Partner practical focus – Science and Plants for Schools (SAPS)
The Getting Practical programme is run by a consortium of partners, including SAPS, and supports high quality practical work in science through training courses and teaching resources. In this article, SAPS invites teacher Roger Delpech to describe a recent secondary biology activity showing how effective, interesting and adaptable practical work can be. The activity promotes independent thinking among students, offers opportunities for out-of-classroom learning, and includes a range of potential learning outcomes, from supporting basic conceptual understanding to making links with recent research.

What do Ash trees, bees and bats have in common?
Natural selection is the mechanism that continually scrutinises the variations in an individual’s offspring. The best-adapted offspring get to pass their genetic blueprints on to the next generation. Fruit dispersal provides a tree’s offspring with the chance to colonise a new habitat, as well as reducing the danger of competition for resources with their parent and siblings, and infection with species-specific pests and pathogens.

A single Common Ash tree (Fraxinus excelsior) produces thousands of fruits (samaras), in large clusters attached to the tips of its branches, which remain for a large part of the year. The variation in length of the winged samaras can be investigated, and each fruit can have its fitness for purpose measured – by measuring its speed of descent when dropped.

Samaras can be collected and stored dry for a year or more – so that practical work can be done at any suitable time – but is best done by staff, as pupils are likely to be over-competitive and create health and safety dangers! Other suitable trees producing useful fruit are Sycamore (Acer species) and Lime trees (Tilia species).

A recent study, published in the journal Science (Lentink et al, 2009), on flying Sycamore fruits has explained why it is that the wings of these falling fruits, along with hovering insects and bats, generate more lift than can be expected by regarding the wings as aerofoil sections. The leading edge of the rotating wing has a high angle of attack, and generates a stable vortex, which joins with the vortex at the tip – this results in an inverted cone of low pressure above the wing, akin to a...
Investigating the germination
Exploring links between biology and
Developing fieldwork techniques
February 2010

is Head of Biology at

is asking teachers to plan how they might obtain
the fruits? Most pupils will predict that
something to do with the flight-times of
‘investment’ per seed, or maybe it is
successful germination, or perhaps the
seeds, with reduced chances for
Maybe the smallest fruits mean small
concerning the distribution of fruit size.
Pupils are asked to think of hypotheses
for fruit-size and seed mass.

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<th>Fruit size class</th>
<th>Flight time (s)</th>
<th>Frequency</th>
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accurate and reliable data about flight-
times and fruit-length.
The natural start position for the fall
of a fruit is blade downwards, so that as
the air pushes the blade, the fruit falls in
a horizontal position, with the
outermost tip of the wing describing a
circle around the centre of gravity (the
seed). Dropping from more than 2
metres up is essential, but data can be
obtained by dropping them from the
ceiling to floor of a laboratory; at least
there is no wind factor to complicate
matters. A perfect indoors opportunity is
provided by a balcony in a sports hall –
with pupils working in teams to
measure, drop and collect the fruits.
All the flight-time data from the class
should be gathered and mean flight-
times for each fruit size-category
calculated. The mean flight-time values
can then be overlaid onto the
size/frequency histograms (using a
second y-axis), and usually the most
frequent class-size is the one with
longest flight time. This comes as a
surprise to most pupils, who intuitively
think that ‘bigger is better’. Finally, a
plot of average flight-time v. size-class
frequency can probe the hypothesis that
the two are linked.
The aims of such work include:
increasing pupil awareness of the natural
environment (trees) and seasons (fruit
fall); developing measurement, data
handling and graphing skills;
encouraging the formation and testing
of hypotheses; and, not least of all,
making pupils aware of the importance of
variation and natural selection.

**Potential opportunities for extension work**
Dissecting seeds to investigate the
importance of blade area and shape in
determining flight-times, or to
investigate the relationship between
fruit-size and seed mass.

- Investigating the germination
  success/seedling growth rate of seeds
  collected from different sized fruit.
- Exploring the importance of the
  shape of fruit blades by comparing
  model fruits created using balsa wood or
  paper (origami seeds).
- Developing fieldwork techniques
  through quadrat sampling of seed
  density v. distance from an isolated tree.
  Is there a relationship between density
  and prevailing wind direction?
- Exploring evolution and adaptation
  by comparing and contrasting seeds
  from other individuals of the same
  species and those from different
  ecological circumstances.

Exploring links between biology and
engineering, by watching and discussing
monocopter engineering video clips on
YouTube.

**Reference**
Lentink, D., Dixon, W.B., van Leeuwen,
Edge Vortices Elevate Lift of
Autorotating Plant Seeds’, Science,
324, 438–440

For more information about
Getting Practical visit
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