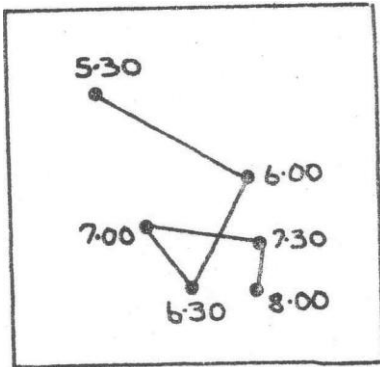


PROBLEM

The growing tip of a stem does not grow directly vertically but moves upwards in a helical path. The problem is whether there is a difference in the magnitude of the movement (called circumnutation) in shrub plants and twining climbers. What environmental factors affect the movement e.g. will it continue in complete darkness? What happens if a piece of vertical fencing wire is placed in the path of a twining stem of leaf tendril?

INFORMATION

1. Young fast growing seedlings in pots are best for this experiment.
2. Darwin's method of examining circumnutation works well even though it is 100 years old! The idea is to mount a sheet of glass about 10 cm above the plants and to line up the apex and put a spot on the glass. Doing this every couple of hours gives you a record like that in the diagram of the plant's movement. For some plants it is easy to line up the apex, for others like peas, placing a piece of glass rod vertically at the apex is a help. To do this, thread a 3 cm fine capillary tube through a triangular piece of paper and insert it into the apical region (don't stab it into the apex itself!) where it is held by the stipules of the youngest leaves. Sight down the length of the capillary and put a spot on the glass where the line of sight passes through the glass plate.



3. A comparison of tall and dwarf peas or beans would be of interest. Other plants that have bush and climbing forms or related species could also be used e.g. *Thysanotus* species (fringed lilies).
4. Plants in the dark can be examined using a torch covered with layers of green cellophane.

DESIGN OF EXPERIMENT

1. What do you think causes the movement of the tip?
2. How will you be sure wind, drought etc. are not affecting your plants?
3. How are you going to quantify the magnitude of the movement?
4. How will you be sure that phototropism is not affecting your experiment?

REFERENCES

- Allan, M. (1977) Darwin and His Flowers (Faber & Faber : London) Chp. 12
- Darwin, C. (1875). The Movements and Habits of Climbing Plants (John Murray : Lond.)
- Darwin, C. (1880). The Power of Movements in Plants (John Murray : London).
- Phillips, E.A. (1971). Basic Ideas in Biology (Macmillan : New York) Chp. 1.