

Appendix

1. Recipes

WARNING – Phenol is poisonous and can be absorbed through the skin. Plastic utensils must not be used with mixtures containing Phenol.

Hexane should only be used in a fume cupboard and using eye protection.

Petroleum jelly - to coat slides, rods, etc. for spore trapping

150 ml petroleum jelly (100 g jar, Vaseline)
18 g paraffin wax of low melting point
10 g phenol

Heat in water bath to melt, stir with glass rod to mix.
To use, dissolve in Hexane or melt in a water bath.

Gelvatol (Polyvinyl alcohol, Moviol) – permanent mountant

35 g Gelvatol
50 ml Glycerol
100 ml distilled water
2 g phenol

Put Gelvatol and phenol in water and leave to stand overnight.
Add the glycerol and heat in water bath or warm gradually in a microwave, stir to mix.

Lactophenol – temporary mountant

20 g phenol
16 ml lactic acid
31 ml glycerol
20 ml Distilled water

Put ingredients together and stir, warm gradually to dissolve the phenol.

Glycerine jelly –sticky surface and permanent mountant

10 g gelatine
54 ml glycerol
60 ml distilled water
1.4 g phenol

Put all ingredients together and heat in a water bath or warm gradually in a microwave, stir frequently till melted
Melt to use, **do not boil.**

Stains

Trypan Blue and **Cotton Blue** can be used to stain fungal spores.
Basic Fuchsin and **Safranin** can be used to stain pollen.

Make up a small amount of stain and add just enough to the mountant to get the required depth of stain.

2. Suppliers

Stains and other chemicals

BDH,
Mail Merck Ltd.,
Hunter Boulevard, Magna Park,
Lutterworth
Leics, LE17 4XN, UK

M.J. Patterson (Scientific) Ltd,
Bramingham Business Park,
Enterprise Way,
Luton,
Beds, LU5 4UB, UK

Burkard spore trap, Gelvatol, Melinex tape and accessories.

Burkard Manufacturing Co. Ltd.,
Woodcock Hill Industrial Estate,
Ricmansworth,
Herts, WD3 1PJ, UK

Burkard Scientific Ltds.,
PO Box 55, Uxbridge
Middx, UB8 2RT, UK

Motor for whirling arm trap

McLennon Servo Supplies
Unit L
Yorktown Industrial Estate
Doman Road, Camberly
Surrey, GU15 3DE, UK

Graticules and micrometers

Graticules Limited
Marley Road
Tonbridge
Kent, TW9 1RN, UK

Other Suppliers

Advances in Life Sciences
9 Market Place, Brackley
NN13 7AB, UK

Biotrace International plc
The Science Park
Bridgend
CF31 3NA, UK

Copley Scientific Limited,
Colwick Quays Business Park,
Private Road No. 2, Colwick,
Nottingham NG4 2JY, U.K.

Lanzoni s. r. l.,
Via Michelino, 93/B,
40127 BOLOGNA,
Italy

SKC Ltd.,
11 Sunrise Park,
Higher Shaftsbury Road,
Blandford Forum, Dorset
DT11 8ST, UK

VWR International
Lutterworth, Leicester
LE17 4XN, UK

3. **Web Pages**

CABI Bioscience and CABI Publishing

<http://www.cabi.org>

British Aerobiology Federation

<http://pollenuk.worc.ac.uk/baf/BAF.html>

National Pollen and Aerobiology Research Unit

<http://pollenuk.worc.ac.uk/Next.htm>

Midlands Asthma and Allergy Research Association (MAARA)

<http://www.maara.org>

International Association for Aerobiology (IAA)

<http://www.isac.cnr.it/aerobio/iaa/index.html>

Italian Association of Aerobiology

<http://www.isao.bo.cnr.it/%7Eaerobio/aia/index.html>

For more information

<http://www.helios.bto.ed.ac.uk/bto/microbes/airborne.htm#Top>

4. **Counting sheets**

Two examples of counting sheets for a Burkard trap and one for the whirling arm trap are given. Counting sheets can be varied according to requirement. Records can be recorded mechanically.

Counting sheet for recording two-hourly pollen or spore counts and combined for daily pollen counts using the 12 transverse traverses method

STATION _____ DATE _____

Objective Magnification: _____

Eyepiece Magnification: _____

Traverse width (μm): _____
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Traverse number and direction	Time (BST)	Vernier reading	N ^o particles counted
1 ↑	10:00		
2 ↓	12:00		
3 ↑	14:00		
4 ↓	16:00		
5 ↑	18:00		
6 ↓	20:00		
7 ↑	22:00		
8 ↓	00:00		
9 ↑	02:00		
10 ↓	04:00		
11 ↑	06:00		
12 ↓	08:00		
Total number of particles counted in 24 h			
Multiplied by correction factor (CF) of:		Particles m^{-3} air	

Notes:

Counted by: _____

Counting sheet for recording daily spore counts using a mean of two longitudinal traverses method over 14 days (normally data are imported into a computer spreadsheet to calculate spores m⁻³ automatically, using the appropriate correction factor

TRAP : _____

SPECIES : _____

Objective Magnification: _____

Eyepiece Magnification: _____

Traverse width (µm): _____

Correction factor: _____

Date	Slide N°	Count A(→)	Count B (←)	Mean	Spores m ⁻³

Counted by : _____

Counting sheet for recording spore counts from whirling arm traps using five transverse traverses per quarter arm-section

TRAP: _____ SPECIES: _____

Objective Magnification: _____

Eye-piece Magnification: _____

Traverse width (µm): _____

Correction factor: _____

Trap N°	Date/Time	Count Arm 1					Count Arm 2					Total	Spores per arm	Spores m ⁻³	

Glossary

abiotic particles - particles that are not of biological origin e.g. soot or clay.
actinomycetes - filamentous gram positive bacteria.
aerobiology - the study of biological particles present in air, their occurrence, dispersal and impact.
aerodynamic diameter – diameter of a spherical particle with an equivalent terminal velocity or fall speed.
aerosol - material finely divided and suspended in air or other gaseous environments.
air spora - the population of biological particles present in the air.
alga – (pl. algae) aquatic lower plants containing photosynthetic agents.
allergen – a substance capable of causing an allergic reaction.
allergy - a reaction of the body's immune system to the presence of a foreign substance e.g.; hay fever or asthma.

anamorph – see imperfect stage.
anemophilous plants - wind pollinated.
angiosperms – seed bearing plants with ovules protected in the ovary, see: monocotyledons and dicotyledons.
apothecia – cup shaped structures containing asci.
ascomycetes – large group of fungi with spores formed in asci.
ascospore - spore produced in an ascus.
ascus – (pl. asci) sac-like cell in which ascospores (generally eight) are produced.
atmosphere - layer of gas surrounding the earth.

bacteria – microscopic organisms with genetic material not bounded by a nuclear membrane.
basidiomycetes – large group of fungi with spores (usually four) produced from a basidium.
basidiospore - spore produced from a basidium.
bioaerosol - an aerosol of particles of biological origin or activity suspended in air. Particle size may range from aerodynamic diameters of ca. 0.5 to 100 μm .
boundary layer - lowest layers of air near the earth surface.
BST – British Summer Time.
Burkard trap – Seven-day recording volumetric spore trap used by many for the daily spore count.

calibration – determining the accurate measurement of a device.

cascade impactor - a four-stage volumetric spore trap

concentration - number of items per given unit of media e.g. number of particles m^{-3} of air.

conidium – (pl. conidia) asexually produced fungal spores.

conifers – see: gymnosperms.

culture – organism grown on culture media.

cyclone - 1: a centrifugal device to collect particles from air. 2: low pressure weather system with air circulation in a clockwise direction.

daily counts – daily counts of pollen or spores, often for allergy sufferers.

daily (diurnal) periodicity – the cycle of high and low production of pollen and spores during a day.

deposition – accumulation of particles on a surface.

diatom – microscopic alga having an intricately sculptured siliceous cell wall.

dicotyledons – flowering plants with two embryonic seed leaves.

diffusion – dispersal of molecules or particles into a medium.

dispersal – moving of particles over a wide area.

eddy - circulating current of air.

ELISA – Enzyme-Linked Immunosorbent Assay: an immunological diagnostic technique

entomophilous plants – insect pollinated plants.

fall speed – see: terminal velocity.

ferns – spore bearing vascular plants, belong to the Pteridophyta.

filter – material used to trap particles present in a fluid.

filtration – process of filtering particles from a fluid.

flowmeter – an instrument to measure the volume of air passing through a sampler.

GMT – Greenwich Mean Time

gradient – change with space or time in the number or frequency of a feature e.g. high to low.

graticule – a scale on glass in the eyepiece of a microscope to enable measurement of objects.

gust – temporary increase in wind speed significantly greater than the mean wind speed.

gymnosperms – seed bearing plants with unprotected ovaries: e.g. conifers.

Hirst spore trap – the first automatic volumetric spore trap.

hourly concentration – concentration of particles in the air for each hour.

hyaline - descriptive term for a structure that is transparent or nearly so.

immunoassay – test for presence of an allergen e.g.: a specific organism or protein (see: ELISA).

immunology – study of the immune system and applications such as using antibodies specific to an antigen for the detection or identification of the organism that produces the antigen

impact – 1: have a strong effect as in the aerobiology pathway. 2: deposited by collision.

impaction – the sticking of airborne particles onto a surface following an active collision.

impactor – an apparatus for catching particles by impaction on a sticky surface or in a liquid.

imperfect stage - part of the lifecycle of certain fungi in which asexual reproduction takes place.

impinger - device to trap particles by their impaction onto a sticky surface or capture into liquid.

laminar boundary layer –microscopically thin layer of still air next to object surfaces, see: boundary layer,

liberation – release or setting a particle free.

lichen – symbiotic association of an alga and a fungus.

macrofungi – fungi having large sporocarps e.g. toadstools.

mesophilic - organisms with optimum growth temperature of 20-35° C.

micrometer – an instrument for measuring very small distances.

microorganism (microbe) - a microscopic organism.

mitosporic – imperfect fungi, spores produced asexually.

monocotyledon – flowering plant with a single embryonic leaf.

mosses – green plants with simple leaves and stems but no roots, belong to the Bryophyta.

mountant - substance used to embed an object between a microscope slide and coverslip.

myxomycete - slime mould.

nematode - unsegmented worm that can be saprophytic or parasitic on plants or animals

number of biological particles per m³ air – standard reference for quantifying the number of airborne biological particles, see: concentration.

orifice - the opening through which air is drawn into a sampling device.

pathogenic - able to cause disease.

perfect stage - part of the lifecycle of a fungus that undergoes sexual reproduction.

PCR, Polymerase Chain Reaction - a method to replicate a specific section of DNA

pollen - spore-like male gamete of a higher plant that fertilises an ovum leading to the production of a seed, may act as an allergen causing hay fever.

protist – single celled organisms e.g. protozoa.

relative humidity – measure of water vapour in air relative to the total amount possible to be present at that temperature.

release - see: liberation.

sampling – to take a representative sample of a medium, such as air, to determine its content.

sedimentation – accumulation of particles on a surface by settling.

spore - microscopic reproductive organ of a bacterium, fungus, moss or fern.

stage micrometer – a microscope slide with a scale 1 mm in length and divided into 100 divisions.

stroboscope – instrument producing a very bright flashing light used to measure rotation speeds.

suction trap – a trap which samples air by drawing a known volume of air into it under suction.

teleomorph – see: perfect stage.

teleutospore - a thick-walled resting spore of the rust fungi (and also used for the smut fungi although ustilospore is more correct) that produces basidiospores by sexual reproduction

terminal velocity – see: fall speed, the maximum speed a particle reaches when falling through still air due to a balance of acceleration due to gravity and drag due to air resistance.

thermophilic – organisms with optimum growth temperature of 40-50° C.

trace - the deposit of particles on a sticky surface.

traverse - the area counted along or across the trace.

uredospore - asexually produced spore of rust fungi with many successive cycles of infection.

Uridinales – rust fungi.

vernier scale – movable scale on a microscope stage to enable the position on a microscope slide to be noted.

viability – measure of the ability to live and grow.

virus – sub-microscopic organism comprising a strand of nucleic acid and a protein coat.

volumetric spore trap – type of trap with which the volume of air sampled per unit time is known.

wind – current of air.

wind tunnel – a tunnel through which air is drawn to enable the study of airborne particle release, dispersal and deposition.

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