

Training and Research Technical Professionals Working Group
UK Physical Sciences Electron Microscopy Roadmap Report March 2025

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Key takeaways:

- *Status:* UK physical sciences electron microscopy (PS-EM) currently has a strong training presence along with an ability to offer more specialised training as demand evolves. Support for RTPs is variable.
- To maintain the globally leading role held by the UK in the PS-EM community it is critical that we further develop our Training and Research Technical Professionals (RTP) landscape.
- Towards this it is key to build a higher level of awareness of the level RTP technical expertise required and timescales needed to properly maintain equipment, carry out research, analyse data and train both RTPs and researchers across all stakeholder levels
- *Challenge:* The current UK PS EM Training and RTP landscape is built from a diverse range of resources (including EMAG, RMS, EMS, national facilities, commercially provided training)- and thus robust to variations in any one scheme. However, as a result this landscape is also complex to coordinate, navigate and organise. The limiting factors currently are overall coordination and publicity.
- *Target:* It is proposed that a network be set up, of a similar style to Bioimaging UK, to provide coordination of community, resources and funding: both aligning existing initiatives and progressing new ones.
- *Target:* To build from the subsequent newly coordinated UK PS-EM landscape, a large scale materials characterisation CDT (or similar) would be an effective way to maintain high levels of expertise moving into the future.

Introduction

Training, alongside career support for research technical professionals (RTP) are the keystones underlying microscopy. In this document we look at how these aspects have developed across the UK since the last roadmapping process, their current status in our community, their current status in other related communities and from these, conclude the most useful future direction of travel.

Herein, by training we are referring to courses and technical education primarily of postgraduate research students (PGRs) and early career researchers (ECRs). This encompasses long term programmes, intensive summer schools, and regular or one-off workshops. By RTP development and support we are looking at the mechanisms by which these professionals develop and enhance their skills to support their long term career progression.

Previous roadmap outcomes

The previous roadmap developed across 2014-2016 encompassed many of the topics we are revisiting in the present process. Within the remit of this working group (WG) we have reflected on the relevant outcomes of the previous process and considered their impact on the landscape today.

In the previous roadmapping process a number of proposals were made which included more coordinated training both virtually and by establishing centres of excellence such as cohorts of doctoral students; forming a network to promote collaboration, equipment sharing and best practice; have a point of contact who could give external representation of the EM community to external organisations.

Since then, the UK PS-EM landscape has evolved significantly. Centres of excellence in the form of national facilities have been newly launched (ePSIC) and more firmly established, with proposals for RUEDI in progress. Establishment of ePSIC has led to the annual data processing course which currently hosts around 100 attendees virtually. Funding such as open access schemes on new equipment (including those supported by Royce) have enabled 'free at point of use' access at multiple UK-EM facilities. Additionally, for postgraduates, a Materials Characterisation CDT (Imperial), training students in electron microscopy amongst other characterisation techniques, ran for 8 cohorts. In parallel to these, Bioimaging UK became much more established, while IOP-EMAG and RMS continue to support training and conferences for all UK PS-EM microscopists - alongside the wider European and International communities (EMS and IFSM, respectively). There has also been a change in funding bodies now allowing RTPs to be PIs or Co-Is on grants.

Current UK PS EM T&RTP landscape

The training landscape across the UK includes:

- Formalised schools and courses:
 - RMS EM Spring school, Leeds. 5 full days, annually. Basic intro to EM
 - ePSIC Hyperspy course, Online/Diamond. 5 days, annually. Data analysis focussed

- EMAG courses (pre-conference workshop). Topic varies with community demand
- RMS-DAIM Image Analysis course. Newly launched - covering Bio and PS communities. SuperSTEM summer school. Historically biennially - but has not run since 2020 due to staffing limitations. Pitched at a more advanced level than the RMS EM Spring school.
- User group meetings and workshops run by manufacturers e.g. Protochips, NanoMEGAS, Gatan, JEOL, ThermoFisher etc.
- Further afield: training schools and workshops run across Europe (e.g. QEM)
- **Challenge:** Funding for microscope time for post graduate student training is significant. High-end instrument time has a substantial cost, and often universities are expected to cover these costs. We highlight the comparison with synchrotron time where costs are not left to individual institutions.
- **Target:** Whilst courses and funding sources are available it is not always clear how to find them. A coordination of these resources would prove invaluable.
- **Target:** Materials characterisation CDT or similar would be a powerful tool to build on a newly coordinated UK PS-EM landscape (we note here that the related Imperial Materials Characterisation CDT has not been renewed)

The RTP development landscape across the UK includes:

- Increasing status of 'Technicians Commitment'. Supported by RMS, IOP and many of our institutions
- Community events in our field are normalising around subsidised or supported registration costs for RTPs at conferences
- Continued existence of the EM-UKI conference series, which is particularly focused on RTP development and community building
- RTP specific training available via RMS, direct-from-manufacturer and new Royce mechanisms (e.g. (<https://www.royce.ac.uk/projects/national-technical-platform-for-materials-innovation/> and <https://www.royce.ac.uk/events/big-data-handling-for-rtps-31mar1apr25/>)

However

- Progression and promotion routes for RTP staff aren't uniformly established and are in the early stages of being developed
- In some cases RTP contracts prevent them directly contributing to or carrying out their own research. This is not suited to EM facilities
- RTPs can now be included as PIs or Co-Is in grants by funding bodies, but not all Universities/Departments are aware, or enabling this to happen
- Some funding is available in the form of reduced conference rates or small travel grants. Further support would be valuable with both RTP Fellowships (similar to those established for Research Software Engineers) and ensuring continued access to resource only grants
- Current challenges include:
 - Advanced microscopy equipment requires highly trained, skilled RTPs to support it
 - Recognition of RTP input to research, and the time and expertise required (inc. data analysis)
 - The need for funding to be available to up-skill researchers (students and postdocs) and RTPs through training and development courses, visits to other institutions and participation in meetings and conferences.
 - The need for clear career pathways for RTPs

Overview of Training and RTP coordination networks in similar groupings

Several networks exist globally which provide the coordination of resources and community training which is urgently needed in the UK Physical Sciences Electron Microscopy landscape. These include Bioimaging UK, Euro-Biolmaging and Microscopy Australia. Of specific relevance to our discussion here is Bioimaging UK, which grew as follows:

- 3 rounds of funding from BBSRC since 2014 (between 3-5 years each). We note here however that PS-EM facilities and training is significantly more expensive than bio-equivalents.
- Staffed at 1x 0.5 FTE (shared BBSRC/RMS funding) to run the network, and a small % FTE across PI and Co-Is
- Remainder of the grant has funded community meetings, travel bursaries, workshops and related initiatives.

The development of the Biolmaging UK network has significantly strengthened the biological microscopy community both within the UK and as an externally recognisable 'brand' internationally and beyond academia. In this way, an initial core network has been used as impactful and effective leverage to draw together the relevant community, and to improve communication both within and beyond that community. A similar network for the UK Physical Sciences Electron Microscopy community would be an impactful way to leverage our existing training and RTP landscape to build a much more cohesive whole.