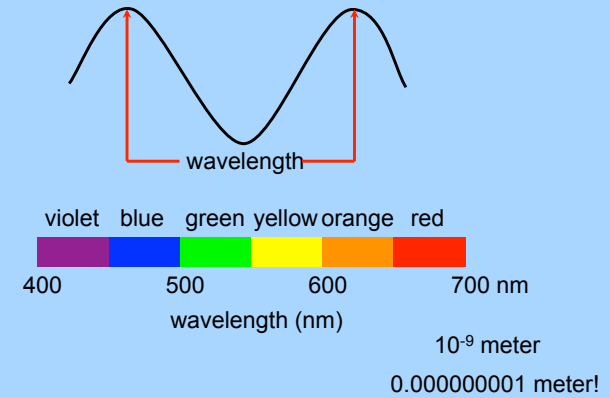


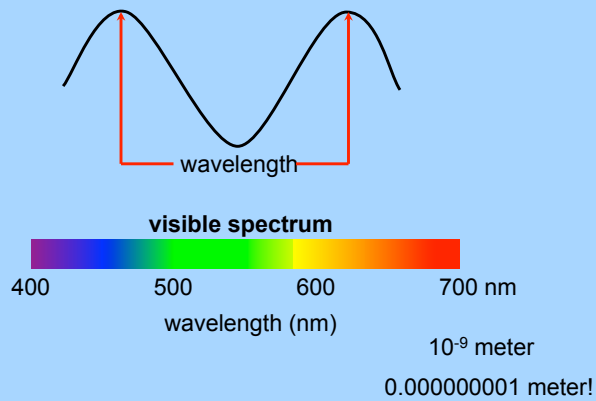
Light

The Source of all Biological Energy
Trapped in Photosynthesis
Used to determine Seasons

Light: An Energy Waveform With Particle Properties Too



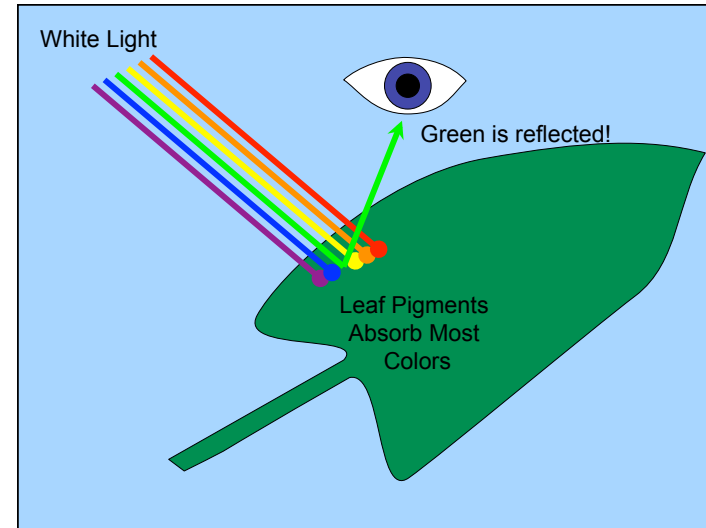
Light: An Energy Waveform With Particle Properties Too



White light: all the colors humans can see at once



<http://www.alanbauer.com/photogallery/Water/Rainbow%20over%20Case%20Inlet-Horz.jpg>



Light: An Energy Waveform With Particle Properties Too

amplitude
brightness
intensity

Many metric units for different purposes
We will use an easy-to-remember English unit: foot-candle

- 0 fc = darkness
- 100 fc = living room
- 1,000 fc = CT winter day
- 10,000 fc = June 21, noon, equator, 0 humidity

Photomorphogenesis

light	form	origin	process
Growth in Dark	Etiolated		
	Tall		
	Thin		
	White/Yellow		
	Unexpanded leaves		
	Preserve reserves		
How deeply buried am I?			
			Growth in Light
			Normal
			Short
			Stocky
			Green
			Expanded leaves
			Use reserves
			Make Hay!
			Gravity!

http://bofit.botany.wisc.edu:16080/images/130/Tropisms/Etiolation/Etiolated_-_light_beans_MC.jpg

Phototropism

light growth toward act

Coleoptile splitting as inner leaves expand

Darwin 1860s
Went: IAA

transduction by IAA
perception by zeaxanthin
differential transport
+ growth response

RL Nielsen, Purdue Univ., 2000

<http://www.ppd.purdue.edu/ppd/images/coleoptile3.jpg>

Photosynthesis: Review and Expansion

We have been hiding considerable truth from you!
Not 1 step...more like 50!

$$\text{CO}_2 + \text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{O}_2 + \text{CH}_2\text{O}$$

Light Reactions: perhaps 25 steps

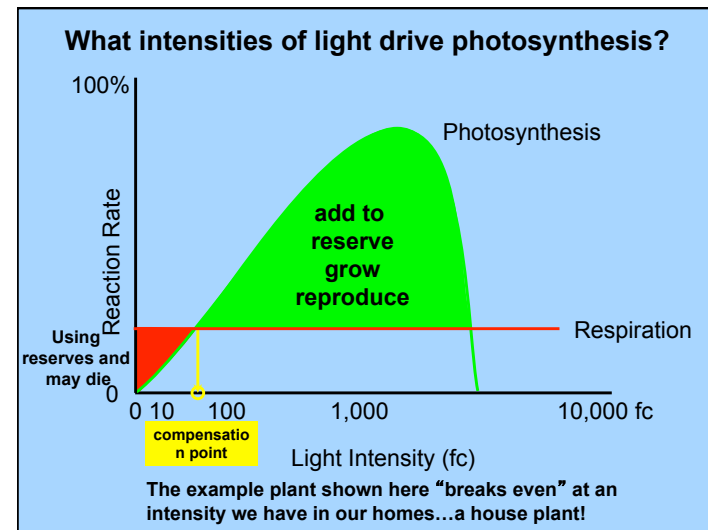
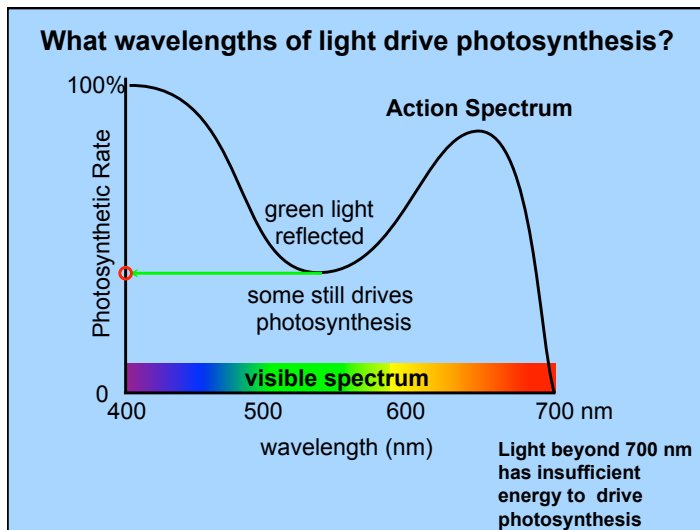
$$\text{ADP} + \text{P} + \text{NADP} + \text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{O}_2 + \text{NADPH}_2 + \text{ATP}$$

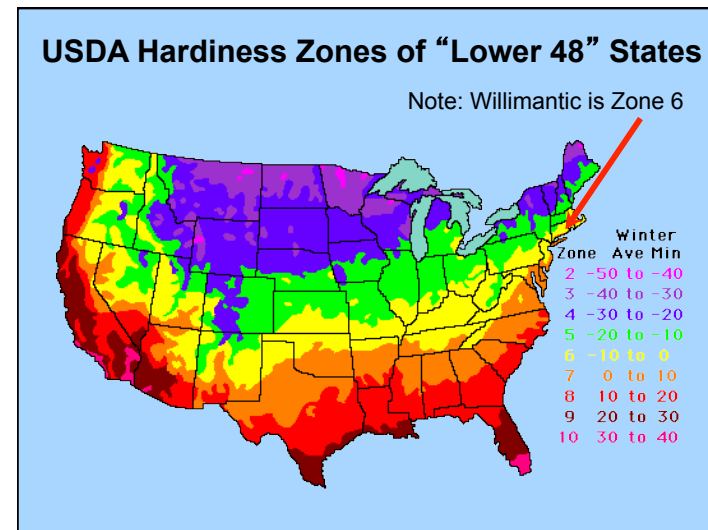
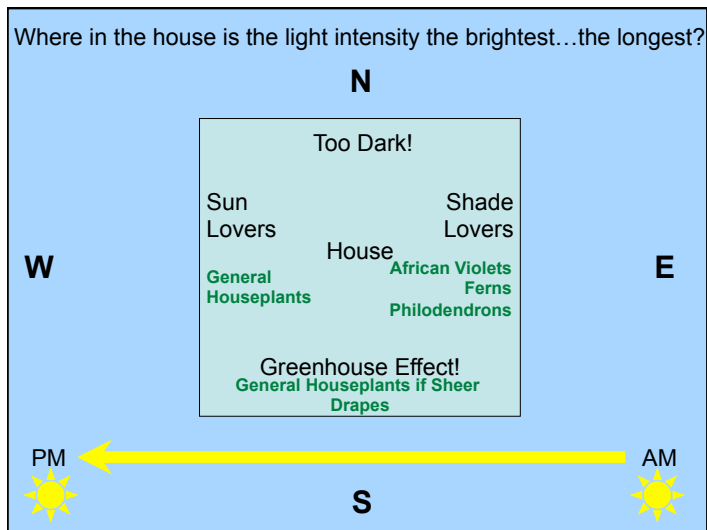
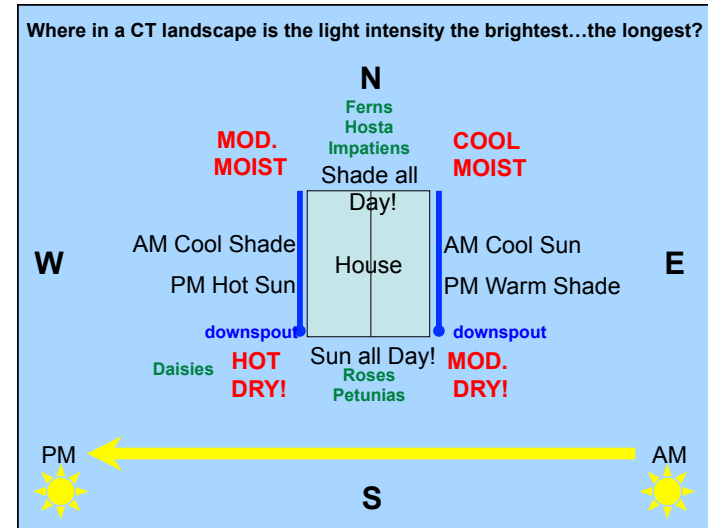
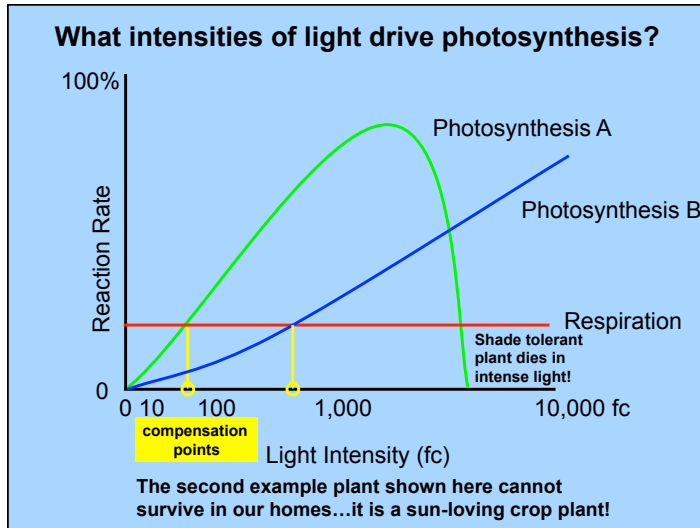
Interdependent Calvin Cycle Reactions: perhaps 25 steps AKA: ~~Dark Reactions~~

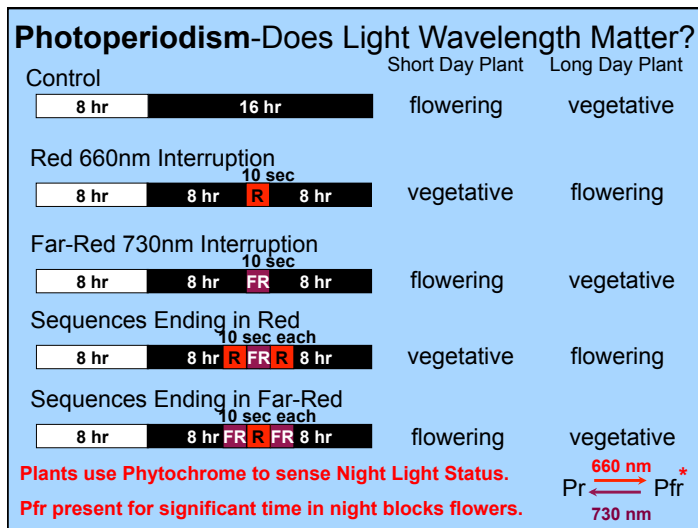
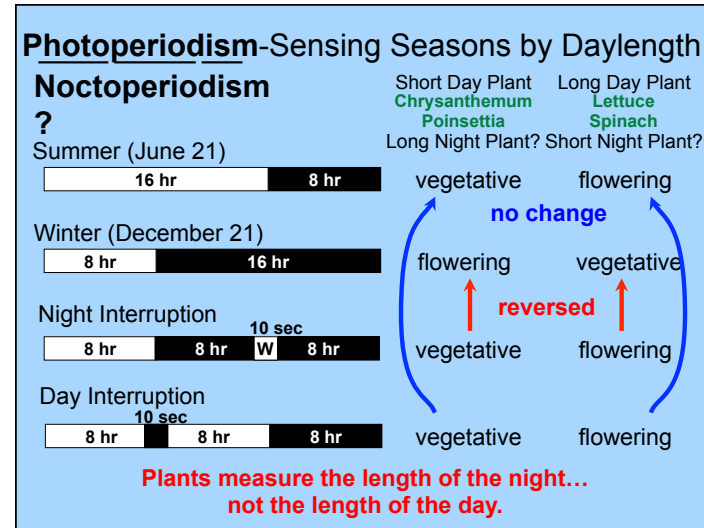
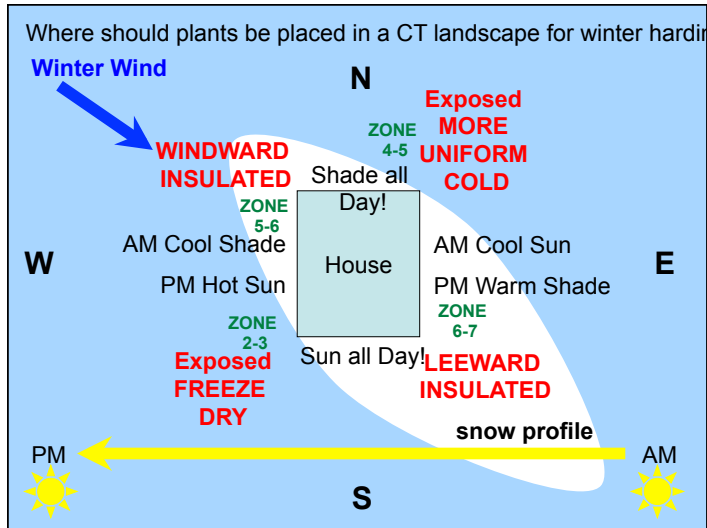
$$\text{ATP} + \text{NADPH}_2 + \text{CO}_2 \longrightarrow \text{CH}_2\text{O} + \text{NADP} + \text{ADP} + \text{P}$$

In sum: $\text{CO}_2 + \text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{O}_2 + \text{CH}_2\text{O}$

The light and Calvin cycle reactions are interdependent...no dark reactions!







Photoperiod Applications:

- Chrysanthemum Story
- Poinsettia Story
- LDP Lettuce Problem: Equinoxes
- LDP Onions: Bermuda=11+ Sweet Spanish=15+
- How long does light need to be on inside house?: Comp Point