

For Primary Schools and Teachers of S1/S2 courses



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Let there be light

"Ever since we crawled out of that primordial slime, that's been our unifying cry, "More light." Sunlight. Torchlight. Candlelight. Neon, incandescent lights that banish the darkness from our caves to illuminate our roads, the insides of our refrigerators. Big floods for the night games at Soldier's Field. Little tiny flashlights for those books we read under the covers when we're supposed to be asleep. Light is more than watts and footcandles. Light is metaphor. Light is knowledge, light is life, light is light."

Diane Frolov and Andrew Schneider, Northern Exposure, 1993

Living things and the Processes of Life

Growing plants under controlled conditions is often a problem for teachers in primary schools. Most plants grow more successfully with a good light source. Indeed, *SAPS fast plants* require a constant, appropriate light source. Given this, all the additional pampering they need is a little water. The complete life cycle of fast plants takes place in only six weeks. Pupils can observe each stage of plant growth from germination through flowering to seed setting within that short time. We are often asked if there is a commercially available light bank for the primary classroom. Until about a year ago we were unaware of any suitable light banks. Recently, however, we have found a small company called *Plants in Primary Science (PIPS)* who seem to have found a sensible compromise.

Whilst the PIPS light bank may upset the purist because of its small light output, we can report that it works and works well. The box is constructed from melamine-faced chipboard, has double 60 cm fluorescent lamps and two sturdy carrying handles. The dimensions (W690 mm x D460 mm x H590 mm) allow the box to be placed on a table or bench top and offer a good height for viewing. Fast plants need to be placed close to the light source when newly seeded. Therefore the seed containers need to be raised towards the light (Figs. 1 & 2).

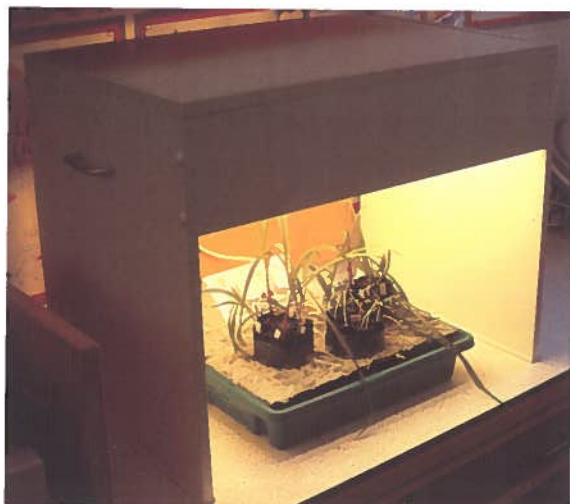


Figure 1 - PIPS Lightbank



The photographs below show such a light bank in the working environment of a local primary school. The teacher who trialled the light bank was delighted with the plant growth and the ease with which pupils could look after and observe the plants. Pupils from P1 to P7 were involved in the trial. There is not much more to say about an open box with an array of fluorescent tubes except that it is reasonably priced, does not take up much space, is easily moved and has been found to be a helpful addition to classroom work.

Should your school be interested in buying a light box, SAPS offer a £100 grant towards the purchase, details at the foot of column 1, page 3.



Figure 2 - Growing plants

To return to our own roots, i.e. making equipment in-house, here are a few photographs of a hand made light box comprising Dexion framing and two banks of 60 cm fluorescent lamps.



Figure 3 - Light unit

A member of our team made this for SAPS. Should you wish to build one all that is required is a hacksaw, spanner, screwdriver and lots of physical input. SSERC will be happy to offer advice on size and where to obtain a suitable fluorescent light unit.

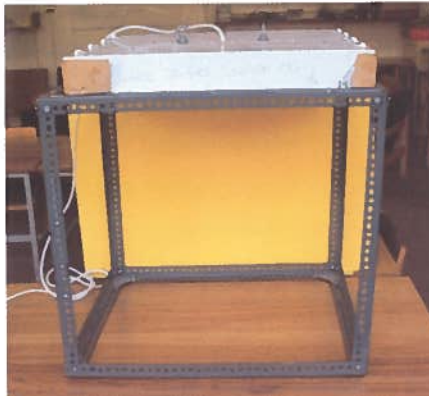


Figure 4 - Home-made lightbank

The Fungal Kingdom

Living things are classified into five Kingdoms, one of which is the Fungal Kingdom. Fungi are another group of living organisms that can be entertaining and informative in the classroom.

One common misconception is that fungi are plants. Plants are *autotrophs* i.e. they can make their own organic food from simple inorganic materials. They do this by the process of photosynthesis. Fungi are *heterotrophs* i.e. they need a source of food (complex organic material) which they can break down to obtain energy and the building blocks for their growth.

There is a wide variety of fungi available in the shops, perhaps the most familiar being edible mushrooms. The most common of these is the 'field or white mushroom' (*Agaricus bisporus*). In the wild, mushrooms usually grow in fairly specific habitats where they break down dead and decaying plant materials. Commercial cultivation takes place on a compost of cereal straw and animal manure under strictly controlled conditions such as in polytunnels or caves as in Derbyshire or Saumur in France.



Figure 5 - A good crop

The Oyster Cap mushroom (*Pleurotus ostreatus*) can be grown successfully in the classroom. These mushrooms are edible and are readily available in supermarkets. They are grown commercially on logs, a replication of the natural process. This takes 3 to 5 years but a recent innovation allows intensive growing in a compost of sawdust and agricultural wastes. A quick, simple and cheap method of growing Oyster Cap mushrooms, one which is suitable for the classroom, is shown in Figs 5 and 6. This method uses a new toilet roll as the growing medium. The toilet paper, which consists mainly of cellulose, provides the complex organic food source for the fungus. The edible part of the Oyster Cap mushroom, the fruiting body, appears within a month. The kit and full instructions are available from the National Centre for Biotechnology Education (NCBE). Contact details are provided at the bottom of page 3.

The life cycle of fungi

The life cycle of a fungus begins with a spore that grows when conditions are just right. Out of the spore wall grows a hypha that looks like a clear, microscopic fingertip. Hyphae grow and branch to form a network



Figure 6 - A different crop

of threads collectively called the mycelium. The mycelium extends through soil or living and dead organisms. When growing conditions are appropriate, the mycelium develops fruiting bodies. Mushrooms and toadstools are examples of fruiting bodies. It is these that produce and release spores.

Fungi find nutrition in a number of ways. Some act as parasites and feed on living material, usually doing some harm to their host (Figures 8 and 9 illustrate Bracket or Shelf fungi, the class *Basidiomycetes*, which can damage cut logs and standing timber). The Oyster mushrooms shown in Figs. 5 and 6 are an edible form of bracket fungi.

Many fungi associate with plant roots to the benefit of both plant and fungus. One particular strain forms an association with birch, aspen and conifers throwing thick coats of mycelia around the rootlets, thereby transferring minerals and other materials from the soil into the roots of the tree. In return the plant host supplies the fungus with sugars and vitamins.

Yet other fungi are useful in decomposing dead plant and animal matter; they act as recyclers of organic matter, obtaining food and energy from this material and recycling nutrients such as carbon and nitrogen. Hyphal tips secrete enzymes that digest organic materials and release the products into the surrounding environment. Such saprophytic fungi can often be seen on dead leaves, logs and other plant litter.

SAPS Sponsorship

Sponsorship of £100 towards the cost of a light bank is available to schools from SAPS. Once the application is approved, SAPS will order a light bank from PIPS who will then despatch it directly to the school with an invoice for the balance. Application forms can be obtained from SSERC or SAPS.

Kit suppliers

There are other suppliers of 'educational' mushroom kits; Ragmans sell inoculated birch logs, one for £16.50 or two for £24.50 including postage. An American site offers a selection of kits growing on different composts, the prices from about \$24 and will deliver to the UK. Do remember that inoculated logs take a long time to come to harvest. The minimum is usually about six months.

Science and Plants for Schools (SAPS)

Homerton College, Cambridge CB2 2PH

Telephone 01223 507168

E-mail SAPS@homerton.cam.ac.uk

National Centre for Biotechnology Education (NCBE)

School of Food Biosciences, The University of Reading

Whiteknights, PO Box 226, READING, RG6 6AP

www.ncbe.reading.ac.uk

Plants in Primary Science (PIPS)

27 Cheyne Avenue, South Woolford, E18 2DP

Telephone 020 8989 1793

E-mail lightbanks@hotmail.com



Figure 8 - Bracket fungus, off the shelf



Figure 8 - Class Basidiomycetes (Bracket fungus)

Ragman's Lane Farm

Lower Lydbrook

GL17 9PA

www.ragmans.co.uk/products/logcare.htm

Telephone 01594 860 244

E-mail info@ragmans.co.uk

American site

www.fungi.com/kits/indoor.html

Components & Materials

Item	Description	Price	Item	Description	Price
593	Miniature motor, 1.5V to 3V, 2mm dia. shaft	30p	789	MES (miniature Edison screw) bulbs 3.5 V	10p
614	Miniature motor, 3V to 6V, 2mm dia. shaft. Both motors above can be used for project work but they run at fairly high speeds, some gearing will be required. See worm/gear, item 811	45p	691	MES battenholders for above	20p
621	Miniature motor, 1.5V to 3V, now with 8 tooth pinion. The open body of this motor makes it ideal for showing how such a motor is constructed	25p	866	Lens end lamps, 1.2 V MES. Ideal for use where a narrow, concentrated beam of light is needed. Bargain pack of 100	£3.50
799	Pack of 24 cams, 6 of each of 4 shapes	£1.00	508	LED (light emitting diode) 3 mm, red, per 10	50p
800	Pack of 100 wheels, 39 mm dia., assorted colours, 3 mm axle hole	£5.25	761	LED 3 mm, yellow, per 10	60p
811	Worm and gear, 34 to 1 speed reduction	35p	762	LED 3 mm green, per 10	60p
817	Axles 3 mm dia., nickel plated, round ends, push fit on SSERC plastic wheels, gears and pulleys: 70 mm long, per pack of 4	40p	790	3V buzzer (works with solar cell see Item 838)	55p
818	As above but 95 mm long, pack of 4	40p	846	Sound module with 'melody' chip	£1.00
819	As above but 12 mm long, pack of 4	40p	838	Solar cell, 100 x 60 mm, max 3.75 V per cell	£2.10
820	Worms to fit 2 mm electric motor shaft, pack of 5	£1.00	839	Solar motor, body 25 dia. 12 mm long with shaft 2 mm dia 6 mm long	£1.70
821	Reducers 3 mm to 2 mm enables gears, pulleys and wheels, to be fitted to motor shaft, per 5	25p	840	Solar pack: one of each solar cell, solar motor propeller (801), and 3 V buzzer - with notes	£3.75
867	Reducers, 4 mm to 2 mm, as above, per 5	25p	836	Motor mounts, plastic, push-fit with self adhesive base pad for SSERC motors 593 & 614, 10pk	£2.35
868	Reducers, 4 mm to 3 mm, as above, per 5	25p	801	Propeller, 3 blade, to fit 2 mm shaft. Blade 62 mm long	35p
723	Microswitch miniature, lever operated	40p	792	Propeller kit with hub and blades for ten 3 or 2 bladed propellers	£3.50
822	Plastic toggle switch, low voltage	40p	794	Cotton reels (for making buggies, rubber powered tanks etc.) pack of 20*	£1.25
688	Crocodile clips, red, miniature, insulated	5p	796	Pack of 20 pulleys, 5 of each of 10, 20, 30 and 40 mm diameters.	£2.50
759	As above, but black	5p	837	Ring magnet, 40 mm o.d., 22 mm i.d.	35p
788	Crocodile leads, assorted colours, insulated croc. clips at ends, 36 cm long. Pack of 10	£1.35	815	Ceramic square magnet, 19 x 19 x 5 mm	15p
835	2 x AA Cell ('battery') holder	15p	823	Ceramic magnets, poles at ends, 10 x 6 x 22 mm	12p
845	2 x C Cell ('battery') holder	20p	861	Bimetallic strip, 10 cm length	30p
729	Battery connector, PP3 type, snap-on press-stud, suitable for Items 835 and 845	5p	882	Quartz clock movement, dimensions 56x53x17 mm, with wall hanging bracket, Suitable for dial thickness up to 10 mm. Includes plastic hands suitable for dial diameter to 200 mm. Requires an AA battery. See CD Clocks, Newsletter 18	£1.75
			884	Onager kit. Wood cut to length etc.	£2.00
			885	Chariot kit. Templates and parts	£2.00

A fully illustrated version of this list is posted on the **Shop** section of the SSERC members' website:

<http://www.sserc.org.uk/members/Primary/Surplus/body.htm>

This Newsletter and previous issues can also to be found in web page format on the Improving Science Education 5-14 website at:

http://www.ise5-14.org.uk/prim3/New_Guidelines/Newsletters/menu.htm

Prices do not include VAT or carriage. Please do not send payment etc. but await delivery and then pay on our advice note or invoice.

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