

Greenhouse Effect

A natural process by which gases in the atmosphere absorb and re-radiate thermal radiation from the planet's surface.

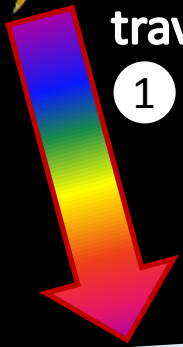


Greenhouse Effect



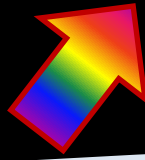
Solar radiation travels to the Earth.

1



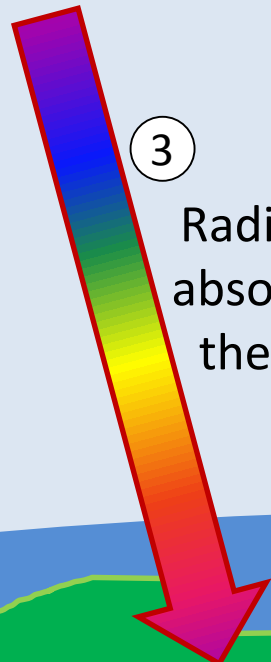
2

Some radiation is reflected back into space.



3

Radiation is absorbed by the Earth.



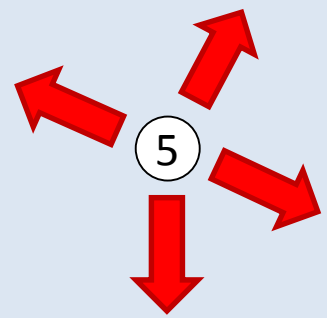
Thermal radiation is absorbed by greenhouse gases, then re-emitted in all directions .

Thermal radiation is emitted back into the air.

4



5

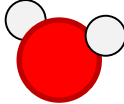
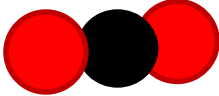
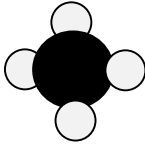
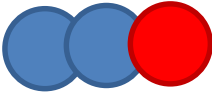
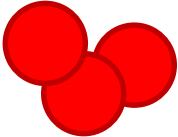


Atmosphere

Earth

Greenhouse Effect

Main Greenhouse Gases in our Atmosphere:

- Water vapour, H_2O 
- Carbon dioxide, CO_2 
- Methane, CH_4 
- Nitrous oxide, N_2O 
- Ozone, O_3 

Greenhouse Effect

- ❖ Greenhouse gases help keep the Earth warm; without them the Earth's temperature would average around -18°C .
(cold, even by Canadian standards).



Greenhouse Effect

❖ Greenhouse gases have always been produced naturally.

- Volcanic activity releases carbon dioxide, CO_2 , and other gases into the atmosphere.



Greenhouse Effect

❖ Greenhouse gases have always been produced naturally.

- Forest fires (*which often occur naturally*) also release CO_2 .



Greenhouse Effect

- ❖ Greenhouse gases have always been produced naturally.
 - Movement of tectonic plates (which causes earthquakes) releases both methane, CH_4 , and carbon dioxide, CO_2 .



Greenhouse Effect

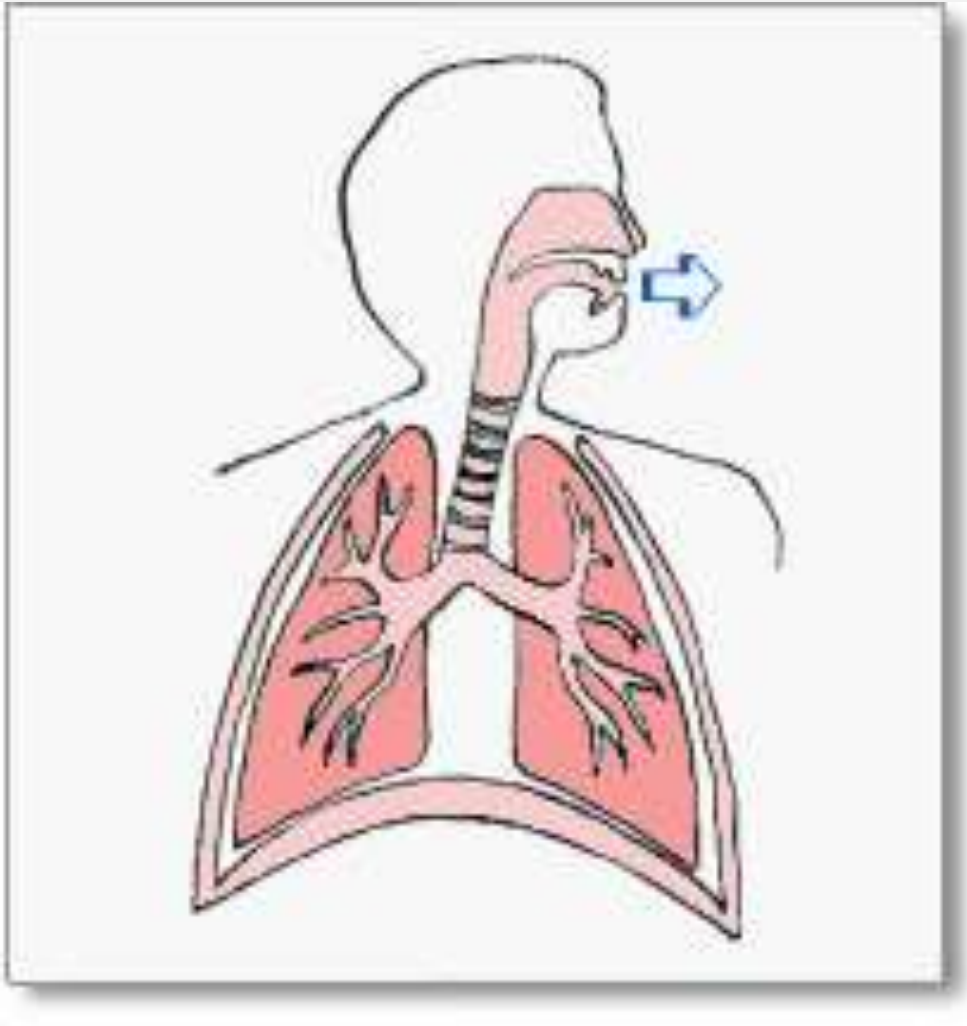
❖ Greenhouse gases have always been produced naturally.

- The thawing of permafrost also results in the release CH_4 and CO_2 .



Greenhouse Effect

❖ Greenhouse gases have always been produced naturally.



- Cellular respiration
(*humans breathing*)
produces CO_2 .

Greenhouse Effect

Increase greenhouse gases → Increase global warming

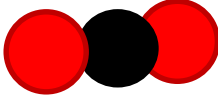
Human activities that contribute to greenhouses gases:

➤ Carbon dioxide, CO_2 

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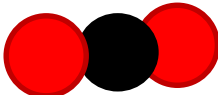
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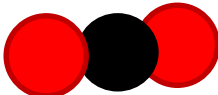
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- Transportation: Burning gasoline in cars and trucks, etc...



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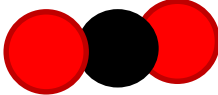
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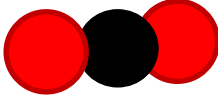
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- Transportation: Burning gasoline in cars and trucks, etc...
- Industry: Fossil fuel combustion for industrial processes.



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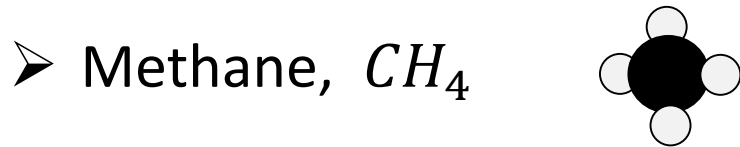
- Electricity: Burning fossil fuels to generate electricity.
- Transportation: Burning gasoline in cars and trucks, etc...
- Industry: Fossil fuel combustion for industrial processes.
- Heating: Burning wood or oil for heat.



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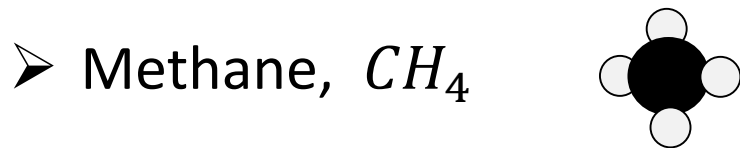
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Greenhouse Effect

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Human activities that contribute to greenhouses gases:



- Industry: During the production and processing of natural gas.

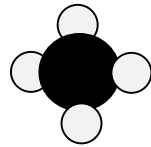


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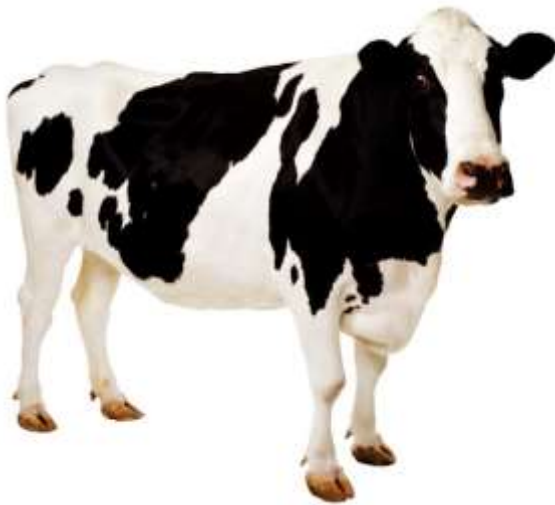
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Human activities that contribute to greenhouses gases:

➤ Methane, CH_4



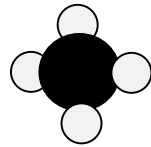
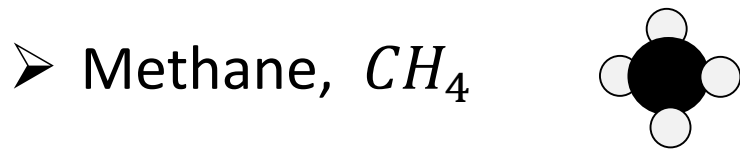
- Industry: During the production and processing of natural gas.
- Agriculture: Livestock and manure storage.



Greenhouse Effect

Increase greenhouse gases → Increase global warming

Human activities that contribute to greenhouses gases:



- Industry: During the production and processing of natural gas.
- Agriculture: Livestock and manure storage.
- Waste: Decomposition of household and business waste in landfills.

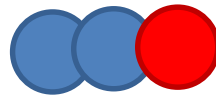


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➤ Nitrous oxide, N_2O

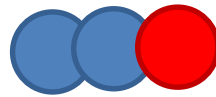


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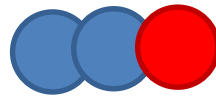


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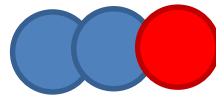


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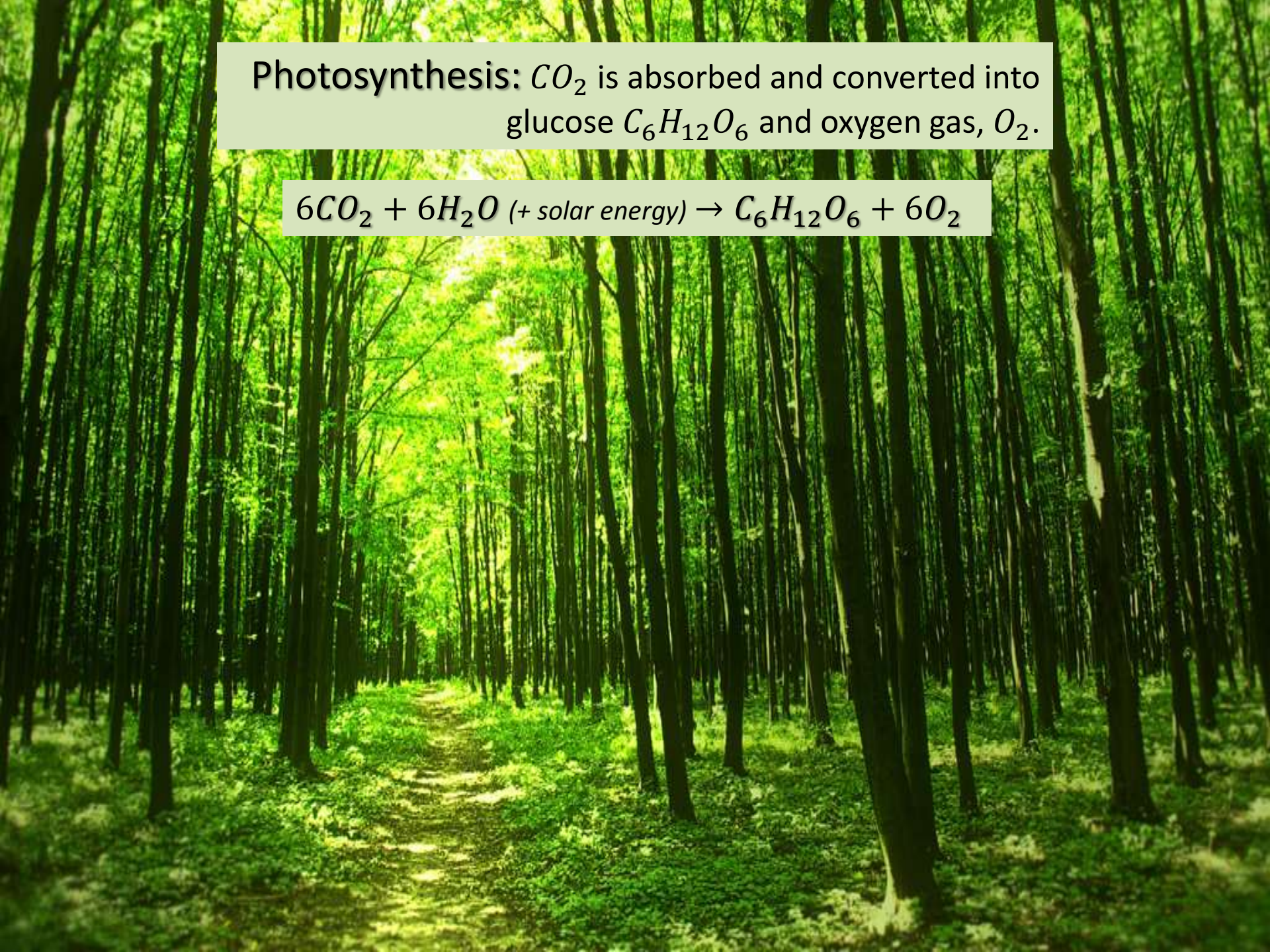
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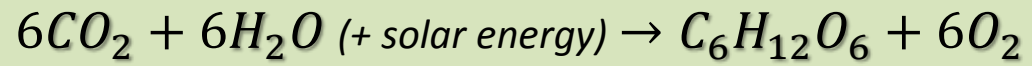
This is getting
depressing...

Is there anything that helps
reduce the amount of
greenhouse gases?





Photosynthesis: CO_2 is absorbed and converted into glucose $C_6H_{12}O_6$ and oxygen gas, O_2 .



Carbon dioxide, CO_2 , is absorbed/dissolved into the **hydrosphere**.

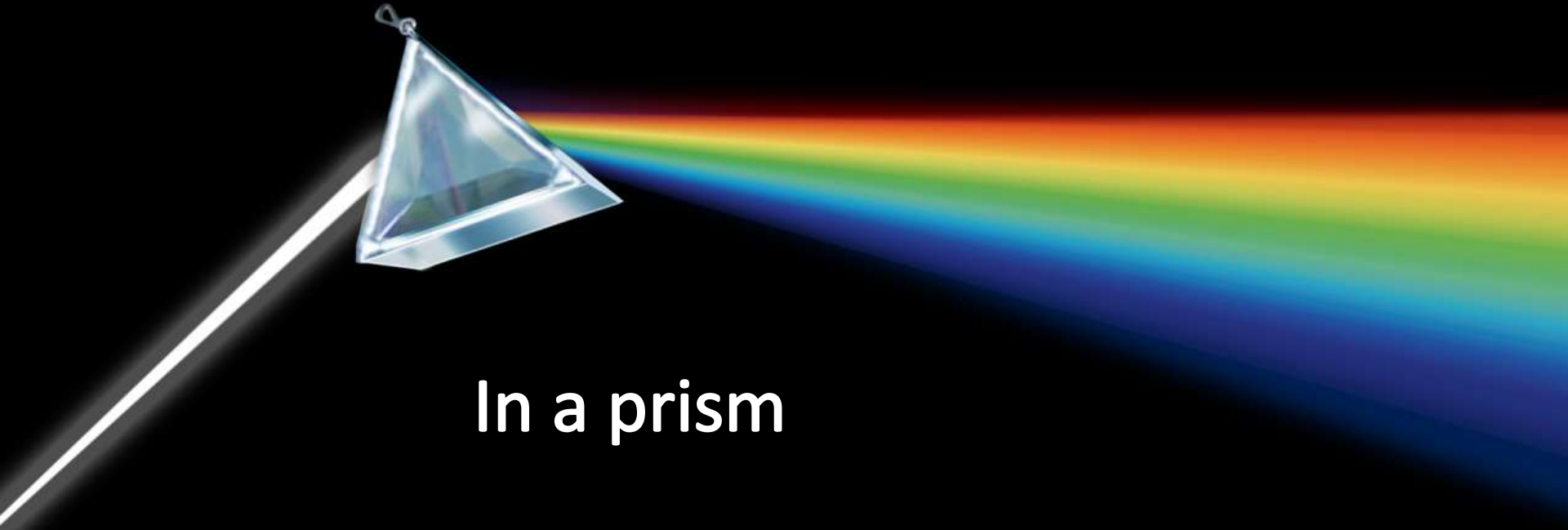
- CO_2 is absorbed (*through photosynthesis*) by aquatic organisms (*phytoplankton*) and plants.
- CO_2 reacts with water and calcium, forming calcium carbonate, $CaCO_3$, a compound used in the formation of shells and skeletons of marine organisms.



EARTH



Where does bad light end up?



In a prism