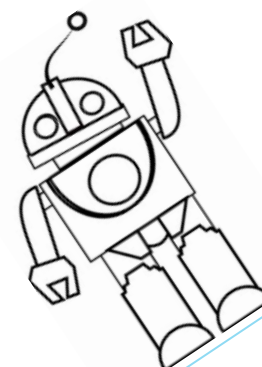


CTY
IRELAND



Exploring engineering!

Christine McGearty



Environmental and Renewable Engineering!

Today we will look at environmental engineering, a very important, but sometimes overlooked field in engineering.

Environmental Engineers deal with things like water treatment, air pollution and recycling.

We have already talked about how important it is to be environmentally conscious when creating something. Let's look at some examples!

Energy



Motors and electric cars



Super cool car!

Boring Tesla no one likes



Keep our planet lush and green
with air that's pure and water clean.

Convert old trash to useful things
like purses, clothes, and playground swings.

Learn to think sustainably
for the good of bird and bee.



- ▶ Environmental engineers work in a number of areas that can relate to air pollution, waste disposal, recycling, global warming, water pollution and other environmental issues.

Renewable Energy!

We have looked at some examples of renewable energy, but how exactly does it work?

Solar Panels

The Sun produces a lot of energy called solar energy, and will keep producing this for another 5 Billion years! (until it dies)

Solar panels are made of solar cells, which is the part that turns the solar energy in sunlight into electricity.

Solar cells make electricity directly from sunlight. It is the most trusted energy technology ever made, which is why it is used on satellites in space and in remote places on Earth where it is hard to fix problems.

The light from the sun heats up the atoms in the solar panel and causes the electrons to move, creating electricity! we learned this before in our electricity class.



Windmills and Dams

These are both using the motion of water or air to create electricity. Wind or waves rotates the blades, a generator inside turns this *mechanical* energy into *electrical* energy. The same thing happens in dams or underwater turbines.

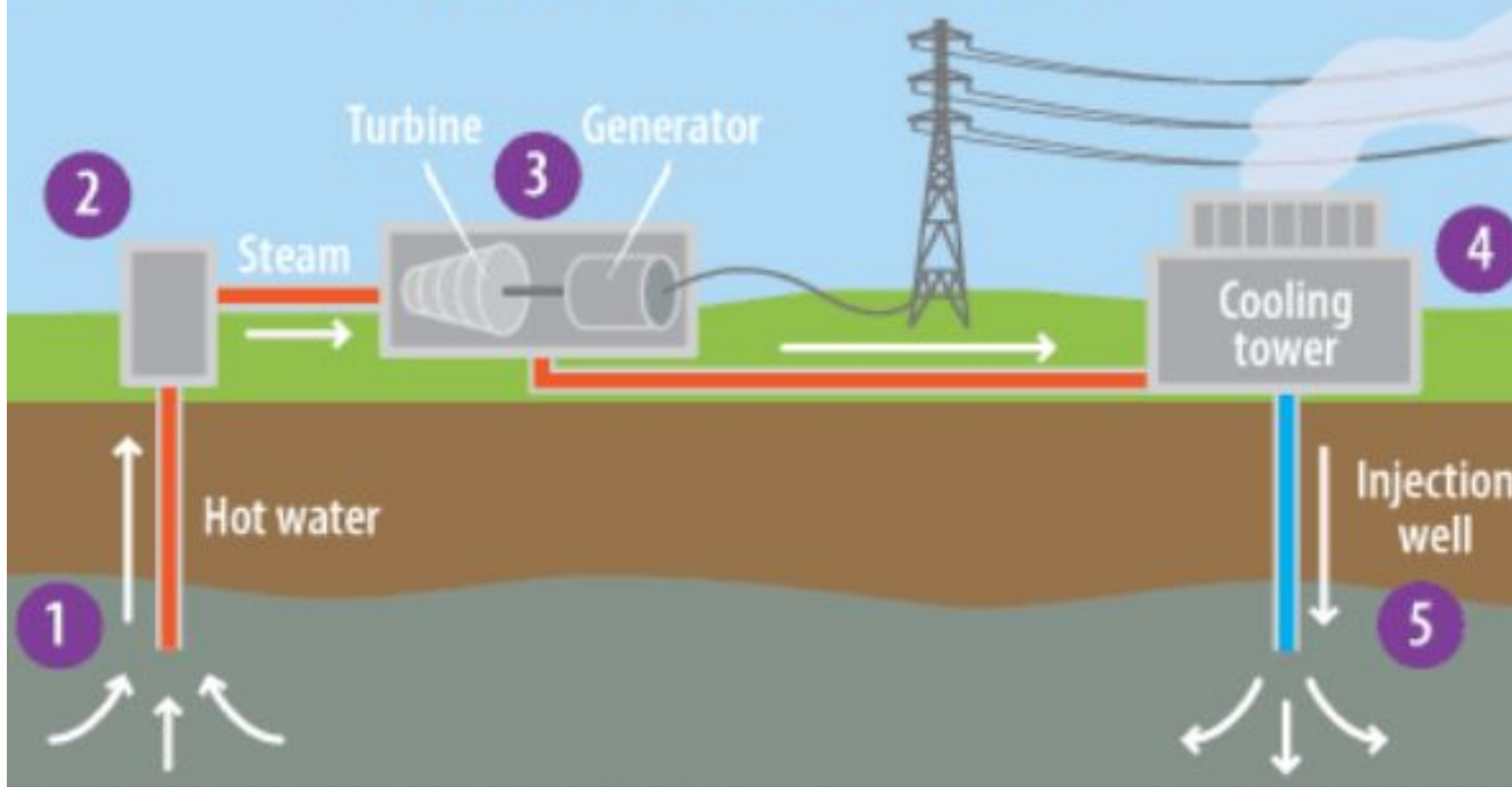


Geothermal energy

This is energy we can create by extracting heat from the earth. If you think of things like volcanoes or geysers!



Geothermal Power Plant



Drinking water

- ▶ Does anyone ever worry about not being able to get a drink if they need it?
- ▶ Around 1 to 2 billion people don't have safe drinking water
- ▶ Most of the time this is because of biological contaminants like bacteria, viruses and other micro-organisms which can make you sick right away
- ▶ Things like heavy metals (Lead for example) can be a problem over a longer time by causing cancer and other diseases



In Ireland

- ▶ It's not just poorer countries that can have problems with drinking water
- ▶ In Ireland, when there are problems with the treatment plant people can be told to boil the water from their taps
- ▶ These are called “boil water notices”
- ▶ The reason is because there might be microorganisms in the water which can make you sick
- ▶ “Cryptosporidium” is a type of microorganism which can make you sick even if there is only 1 in the water you drink

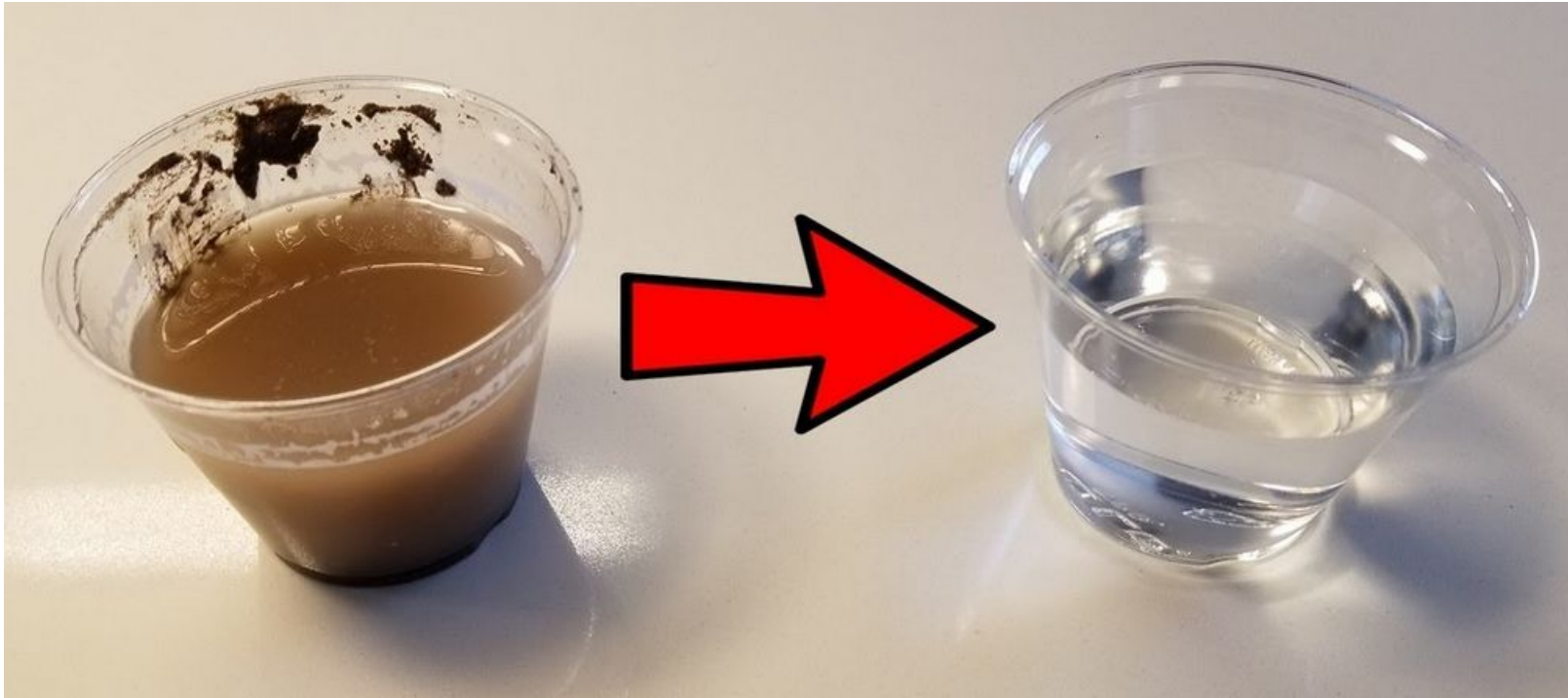


**Microscope picture of
*cryptosporidium***

What is our engineering problem today?

What do we have?

What do we want?



Dirty Water

Clean Water

But how do we get there?

Let's brain storm and think about the different things we need to get rid of

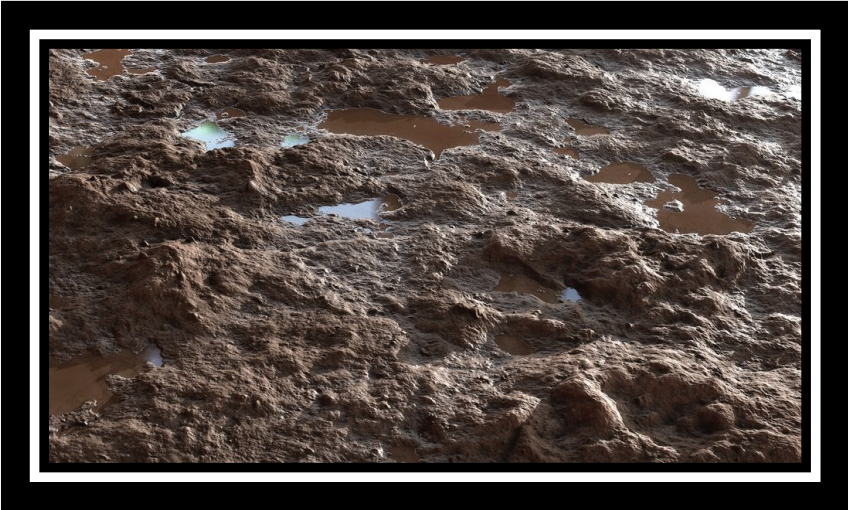
Biological Contaminants



Chemical contaminants



Physical contaminants

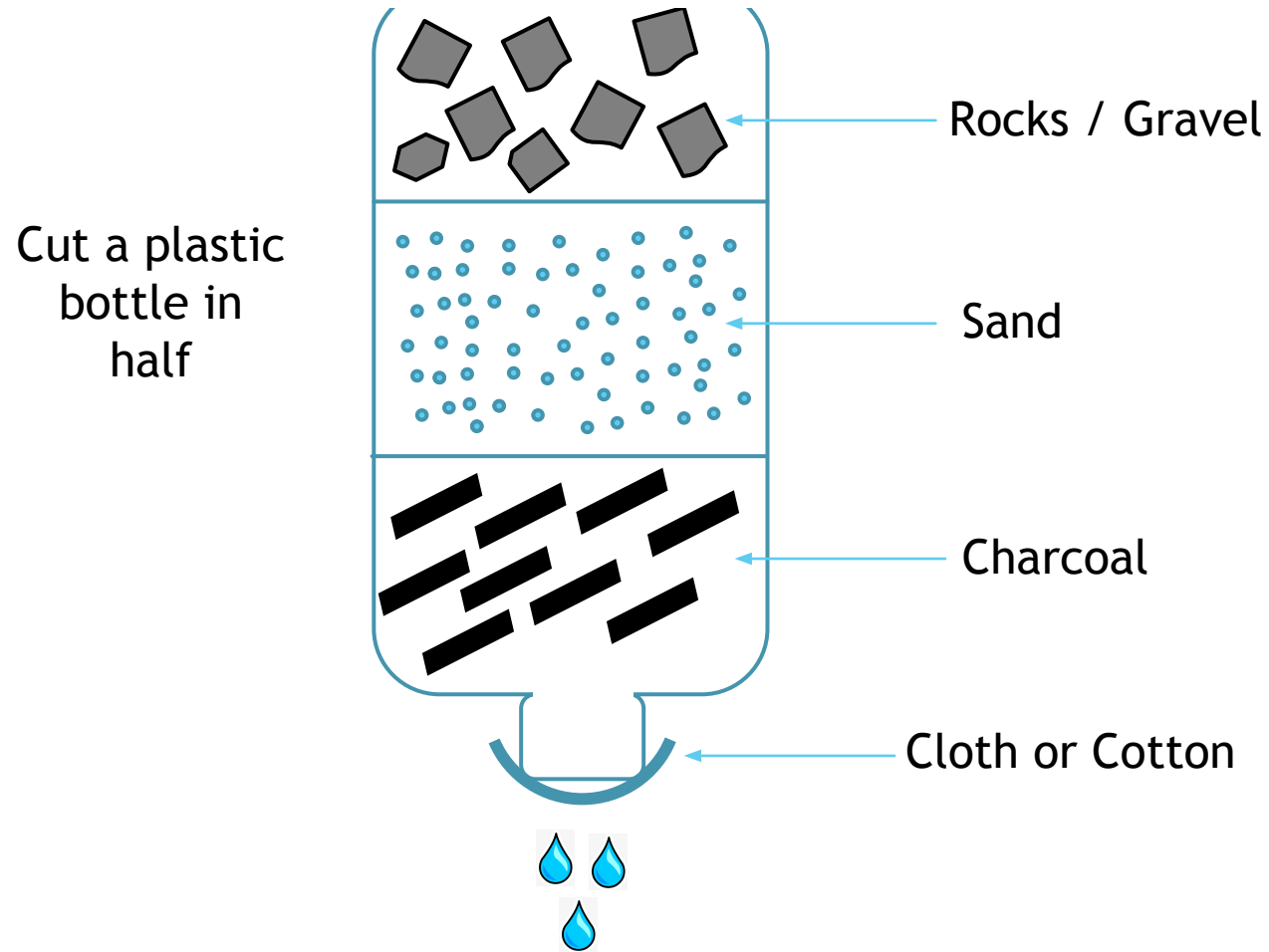


Contaminants

- ▶ **Physical contaminants:** Rocks, pebbles, rubbish, sticks etc.
- ▶ **Chemical contaminants:** Undesirable Chemicals
- ▶ **Biological contaminants:** Bacteria, Viruses or other microorganisms

More physical contaminants can mean more chemical and biological contaminants too as these can be stuck to small particles

Making a water filter

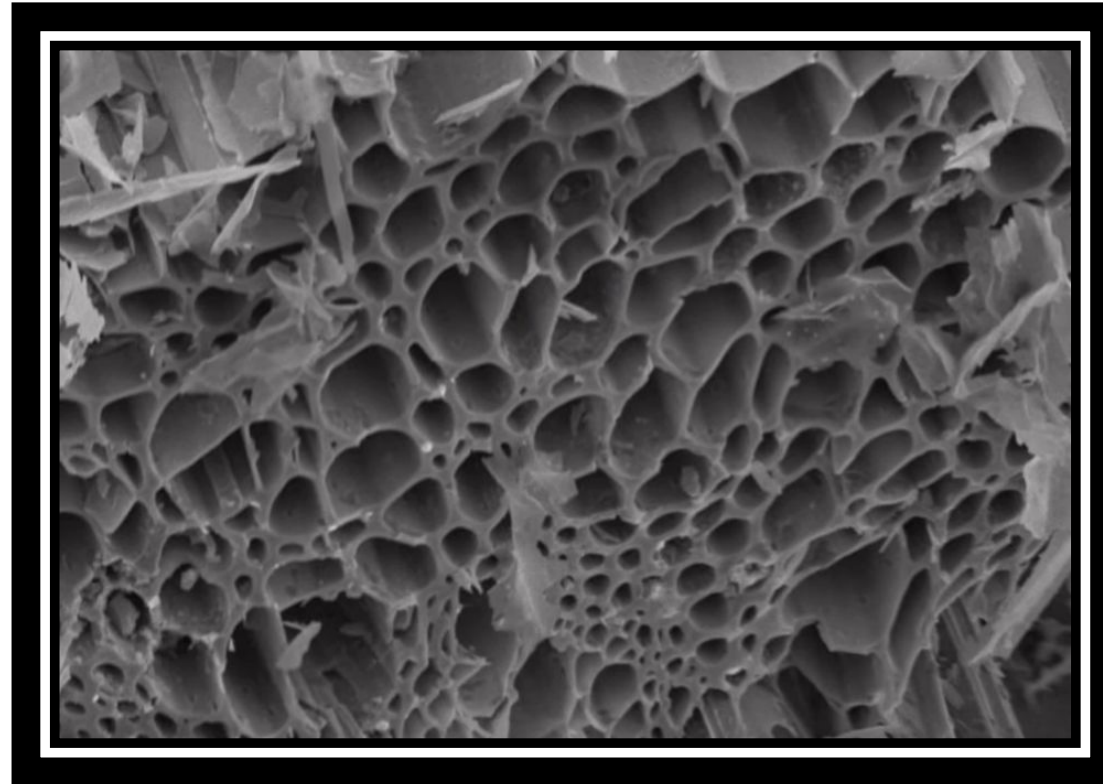
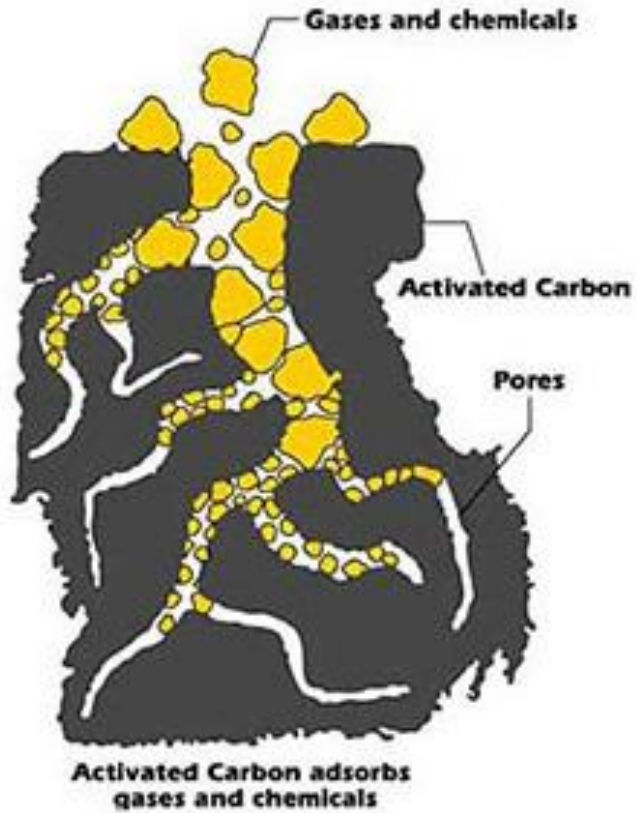


Why do we need two filters for the physical contaminants?

- ▶ Couldn't we just use one to remove everything?



How activated carbon removes chemicals



Microscope picture of *activated carbon*

- Activated carbon is “fancy charcoal” that has lots of tiny holes
- These holes are so small that they can catch chemicals and take them out of the water

Biological contaminants - Disinfection

- ▶ <https://www.youtube.com/watch?v=8jNw-e-3H1M>
- ▶ But this water still isn't safe to drink!
- ▶ You would need to boil it in order to be able to drink it

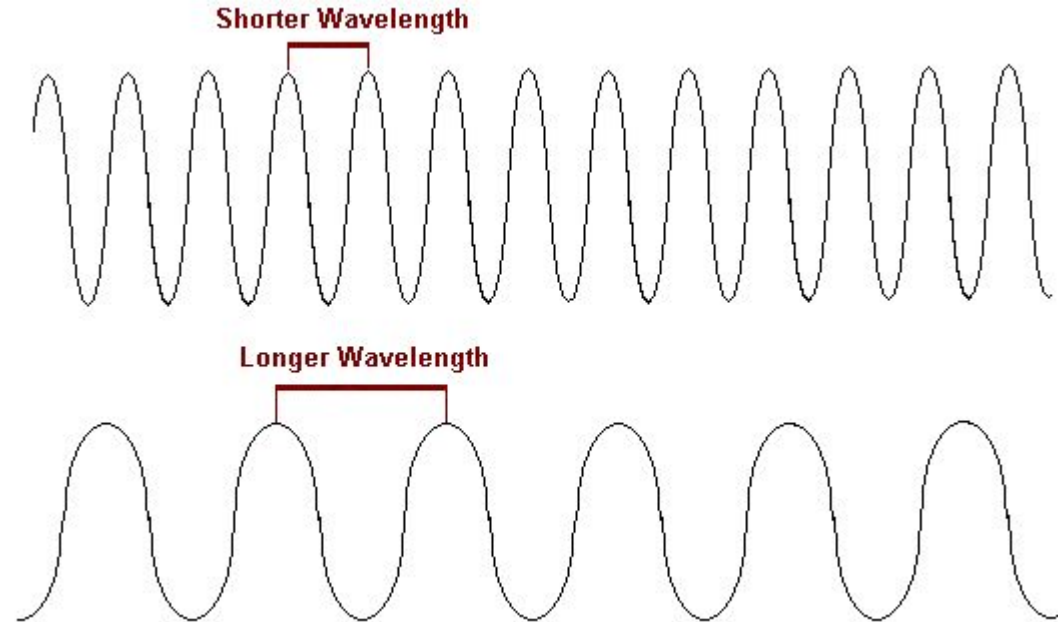
Biological contaminants - Disinfection

- ▶ There are a few different ways to kill microorganisms in water
- ▶ Boiling - Just boil the water!
- ▶ Chlorination - Adding chlorine
- ▶ Ultraviolet light - using ultraviolet lights or the sun



Solar disinfection - After the water is filtered it is left in the sun

UV disinfection



- Ultraviolet light has a shorter wavelength and a lot more energy
- This is why it can burn you
- This also makes it useful for killing microorganisms in water

What are the requirements for our water filter?

Let's make our own water filter



WATER FILTER PROJECT:

<https://www.youtube.com/watch?v=-c1xM2hhfNI>

QUIZ:

<http://www.quiz-maker.com/QDFDCGF>