

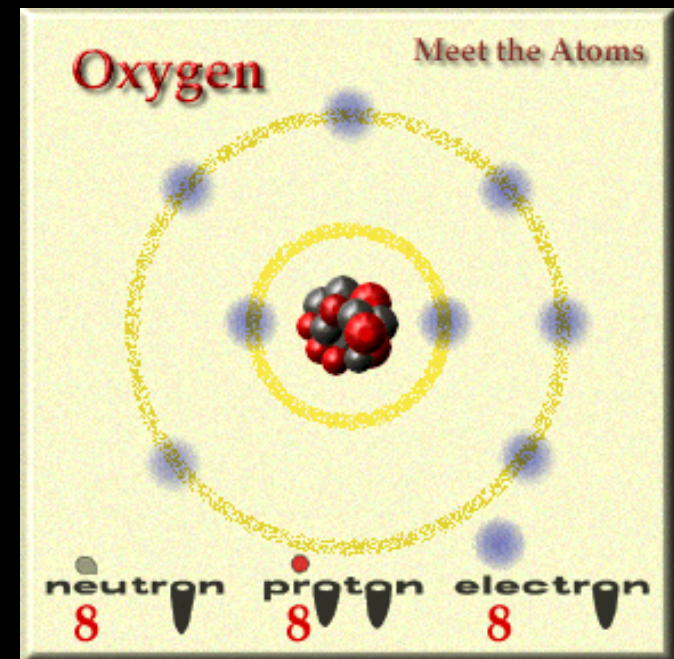
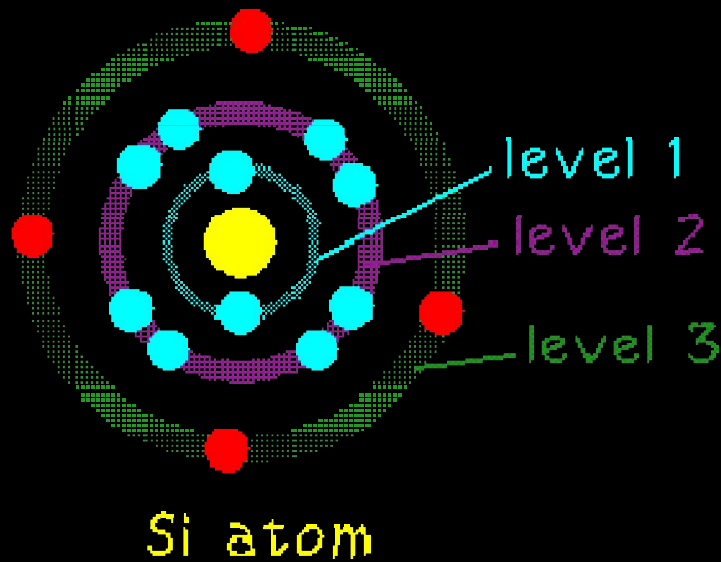
# Earth Chemistry

# Matter

- **Anything that has mass and volume.**
- **Solid:** definite shape; definite volume
- **Liquid:** no definite shape; definite volume
- **Gas:** no definite shape; no definite volume
- **Plasma:** is a gas in which a certain portion of the particles are ionized; no definite shape or volume;

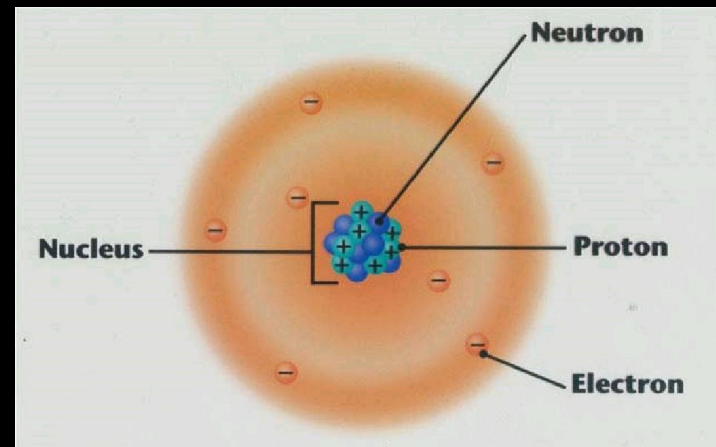
# Element

- Substance that cannot be broken down into simpler substances.
  - Ex. Oxygen, hydrogen, chlorine
- 115 known elements; 92 occur naturally.



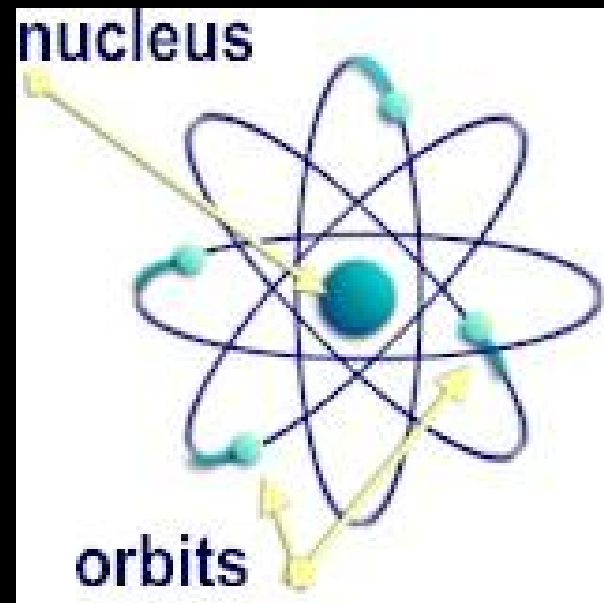
# Atom

- **Smallest part of an element that has all the properties of that element.**
- **Subatomic particles are the parts of an atom.**
  - **Electrons: negatively charge**
  - **Protons: positively charged**
  - **Neutrons: neutral (no) charge**



# Structure

- **Nucleus: protons + neutrons**
  - positive charge
- **Electron cloud: energy levels inhabited by electrons**
  - overall negative charge.



# Fusion vs. Fission

## Fusion

- Combines atoms
- Larger atoms are formed
- Fuse hydrogen atoms into helium atoms
  - In the core of the sun
- Higher temperatures are created

## Fission

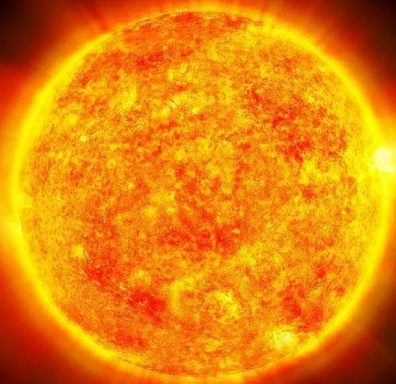
- Splits atoms
- Smaller atoms are formed
- Use uranium atoms to begin reaction
  - Nuclear power plants
- Creates radioactive waste
  - What do we do with it?

### BOTH:

- Release energy
- Use atoms

$$E = mc^2$$

## Fusion

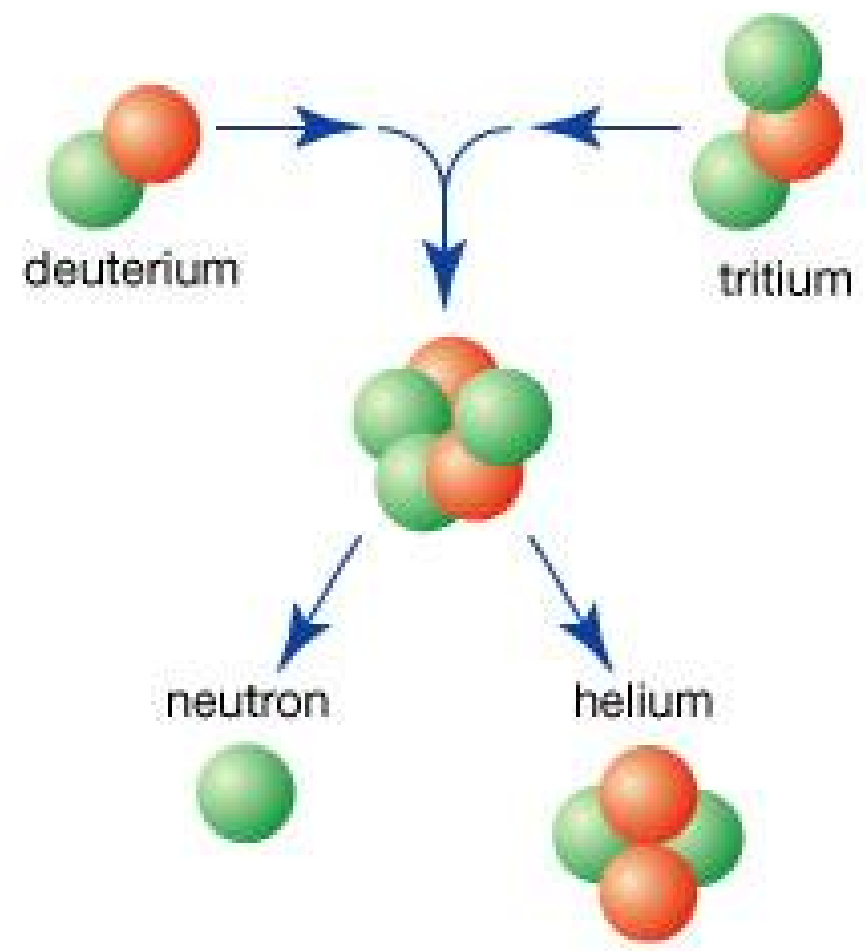
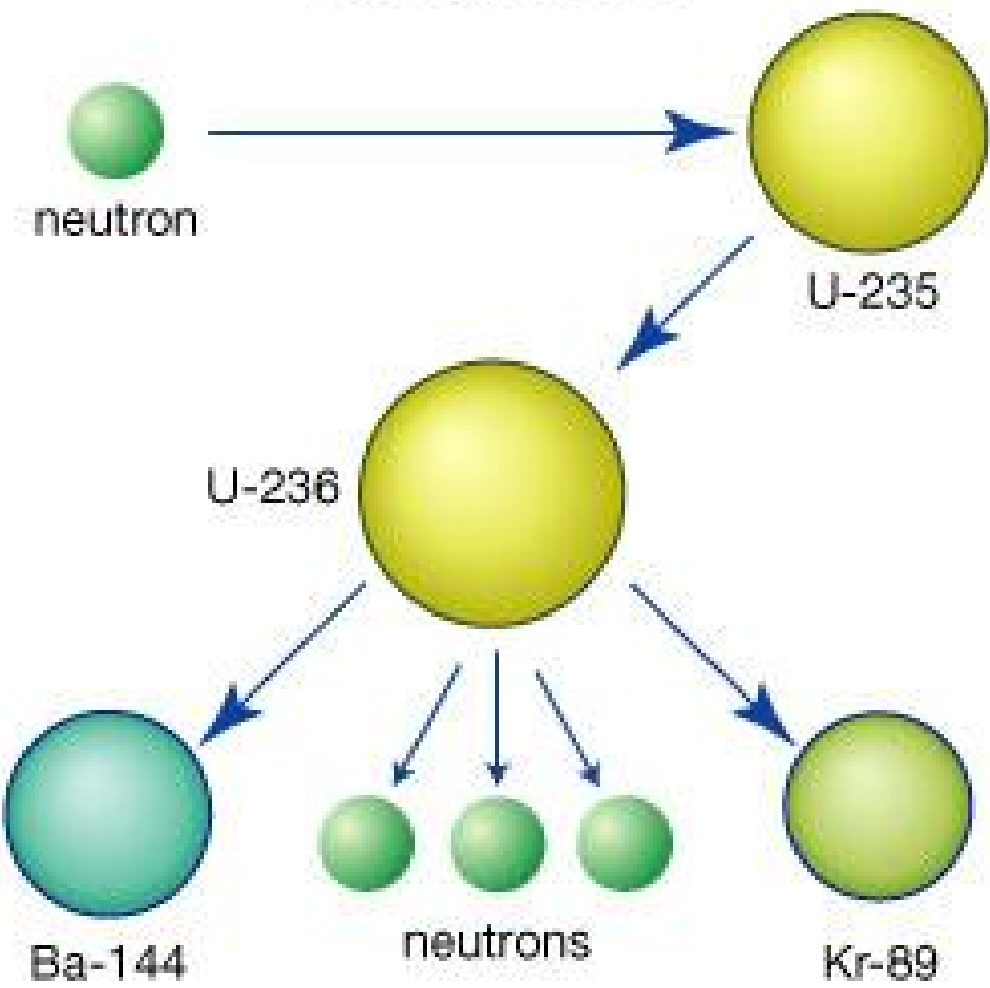


## Fission



### nuclear fission

### nuclear fusion





# Our Sun

- Made up entirely of plasma
  - Gas that shares electrons
- Average rotation: 27 Earth days
- Surface temperature = 5500°C (9932°F)
- Interior temperature = 15,000,000°C (27,000,000°F)
- FUSION TAKES PLACE!!!!!!!!!!!!!!!!!!!!
- <http://www.youtube.com/watch?v=OlKfpaSOuBM&feature=related>

**Internal structure:**

inner core

radiative zone

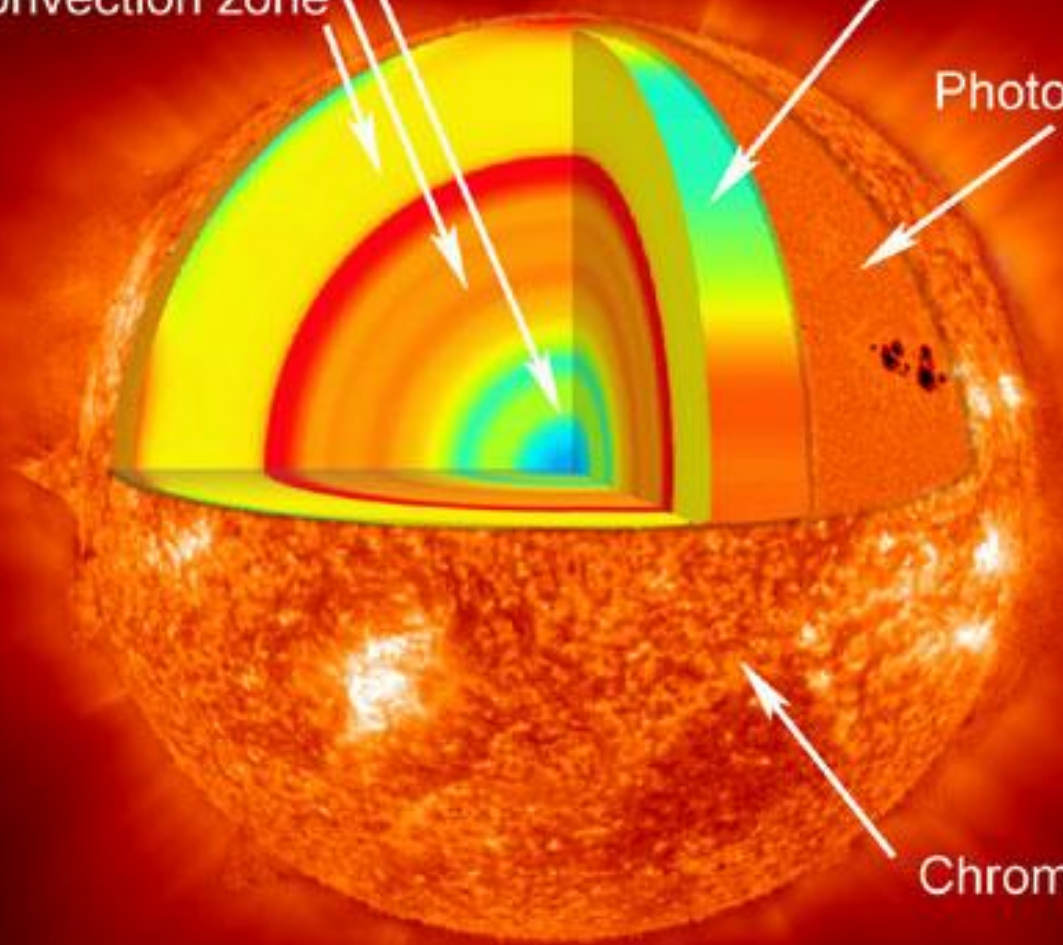
convection zone

Subsurface flows

Photosphere

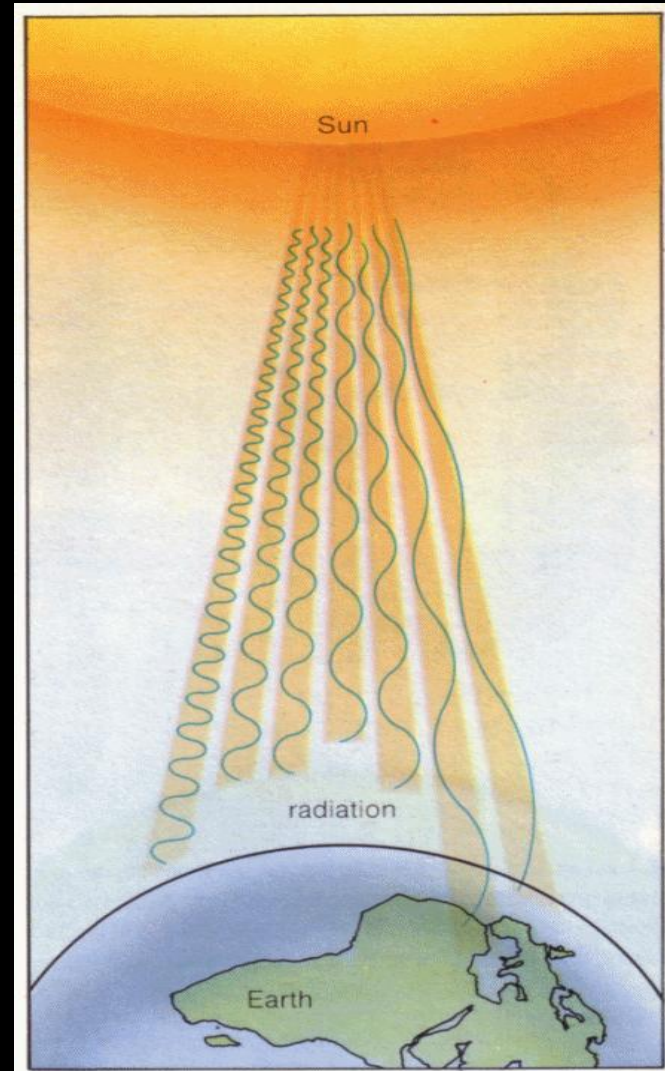
Chromosphere

Corona



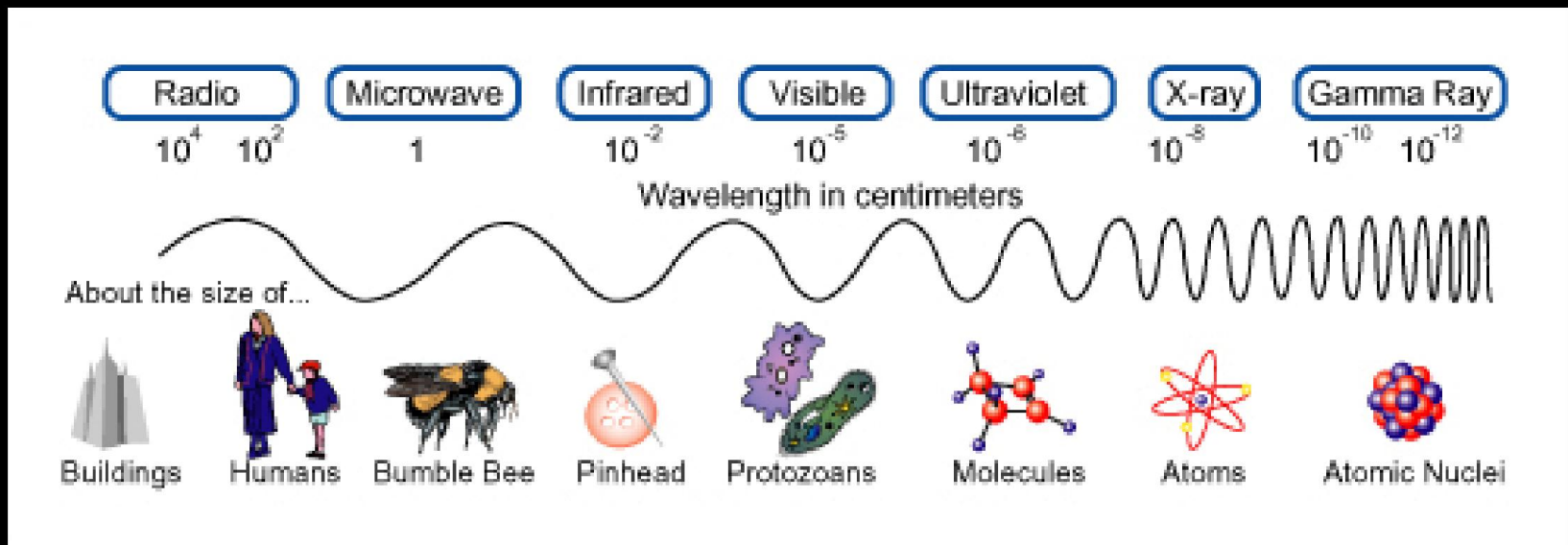
# Sunlight

- The sun radiates energy into space
- This energy is called electromagnetic energy and travels to Earth in the form of radiation
  - Speed of light:  $3 \times 10^8$  m/sec
- The term “radiation” simply means that the energy travels as rays, in straight lines



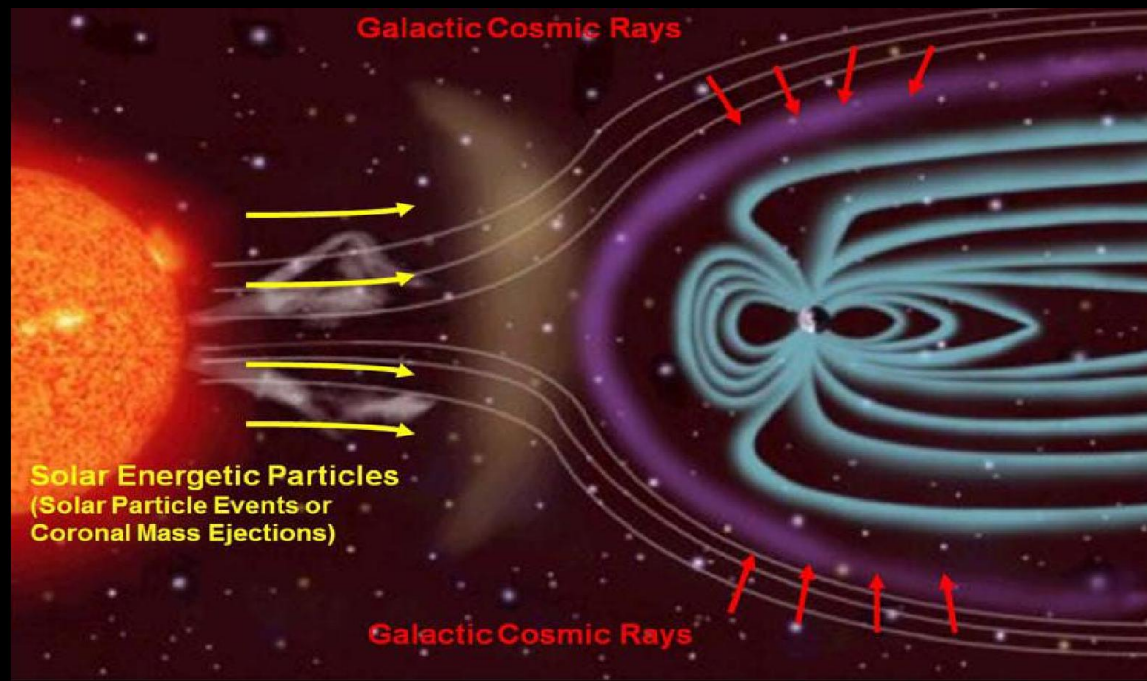
# Electromagnetic Spectrum

- There are many different types of electromagnetic energy
  - Differentiated by wavelength and frequency
- All together we called them the electromagnetic spectrum
- The sun mostly emits ultraviolet, visible light, and infrared



# Cosmic Rays

- High-energy particles that flow into our solar system
- Most deflected by Earth's magnetic field
- Others interact with Earth's atmosphere and collide with molecules in the air



# Solar Energy for Life on Earth

- Life on Earth relies on solar energy from the sun!
- Plants transform solar energy into chemical energy through photosynthesis
  - Make food for themselves
  - We eat the plants or eat the animals that eat the plants!