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Nick Baker's POCKET MICROSCOPE

INSTRUCTIONS



Great for Nature Study,
Crime Scene Investigations
and Science Experiments!

WARNING!

For children over 6 years of age only.
For use under adult supervision.
Read the instructions before use.
Follow them and keep them for reference.
Not suitable for children under 36 months
due to small parts that could represent a
choking hazard.
Do not use the Pocket Microscope to
look directly at the sun, or other sources
of bright light, as this could damage
your eyes.



Batteries:

2 x 1.5V AA batteries are required.
If rechargeable batteries are used, these must
only be charged under adult supervision using
an appropriate charger. Never mix rechargeable
batteries and non-rechargeable batteries in
the microscope. Do not short circuit the supply
terminals.
Never use different batteries to those recommended.
Never mix old and new batteries, or different types
of battery.
Do not attempt to recharge non-rechargeable
batteries. Remove and carefully dispose of
exhausted batteries (recycle if possible).
Batteries must be inserted with the correct polarity.
The spring in the battery compartment corresponds
to the negative (-) end of the batteries.

To insert, replace, or remove the batteries, loosen
the screw with a Phillips (cross-head) screwdriver
and remove the access panel. Remove batteries
from the Pocket Microscope when not in use.

Mains Electricity: Never connect to mains
electricity. Children should be instructed about the
dangers of mains electricity.

Recycling: Please recycle used batteries and
electrical products using the facilities provided by
your local authorities.

If you have any customer service enquiries please visit:
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INTRODUCTION

**A Pocket (or Field) Microscope is a really handy
piece of kit to have whether you are interested in
science, nature, crime investigation or just want a
fascinating view of everyday items magnified way
beyond what a human eye can see.**

It is much easier to use and carry about than a 'desk'
microscope and is great for taking out and about on
field-trips.

In this booklet we will show you how to use the Pocket
Microscope, how to make and view slides and also
point you towards some interesting activities to do.

We hope that by using this Pocket Microscope and
reading this book you will learn a little about the
science of microscopy, but most of all we hope you
have great fun discovering the world close up!

CONTENTS:

- Pocket Microscope
- Textile Slide
- Insect Slide
- 3 x Blank Slides
- 4 x Specimen Pots
- 12 x Specimen Labels & Clear Covers
- Tweezers

You will also need 2 AA batteries (not included)

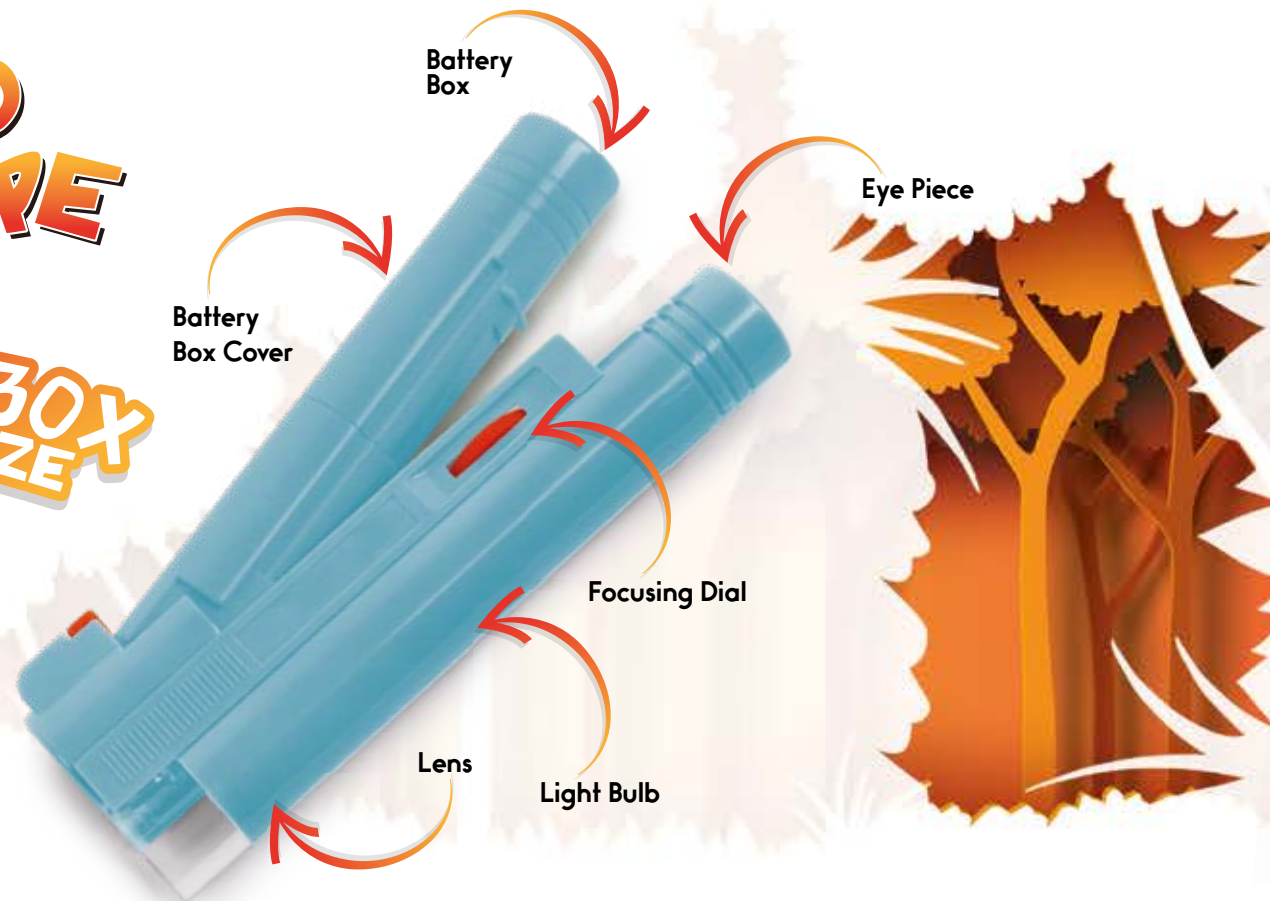
- Quality field equipment recommended
by naturalist Nick Baker

Designed for
children by
Nature Experts



Nick Baker's POCKET MICROSCOPE

**MAGNIFIES 30X
ACTUAL SIZE**



HOW TO SET UP THE POCKET MICROSCOPE

The first thing to do is put batteries in the battery compartment so the light works.

Open out the Pocket Microscope by unscrewing the battery compartment with a Phillips (cross-head) screwdriver. Insert 2 x AA batteries ('+' positive end inwards; '-' negative end towards the spring) then screw the cover back on securely using the screwdriver.

The light should now come on automatically when you open out the Pocket Microscope and switch off automatically when it closes. Therefore to save your batteries, always make sure it is closed when not in use.

Your Pocket Microscope is now ready to use.



HOW TO USE THE POCKET MICROSCOPE!

To see how the Pocket Microscope magnifies, find an object to observe; the slide containing insect body parts is a good place to start.

Put the slide on a flat and stable surface and open out the Pocket Microscope so the light switches on.

Then place the lens directly onto one of the samples of the wing part. Next, look through the eye piece to observe it close up. Sharpen the image by turning the focusing dial and 'Hey Presto' you should now see the grasshopper's wing 30 times bigger than normal in all it's glory!



Designed for
children by
Nature Experts





HOW TO USE THE EQUIPMENT

Specimen Pots and Tweezers

The tweezers are for picking up delicate items that may get damaged by fingers. The specimen pots are to keep your specimens safe from being damaged or contaminated. For instance, you can use a pot to keep hairs found at the scene of a crime or you can keep a dead insect in one to observe at a later date or keep as part of a project.

There are also some blank stickers included in the kit so you can label your specimens if required.



PREPARING A SLIDE

You don't necessarily need to use a slide with your Pocket Microscope. You can just hold it up against the object and observe. However, preparing a slide is the scientifically correct procedure to mount and preserve specimens and it also makes some items easier to see and study.

To make a slide, take a suitable sized piece of the item you want to observe, it should be very thin and flat like a butterfly wing for instance.

Cut out the part of the object you want to observe (about 5mm in diameter - use the existing specimen slides in the kit as a guide). Place it on one end of the slide then hold in place with a sticky clear label.

To finish, stick a blank white label at the other end of the slide and write down important details of what it is or perhaps where it came from and the date it was found.



PREPARING A SLIDE FOR LIVE INSECTS

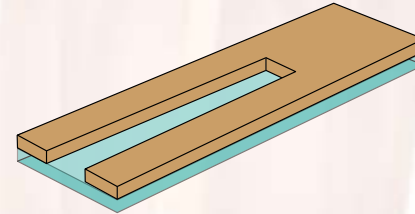
Live animals are really hard to study because they just won't keep still!

Here is a trick to allow you to observe very small insects like ants or similar sized creatures.

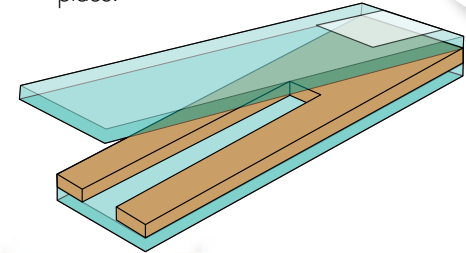
You will need some cardboard, a sharp knife and some sticky tape.

Note: The help of an adult will be required to do the cutting.

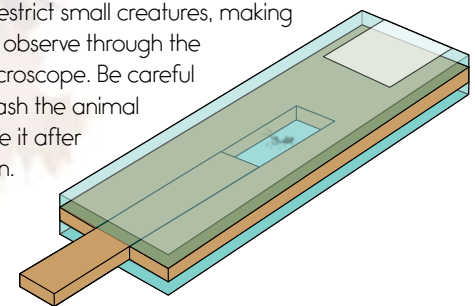
- 1 With a sharp knife, cut a piece of cardboard the same size as a blank slide. Then cut out the middle section as shown in the diagram.



- 2 Sandwich the card between two blank slides and use sticky tape on the closed end to hold in place.



- 3 Next slide the middle section of cardboard into the gap. You now have an area in the slide that will hold and restrict small creatures, making it easier to observe through the Pocket Microscope. Be careful not to squash the animal and release it after observation.



OBSERVATION ACTIVITIES - NATURE STUDY

Observing nature close up can be a real eye opener; there are just so many fantastic things to see and discover!

With the Pocket Microscope you can go into your garden or park and observe details you have never seen before, from a bird feather to the bark on a tree. Seeing things close up gives you far more appreciation of how beautiful and complex nature can be.

Take the 'Large White' butterfly for instance; no great 'looker' compared to some of its colourful cousins. But let's take a look at its life close up.

You can find the eggs in late summer on the underneath of cabbage leaves and to the human eye they look like small yellow dots. But magnify them and you will see their amazing ribbed, conical structure, like an alien pod from a 'Dr Who' episode, each one stuck individually to the plant by the female adult butterfly.



Microscopic image of Butterfly Eggs



The eggs then hatch after a week or so and minute larvae emerge from each egg. They are less than 1mm in length. Look at them close up with your Pocket Microscope and you will see they are perfectly formed caterpillars!

The caterpillars grow rapidly and then pupate (this is the part of every insect's life cycle where they develop a protective cocoon in which they transform to an adult). The butterfly then emerges the following year to start the life cycle over again.

If you come across a dead adult look at the body parts close up; the delicate antennae, the hairs on the abdomen and also see how the wings are formed from thousands of small scales overlapping like medieval armour...

There are really amazing things to observe at every stage of the butterfly's life!



Microscopic image of Caterpillars



Microscopic image of a Butterfly Wing



OBSERVATION ACTIVITIES - CRIME SCENE INVESTIGATION

A Pocket Microscope is a good piece of equipment to have at a crime scene; the analysis of tiny particles can provide vital evidence in catching the criminals who are responsible.

It's probably best to pretend you are at a crime scene rather than disturb an actual one and you could search your house for specimens to analyse like hairs, clothing fibres and dirt from shoes etc. See if you can match fibres found at a 'scene' to a specific item of clothing, or hairs to family members or pets.

On the fabric slide in the kit there are four common types of fibre; wool, silk, cotton and nylon. If you look close up at all four you will see there are differences between each type. The wool is almost transparent whereas the silk is much finer and a solid colour.



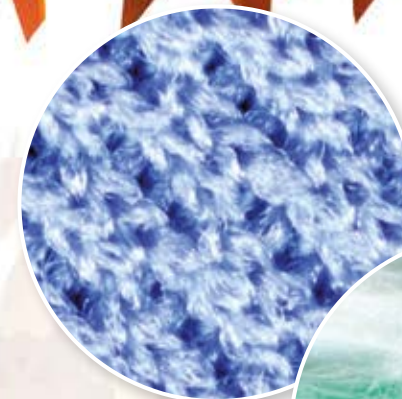
**Microscopic images
of different fibres**



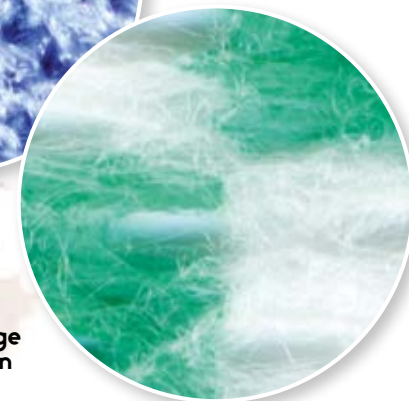
Try looking at an item of your clothing through the Pocket Microscope. See how the fibres are all neatly woven together in a regular pattern.

Try to identify the material your clothing is made from by comparing it to the samples you have already seen on the slide. You should be able to distinguish between cotton and wool or a man made fibre like nylon.

You should now have some idea of how professional crime scene investigators can match fibres found at crime scenes to the clothing of the criminal responsible.



**Microscopic image of
a piece of Woven Cloth**



**Microscopic image
of a piece of Spun
Cloth**



OBSERVATION ACTIVITIES - SCIENCE

Science is another exciting area where your Pocket Microscope can be used. Looking at crystal structures can be great fun!

OUTDOORS:

In winter try looking at a snowflake on one of the blank slides that come with the kit. There is a trick to doing this; put the slide in the freezer first to cool it down, then the snowflake doesn't melt straight away. A snowflake is made of water crystals and the really amazing thing is that every snowflake is different; they are like finger prints, no two are the same.

Microscopic
images
of a Snowflake



INDOORS:

Try looking at salt granules; they are a type of crystal and look quite different under your Pocket Microscope. Table salt crystals are irregular in shape because they have been eroded by friction with each other (like sand on a beach) but a newly formed salt crystal should have a cubic shape.

Here's an experiment:

Dissolve some salt in a little warm water and then add one drop to two of your slides. Let the water on one slide evaporate slowly and then put the other in a warm place so the water evaporates quickly. When both slides are dry, look at the difference between the two. The crystals should look different because the shape of a crystal often depends on how quickly the liquid dries out!



Microscopic image
of Salt Crystals

TYPES OF MAGNIFYING TOOLS

There are many tools available that will help you look at an item close up.

The most basic and cheapest tool is a magnifying lens. Most common ones magnify up to about 6 times. An interesting fact is that in the time before they were invented, scientists realised that a drop of water could act as a lens. Try it yourself; put a drop of water on a slide and look through it at an object.

It works surprisingly well!

Then there is the 'Pocket Microscope' or 'field microscope' which magnifies 30 times. It is compact and easy to carry making it ideal for studies outside.

A more powerful tool is an 'optical' or 'desk' microscope. These are indoor instruments which are more difficult to use than a Pocket Microscope.



Magnifying Lens



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However, a standard one has several settings and can magnify from 100 to 1200 times. A fairly good quality one for home or school should cost about £30.00, but a professional one can cost thousands of pounds and can magnify up to 2000 times.

Around 70 years ago scientists invented an electron microscope which can magnify 250,000 times. These work differently to optical microscopes using a beam of electrons rather than light. They are very expensive and only found in sophisticated laboratories.

One really effective and fun bit of kit that has been on the market a few years is a digital microscope. It works similar to an optical microscope but hooks up to a computer where the image is viewed on a screen.

The great thing about these is that you get a fantastic image that can be saved or printed. A good one for home use will cost about £60.00 and will magnify 200 times.



Desk Microscope



Digital Microscope