person the following

# *How Are Optical Fibers Useful?*

As a class discuss:

- How many channels could they get on TV when they were your age?
- How did the TV reception compare to today?

# *How Are Optical Fibers Useful?*

Answer in your book:

Why do you think the situation today is different than what they described?

Describe what you learned.

# *Using Optical Fibers: Surgery*

Read the entire section silently to yourself.

As you read, make connections in the margins.

Be prepared to share

# *Stand, Share, Sit*

Stand Up

Share your connections

Sit down after you have shared

# Using Optical Fibers: Surgery

## *Using Optical Fibers: Surgery*

When doctors do surgery, they must be able to see inside a patient's body. Usually, they have to cut into skin. By using optical fibers, doctors can make very tiny cuts and leave scars that are almost invisible. After making a tiny cut, doctors insert a small optical fiber. They can light up the inside of the patient's body by sending light through the fiber. When the light hits something inside the body, it bounces off and enters a second optical fiber. The second cable carries the light to a camera. The camera produces a picture that the doctor can see on a television screen. Optical fibers have made surgery much safer for patients.



# Using Optical Fibers: Lighting

## *Using Optical Fibers: Lighting*

Have you ever been in a room with no windows? Many people who work in office buildings do this every day. Some scientists are working with optical fibers to change that. By putting one end of an optical fiber outside, it is possible to send sunlight to a room that has no windows. Optical fibers may someday provide sunlight for people with no windows, even if they are underground.

# Open Ended Question



**Optical fibers can provide people with natural sunlight for free, but what are some disadvantages to using optical fibers to light a room with sunlight?**

# *Why Are Optical Fibers Important?*

Optical fibers allow people to use light for a lot of new purposes. People can send signals between computers, and they can do much safer surgeries. To send light down a cable, optical fibers rely on reflecting and transmitting light. These are two different ways that light can interact with objects and materials. In the next lesson, you will learn about a third way that light can interact with objects and materials, and you will begin to imagine new possibilities for the future.

# Quiz

## Reading 8.6 Quick Check

## Optical fibers use the following to work:

- Reflection and Scattering
- Reflection and Transmitting
- Scattering and Transmitting

## How are optical fibers used in surgery?

- Doctors can look inside a patients body without having to make large cuts
- Doctors can use the optic fibers to decorate the operating room
- Doctors can use the optic fibers to hold their hair back

## Why Are Optical Fibers Important?

- People can send signals between computers
- Optical fibers allow people to use light for a lot of new purposes.
- Optical fibers allow doctors to perform safer surgeries
- All of the above



<https://www.youtube.com/embed/kx3qwqtZvs4>