

The Hitachi STEM education programme in the United Kingdom - Information for schools



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What are we offering?

- Free loan of the portable SEM for up to half a term.
- Full training and support.
- Materials to assist you with teaching and training.
- Free transport of the SEM to and from your school.



SEM Details

Hitachi TM4000Plus

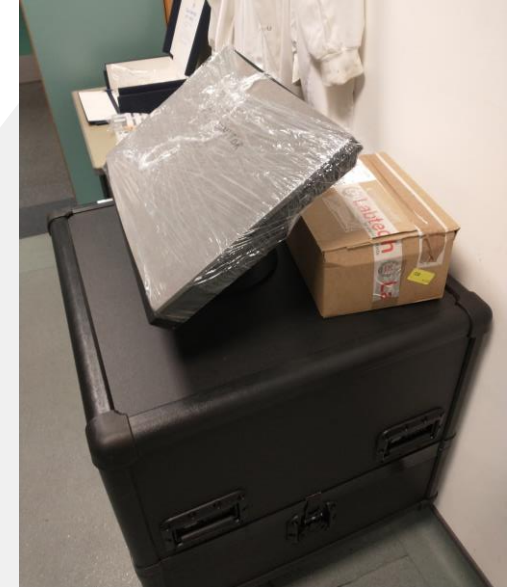
- Portable SEM with Secondary and Backscattered electron detectors
- Variable Pressure design (no sample coating required)
- Oxford Instruments Aztec One EDX system included
- Can carry out point analyses and mapping



**What does
portable
really mean?**

We commissioned photography of the SEM in Museum gallery spaces, to show how easy it is to move and how it requires only a single power cable for connection.



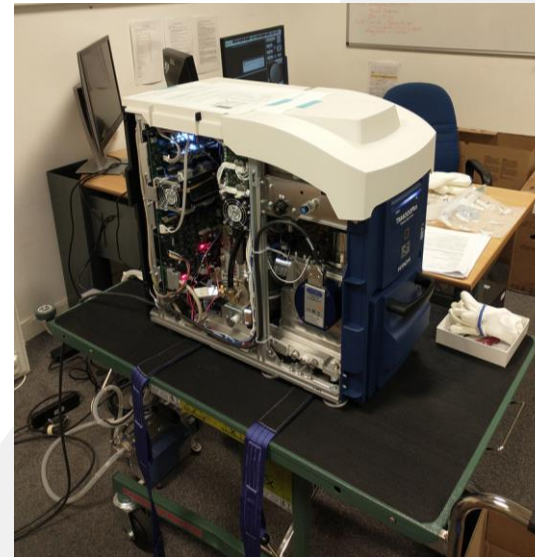
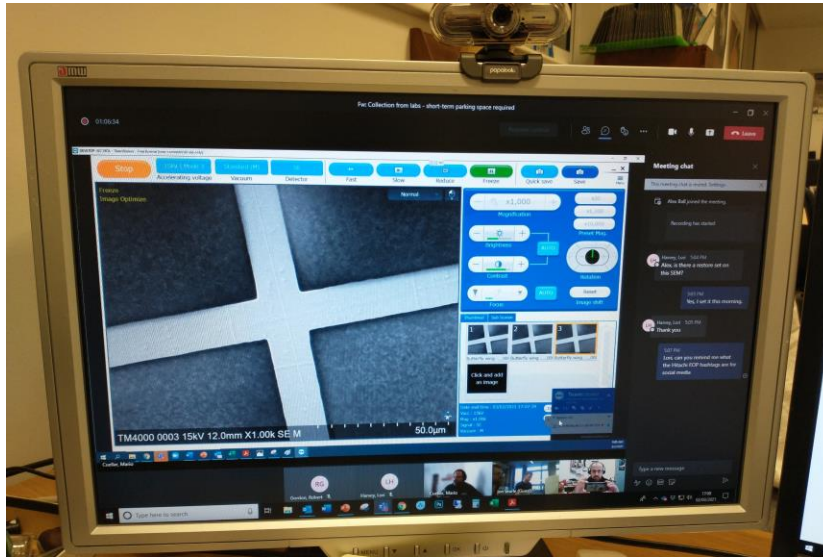


Packaging the SEMs for transport

The SEM weighs about 50kg. With the accessories the whole package weighs 80kg.

Nevertheless, two people can easily lift it into a van or estate car.

Schools that are close to the NHM can collect the microscope, or we can send it on a standard shipping pallet at no charge.

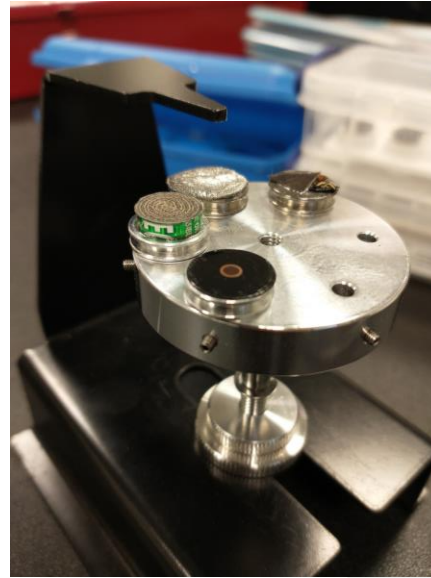
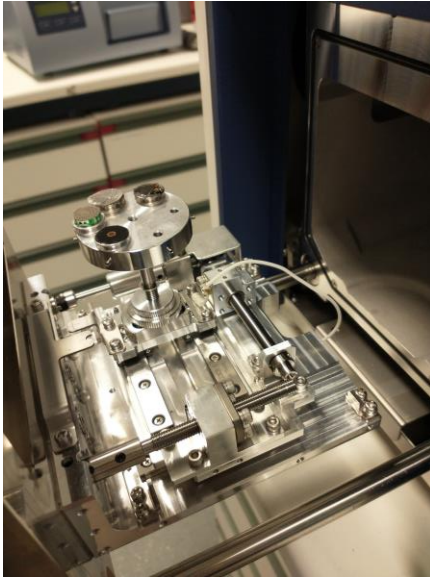


Installation support and training

We provide remote support for installation and training via Teams and Team Viewer.

Unpacking and installation takes less than an hour.

A follow-up call to provide more training and to answer questions is provided.



Getting started straight away

Each SEM comes packaged with a set of demo samples which allows teachers and students to immediately explore the capabilities of the SEM.

We also included kits to prepare your own samples for examination.

Supplied samples (1/2)



- Cross section through rechargeable battery
(Good for EDX analysis)
- Copper grid on carbon tab
(Test sample for SEM set up)
- Bird feathers
(Good for imaging)
- Mechanical watch
(Good for EDX imaging)

Supplied samples (2/2)



- Geological sample
- Beach sand
- Shark skin
- Human hair
- Sections of butterfly wing
- Collection of chemical compounds
- Sugar and salt
- Variety of metals
- Uncoated beach sand

Preparing your own samples



We provide stubs and self-adhesive carbon tabs to mount your samples.

You can also use BluTak to mount samples temporarily.

Most samples need no further preparation.

However, samples must be dry.



How hard is the SEM to operate?

The SEM user interface is simple to use. It can usually be used on automatic settings. Most users understand it intuitively and require only a few minutes training to master the basics. More complex functions are available if you want them, and full training and online support will be provided.

Stop

5kV | Mode 3

Accelerating voltage

Standard (M)

Vacuum

SE

Detector



Fast



Slow



Reduce



Freeze



Quick save



Save



Menu

Run

Normal

x100

Magnification

x30

x1,200

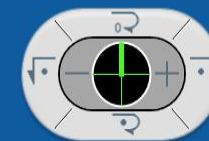
x10,000

Preset Mag.

Brightness

AUTO

Contrast



Rotation

Focus

AUTO

Reset

Image shift

Thumbnail

Sub Screen

Click and add
an image

Date and time : -

Vacc : -

Mag : -

Signal : -

Vacuum : -

Display folder

Select all

Rename

Delete

Report

4:37 PM
2/10/2021

TM4000 0008 5kV 16.8mm x100 SE M

500µm

Type here to search

What have schools been doing with the SEMs?

- Using the SEM as a teaching resource for class work
- CREST award individual projects
- Spectroscopic analyses of antique coins
- Examination of biological structures for biomimicry
- Comparative studies of insects
- Failure modes in different metals
- Microstructures in iridescent materials
- Analyses of 3D printed surfaces
- Welded metals in cross-section
- Linking remotely to other schools for collaborative projects

How are we doing?

Over 1200 students have now used the SEM in the UK programme.

"I have to say, I've never been happier to do so much overtime, than in the last few days! It's really quite hard to stop, once I'm sitting in front of it!"

– Science technician Tonbridge School

"Just so you know, there appears to be a big buzz around this project! My friend works for the Ogden Trust and they have already gotten wind of schools having the microscopes and are hearing about primary schools being keen to get involved. Very exciting!"

– Teacher London South Bank University Academy of Engineering

"As a young black female, I rarely get opportunities like this. Using the electron microscope was an amazing experience. I learned so much in a short period and would be ever so grateful if we could continue using it."

- Student London Southbank University Academy of Engineering

A collaborative project



Oxford Instruments – X-ray microanalysis for the portable SEM



The Royal Microscopical Society – expertise in coordinating a large scale instrument loan programme to schools in the UK



The Natural History Museum – expertise in outreach and education



The Institute for Research in Schools – expertise in developing research programmes within schools

The project leaders

Dr James Perkins

High school head of science
with academic expertise in
electron microscopy

Dr Alex Ball

Head of Imaging and
Analysis at NHM, RMS
Fellow with 25+ years
experience in SEM

The “small print”

Unpacking the SEM

- When we deliver the SEM it will be packed safely and needs to be unpacked and a set of “transit” bolts removed. You will need at least two people present for safe handling of the SEM which weighs around 50kg and will need to be lifted into position. **We will oversee the unpacking and set up process remotely for safety reasons.**

You must not unpack the SEM unsupervised.

- We will also cover a basic “remote health check” and record some initial images.
- Finally, we’ll provide some basic initial training.
- This process takes about 90 minutes (30 minutes to unpack and set up, 15 minutes for the initial imaging and then about 45 minutes for training).
- We will then follow up a couple of days later with a more in-depth training session (typically 2 hours).
- When we unpack the SEM we’d like you to take some photos of the process so that when we go to pack up the SEM again you have some reference images. We do the same at our end, so we can ensure that the SEM is packed safely for transport.

At the end of the loan

- At the end of the loan period we’ll schedule a second session to assist you in securing and packing the SEM for transport and we’ll ensure that the microscope is booked for return transport (if we use a courier), or for you to return it if you are using a van.
- This requires a 40 minute video chat session and two people to manage any lifting or movement of the SEM.

The “small print”

Will test samples be supplied?

- YES - We provide a set of samples that you can use for training and to explore the capabilities of the SEM. In future we hope to develop these into full teaching resources, but for now they will give you and your students some interesting materials to explore.

Are there any training resources supplied?

- YES - We provide a good quality guide to electron microscopy and there are some online resources. We will also supply additional copies for your students, together with a guide aimed at younger students.

Do we need to buy any supplies?

- NO - We provide a bag of “stubs” to mount samples onto and can provide advice for mounting samples for examination. You can buy more stubs from one of the UK laboratory suppliers and prepare samples in advance if you need to. We can provide all the necessary details if you wish to do so.

What if something goes wrong with the SEM?

- The SEMs are very reliable and most problems are simple software hiccups that are easily resolved. However, we can provide remote assistance if needed. We have had to replace an SEM filament with a school remotely, but this went smoothly and the school were back up and running in less than 40 minutes.
- At worst you will need to pack up the SEM and return it for repair, or we can try to send a service engineer to you.
- The SEM is fully insured through Hitachi, both whilst on site and during transport.

The “small print”

What do we want in return?

- We want SEM images, photos of you and your students using the SEM, your stories, reactions and quotations. We need to fill out a report for Hitachi every month, so we need SOME statistics. This helps us to build up a picture of how the SEM is used as an educational resource and we can develop materials or provide additional resources to support you.

Data we want to gather:

Teachers trained	Teachers as users	Students trained	Student projects	SEM in lessons	Additional schools
How many teachers or technicians have been trained to use the SEM independently?	How many teachers have used the SEM (perhaps under guidance)	How many students were trained to use the SEM independently?	How many students used the SEM in project work?	How many students attended lessons where the SEM was used as part of the lesson?	Did you engage with other schools? How many students were involved and how did you do this?