List of Suggested Minimum Experimental Projects.[1]

The following is an outline of several experiments. Successful completion of any one of the experiments (including duplication) is sufficient for a passing grade, assuming other course requirements are met on deadline. The suggested experiments vary in complexity. As an example, #5 is simple and straightforward and requires minimum effort--just sufficient for a "C." To achieve an "A" or "B," students must choose more complex projects, or devise additional experiments that provide an in-depth investigation of a simple question, which they may pose or which may be inspired by the following list. In some cases, a combination of questions may be permissible (e.g., one may ask how many photons must strike a leaf to achieve a certain level of light activation, which is a combination of questions #1 and #2), but a simple "survey" set of experiments is not encouraged.

1. **What is the time-course for light activation?** Student will illuminate a series of leaves, take extracts over a time course, and assay for light activation. (In all cases, leaves should be dark inactivated for a full hour.)

2. **What levels of irradiances are required for light activation?** Student will illuminate a series of leaves with different photon flux densities, take extracts, and assay for light activation.

3. **Does a circadian rhythm influence the capacity for light activation?** Student will light activate over a daily time course, take extracts, and assay for light activation.

4. **What is the pigment responsible for sensing the presence of light?** Student will illuminate a series of leaves with differently colored light, take extracts, and assay for light activation.

5. **Is the "signal substance" diffusible?** Student will illuminate a portion of a leaf, take an extract of the illuminated portion and one of an unilluminated portion, and assay for light activation.

6. **Is the "signal substance" stable?** Student will illuminate one leaf and maintain a second in darkness. Extracts of the two leaves will be assayed separately . Aliquots of the extracts will be mixed, incubated, and reassayed for light activation to determine whether there is a synergistic effect.

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[1]It is important to recognize that these questions are posed in the context of BSC 3402L. Definitive answers, we recognize, may not be forthcoming with our provision of facilities, the one-semester time-line, and your experiential basis. All these constraints will be considered in our evaluations. We expect that you will do the best that is possible with the resources available.

7. **Can an *in vitro* disulfide reduction mimic the light activation?** Student will take extract from a darkened leaf, incubate the extract with DTT, and assay for "light" activation.

8. **Can an *in vitro* change in enzyme aggregation states mimic light activation?** Student will take an extract from a darkened leaf, incubate the extract with glycerol, and assay for "light" activation.

9. **Is light activation stable?** Student will illuminate a leaf, take an extract, and incubate aliquots of the extract (e.g., at 37°C and at room temperature), and, at various times, assay for loss of light activation.

10. **Does physiological history affect the capacity for light activation?** Student will maintain a plant in darkness for 48 hours, take an extract, and assay for light activation.

11. **Does physiological age correlate with the capacity for light activation?** Student will take extracts of illuminated leaves of various ages and assay for light activation.

12. **Does the fate of the photosynthate affect the capacity for light activation?** Student will excise a leaf, incubate it for 24 hours in water, assay extracts for light activation.

13. **Is cytosolic protein synthesis required for light activation?** Student will feed a leaf with CHI, then incubate in light, take extract, and assay for light activation.

14. **Does light activation require intact tissue?** Student will illuminate an intact leaf and a leaf that has been minced in mannitol (to maintain chloroplast integrity), and take an extract and assay for light activation.

15. **Is light activation restricted to photosynthetic tissues?** Student will illuminate a green tissue and a nongreen tissue, take extracts, and assay for light activation.

16. **Does CO_2 availability correlate with the extent of light activation?** Student will illuminate a leaf in a chamber devoid of CO_2, take extract, and assay for light activation.

17. **Does diversion of reducing equivalents from the photosynthetic electron-transport chain to other than CO_2 reduction correlate with the extent of light activation?** Student will excise a leaf, feed it with 10 mM NO_3^-, incubate in light, take extract, and assay for light activation.

18. **Does water stress (which lowers the rate of photosynthesis) affect the extent of light activation?** Student will deprive a plant of water for several days, illuminate a leaf, take extract, and assay for light activation.

19. **Does the water-stress hormone ABA affect the extent of light activation?** Student will excise a leaf, feed it with ABA, incubate in light, take extract, and assay for light activation.

20. **Does mechanical injury induce a systemic response that lessens light activation?** Student will prick a target leaf with pins 24 hours before an experiment, then illuminate it, extractit, and assay for light activation.

21. **Which kinetic parameter of the enzyme is affected by light activation?** Student will illuminate a leaf, take an extract, and devise different cocktail compositions with which the extent of light activation will be assayed.

22. **Does the availability of PO_4^{2-} (required for synthesis of photosynthetic intermediates) affect the extent of light activation?** Student will excise a leaf, feed it with mannose, illuminate the leaf, take an extract, and assay for light activation.

23. **Does demand for photosynthate affect the extent of light activation?** Student will remove and discard mature leaves, except one, from a plant 48 hours before an experiment. The maintained leaf will be illuminated, an extract taken, and the extract assayed for light activation.

24. **Is linear electron transport required for light activation?** Student will excise a leaf, feed it DCMU, illuminate it, take an extract, and assay for light activation.

25. **Is light activation a universal phenomenon?** Student will collect leaves of various species, illuminate them, take an extract, and assay for light activation.