

Lecture 6: Blue light responses

Phototropism in plants and fungi

Inhibition of elongation growth in plants

Stomatal opening in plants

Carotenoid synthesis in fungi

Anthocyanin synthesis in plants

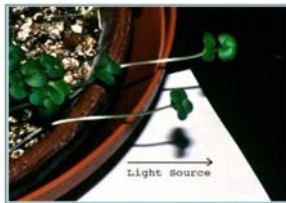
Regulation of metabolism in algae

Entrainment of behavioural rhythms in mammals and insects

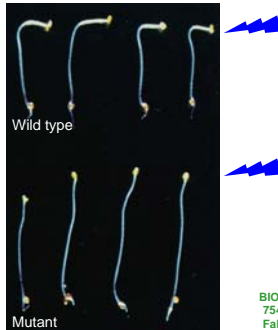
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Phototropism a blue light response

Phototropism = directional growth toward the light in fungi, ferns and higher plants



Phototropic bending only growing organs



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Darwin's experiments on phototropism



Grass coleoptiles curve towards the light of a candle



An opaque cap over the tip of the coleoptile prevents bending

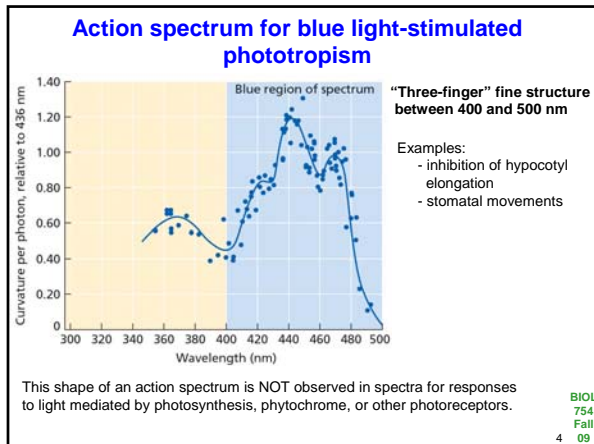


When the tip alone is illuminated bending still occurs

How can we distinguish specific responses to blue light from red/far-red light?

- In specific blue-light responses, blue light cannot be replaced by a red-light treatment.
- There is no red/far-red reversibility.
- Many blue-light responses share a characteristic action spectrum.

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Photoreceptors

Cryptochrome 1

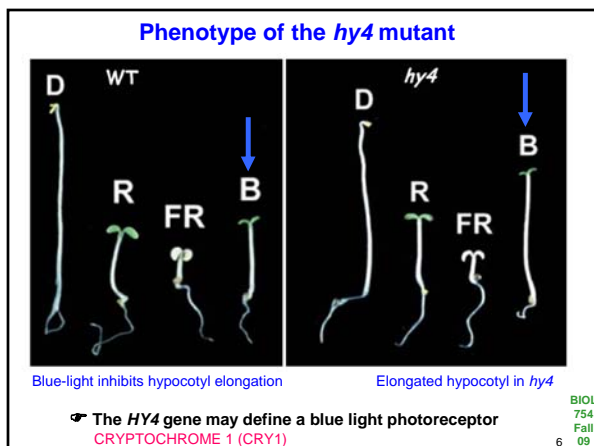
Cryptochrome 2

NPH1 = Phototropin 1

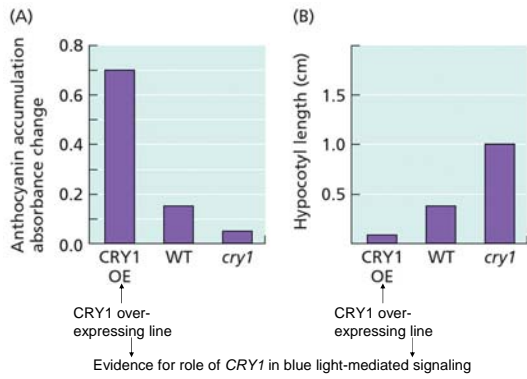
NPH2 = Phototropin 2

Others?

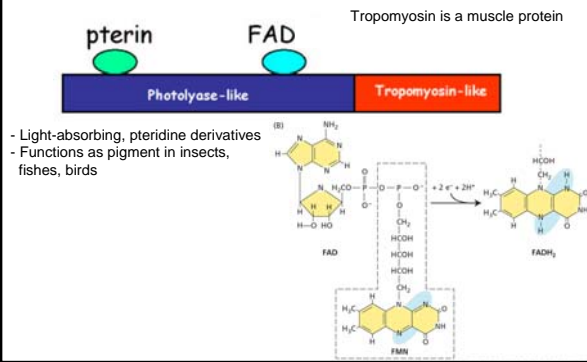
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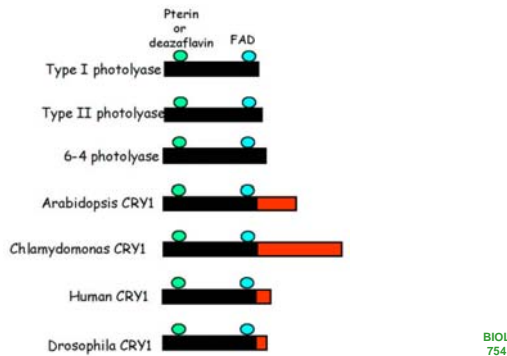
Blue light stimulates the accumulation of anthocyanin and inhibits stem elongation



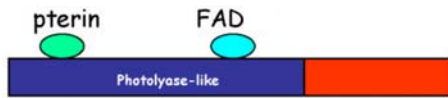
Structure of Arabidopsis CRY1



Photolyase and cryptochrome structures

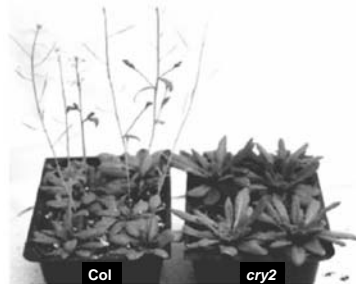
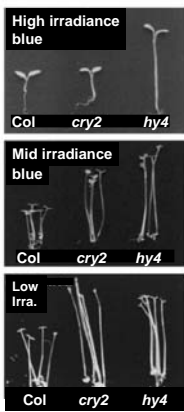


Plants have a second cryptochrome - CRY2



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Phenotypes of *cry2* mutant



cry2 is late flowering under long day conditions

cry2 is relatively insensitive to low irradiance blue light

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Functions of the cryptochromes

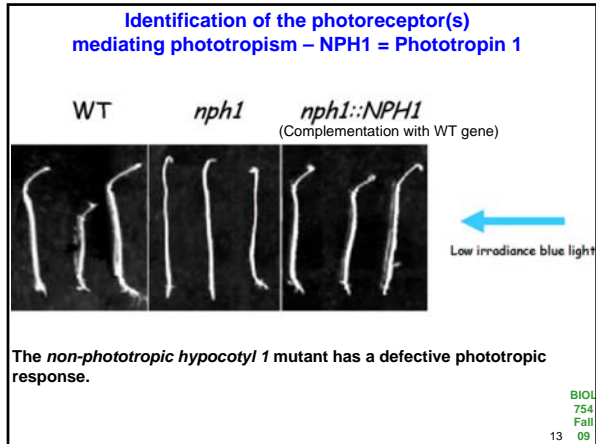
Regulation of seedling de-etiolation and elongation growth

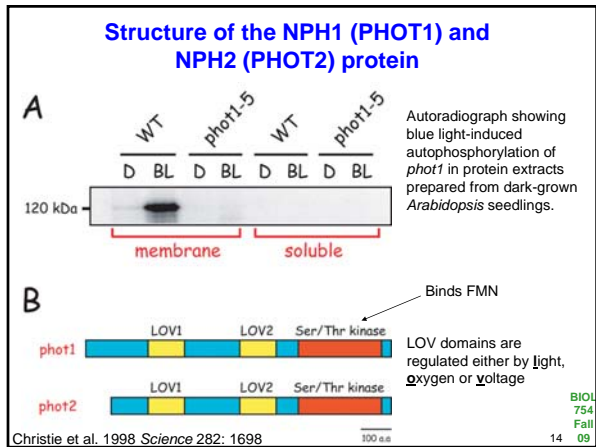
Regulation of flowering time

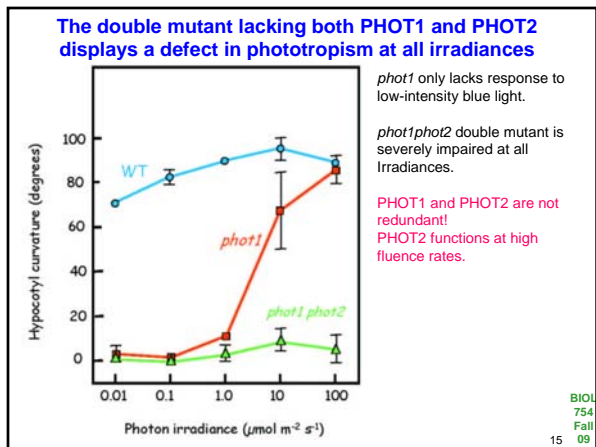
Co-action with phytochromes (e.g. amplification)

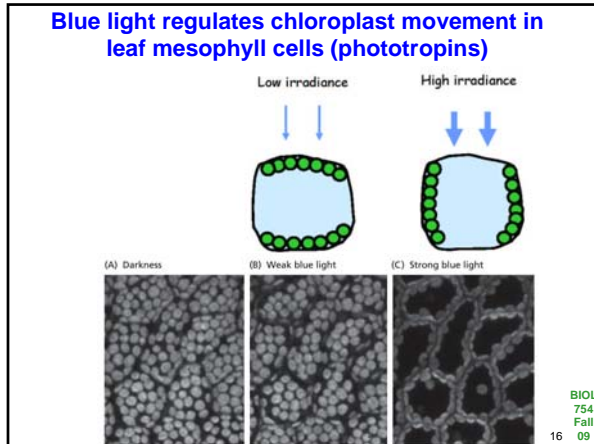
Cryptochromes are NOT involved in phototropic curvature

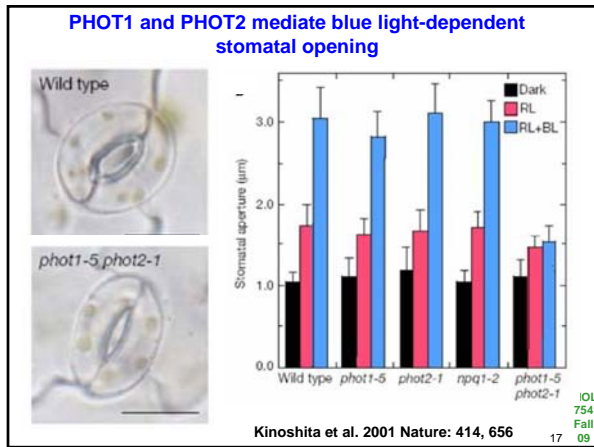
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Functions of the phototropins

- Phototropic curvature
- Chloroplast movement
- Stomatal opening

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