Using Environmental Sensors

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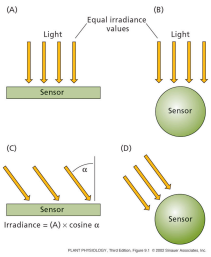
Using environmental sensors

- Temperature
  - Contact sensors: Thermal equilibrium between sensor and object measured
    - **Thermocouples**: Measure temperature based on the Seebeck effect that occurs in electrical conductors that experience a temperature gradient along their length.
  - Non-contact sensors: Measures radiation and infers temperature of the object from which the radiation is assumed to be emitted
    - **Infrared thermometer**: Measures temperature based on IR emission

Using environmental sensors

- Light sensors
  - Radiometer with quantum sensor:
    - Measures photosynthetic photon flux density (PPFD in μmol photons m^{-2} s^{-1})
  - Flat vs. spherical sensor
    - Flat sensor is cosine-corrected when light is not collimated



Using environmental sensors

- Hygro-thermo-anemometer
  - % relative humidity
    - What is relative humidity?
      - RH = $\frac{\text{Actual vapor density, g/m}^3}{\text{saturation vapor density}}$ X 100
      - Warm air holds more water vapor than cold air
  - Air temperature
  - Wind speed

Environmental sensor use

- Pick 5 *different* plants to measure environmental parameters in and around (3 places/plant)
  - Measure each one with the two different types of temperature sensor and record data
  - Measure photosynthetic photon flux density (PPFD) with the quantum sensor and radiometer
  - Measure relative humidity and air temperature
  - Measure minimum and maximum wind speed
- How are light, temperature and humidity related?
- How does wind affect temperature and humidity?
- What are the pros and cons of each thermometer?