# A new Collaborative Computational Project for Volume Electron Microscopy

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Volume Electron Microscopy

Volume EM (vEM) is a collection of techniques used to image the structure of cells and tissues through continuous depths of at least one micrometre, at nanometre resolution, based on both transmission electron microscopy (TEM) and scanning electron microscopy (SEM).
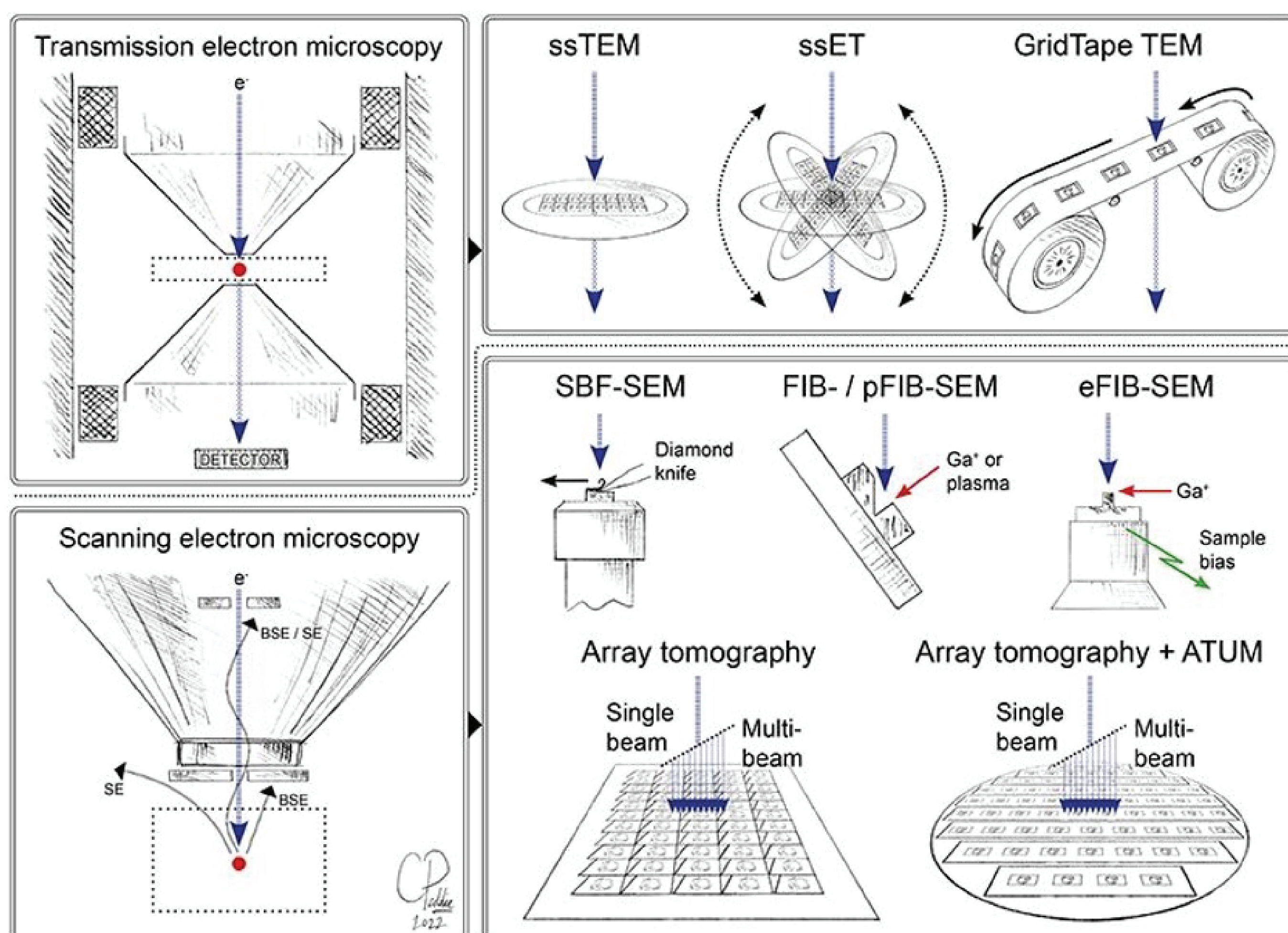
Overview of the diversity of vEM technologies from [1], original artwork by Chris Peddie, Licence CC-BY-4.0

These techniques now routinely generate terabyte scale datasets, which are extremely challenging to analyse, requiring a community of biologists, microscopists, image analysts, and software engineers to coordinate efforts to establish best-practices and ensure a wide range of scientific questions can be accurately and efficiently addressed.

CoSeC

Computational Science Centre for Research Communities

UKRI Science and Technology Facilities Council

Scientific Computing

CoSeC is a large and skilled group of Research Technical Professionals (scientists, RSEs, management and support) within UKRI-STFC.

Based in national labs at Daresbury and Harwell campuses, with funding to provide research support to 25 communities.

Funding stream from UKRI Digital Research Infrastructure (DRI) supports new Collaborative Computational Project (CCP) activity, and the creation of CoSeC Fellowships and placement schemes.

Cross-cutting activities allow computational communities to benefit from the latest advances in a diverse range of scientific domains.

Collaborative Computational Projects

CCP4, CCP-Turbulence, CCP-EM, CCP5, CCP-QC, CCP-NC, CCPi Tomographic Imaging, CCP-NTH, CCP-WSI, CCPN, CCPBioSim

High End Computing Consortia

MCC, HECBioSim, HEC-WSI, UKCP, UK-COMES

Community Building

There are many stakeholders in the vEM data analysis pipeline, from biologists and microscopists to computer scientists and analysts. A key aim of this project is to ensure all parties get the maximum benefits from a wide range of domains.

A community survey will establish the highest priority goals and guide the long term technical efforts.

A series of community events and hackathons are planned to establish a roadmap for the Collaborative Computational Project (CCP) and to coordinate technical efforts.

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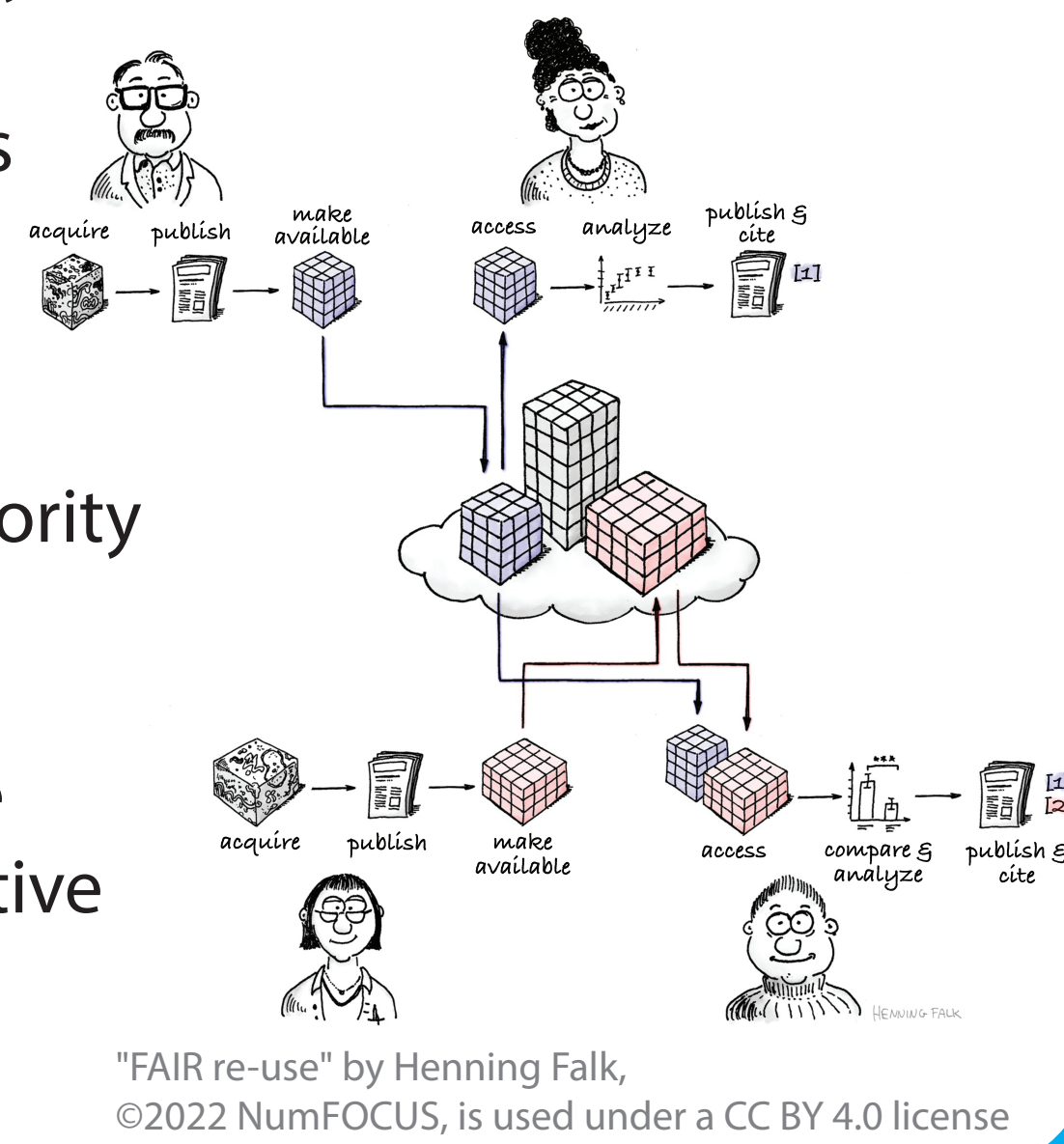
Research Software and Data Managment

As datasets increasingly reach the terabyte scale, efficient handling and processing are critical. Modern tools and techniques, such as Artificial Intelligence (AI), Next Generation File Formats (NGFF) and heterogeneous computing, offer great promise, but require significant RSE effort for robust implementation.

Pilot projects are underway to develop methods to translate technological advancements into sustainable and open solutions that are accessible to all end-users, regardless of their computational background.

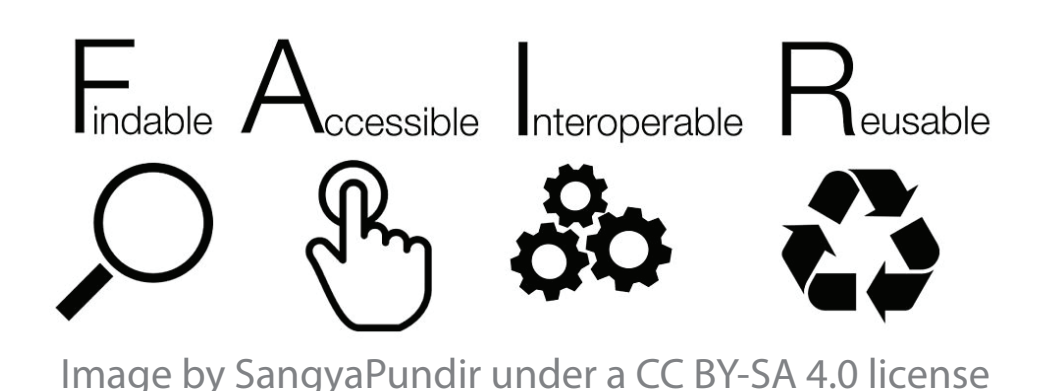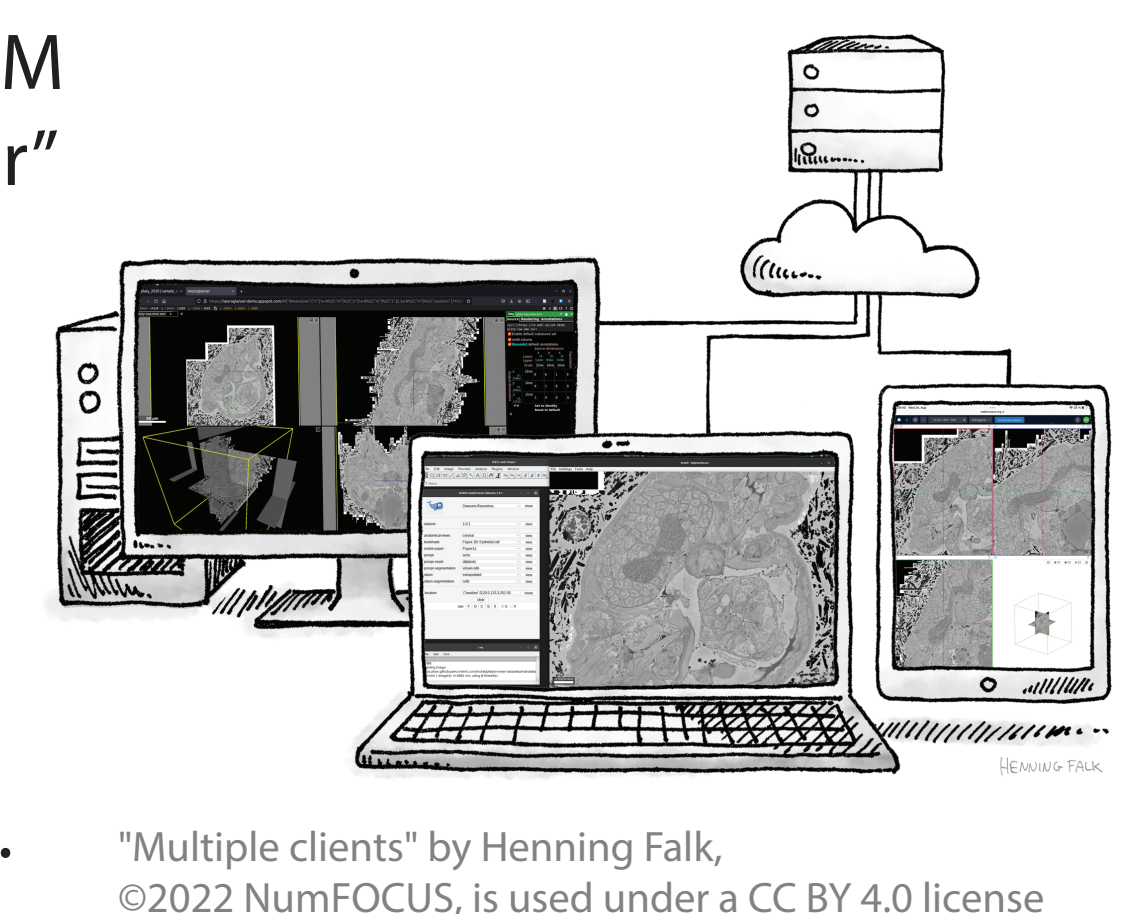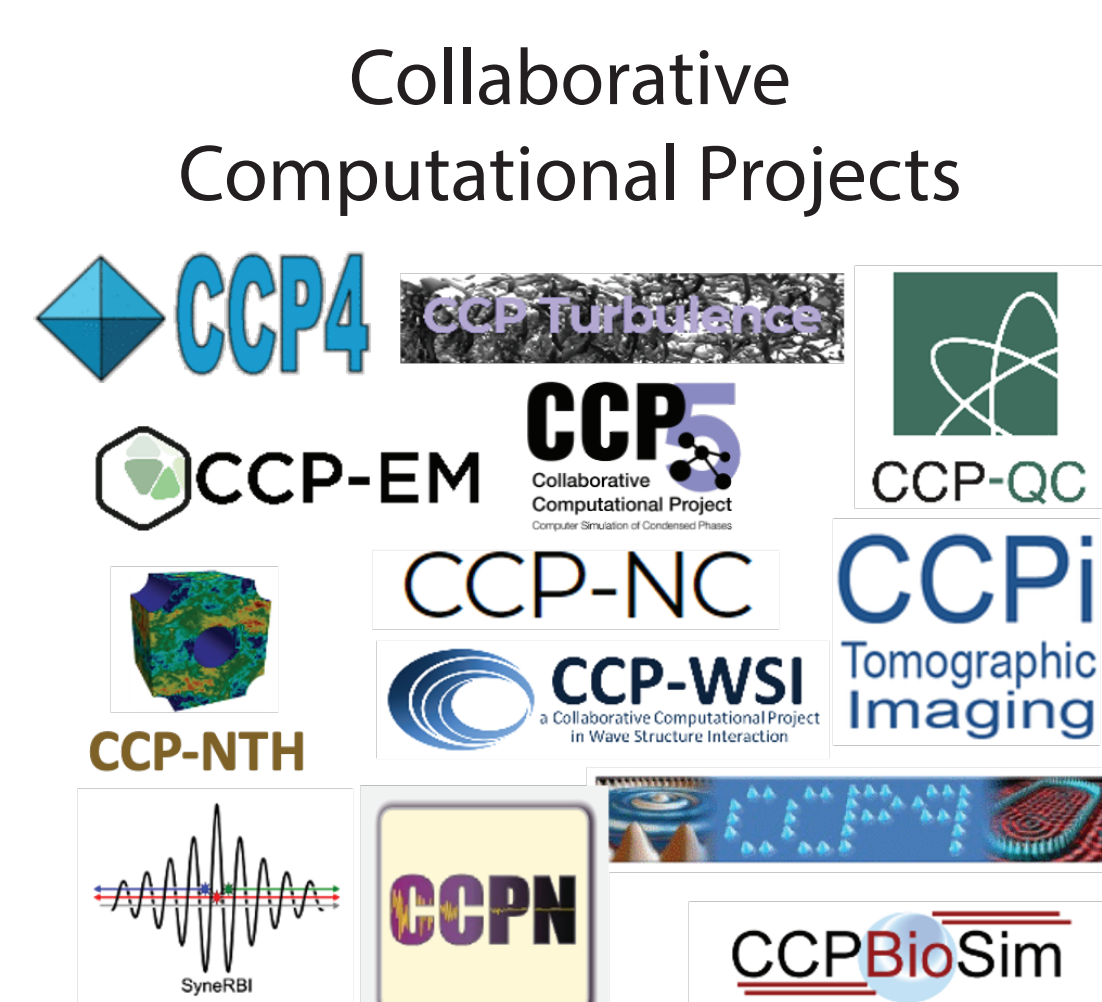"Bea computes" by Henning Falk, ©2022 NumFOCUS, is used under a CC BY 4.0 license
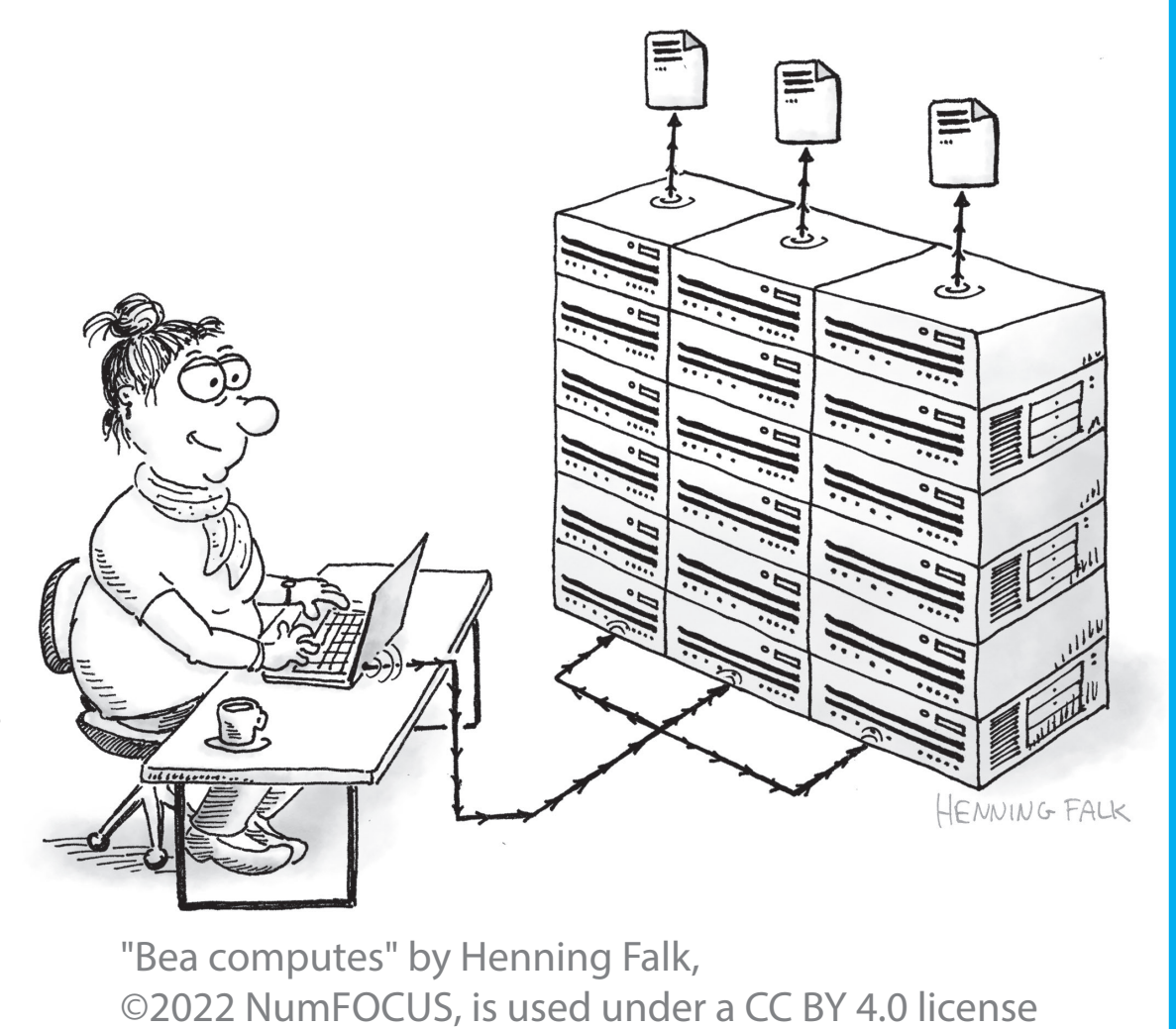
Training and Skills

The rapid advances being made in analysis of vEM data often get stuck in the "developer/super-user" group, never reaching the end-users who need them the most.

In order to disseminate the knowledge to make use of these cutting-edge methods to a broader audience, we will support the community by developing training materials and infrastructure.

Materials will be shared openly, allowing development and refinement by the community.

Ensuring data adheres to FAIR principles (Findable, Accessible, Interoperable, Reusable) will be a key message throughout.

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Findable **A**ccessible **I**nteroperable **R**eusable

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How to get involved

If you're interested in getting involved, or finding out more, please email Martin.Jones@crick.ac.uk and look out for upcoming announcements about events and activities!

References:
[1] Collinson, L.M., Bosch, C., Bullen, A. et al. Volume EM: a quiet revolution takes shape. Nat Methods 20, 777–782 (2023). https://doi.org/10.1038/s41592-023-01861-8
[2] Falk, H. zarr-developers/zarr-illustrations-falk-2022 | Zenodo [WWW Document], 2022. URL https://doi.org/10.5281/zenodo.7037367 (accessed 14/4/2025)

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