



Beyond the Slide: Building Community through the RMS Histology FIG

Steven J. West
Sainsbury Wellcome Centre, UCL

BiolmagingUK Meeting - 30th June 2025

Why a Histology FIG?

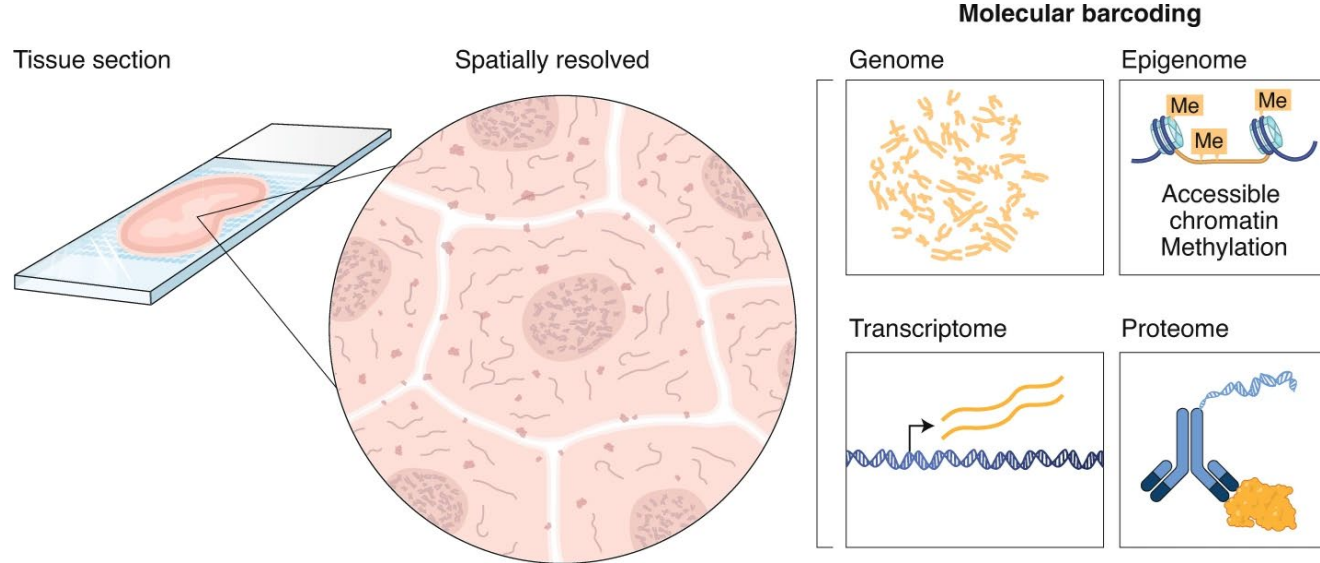
Histology at a Technological Crossroads



The Omics Revolution:

The central position of a strong hypothesis has all but vanished, and the new mindset is exploratory data analysis.

'The —omics revolution', Systems Biology: A Very Short Introduction, Voit, Eberhard O. 2020



Next-generation spatial barcoding of biomolecules from tissue sections for spatial multi-omics.

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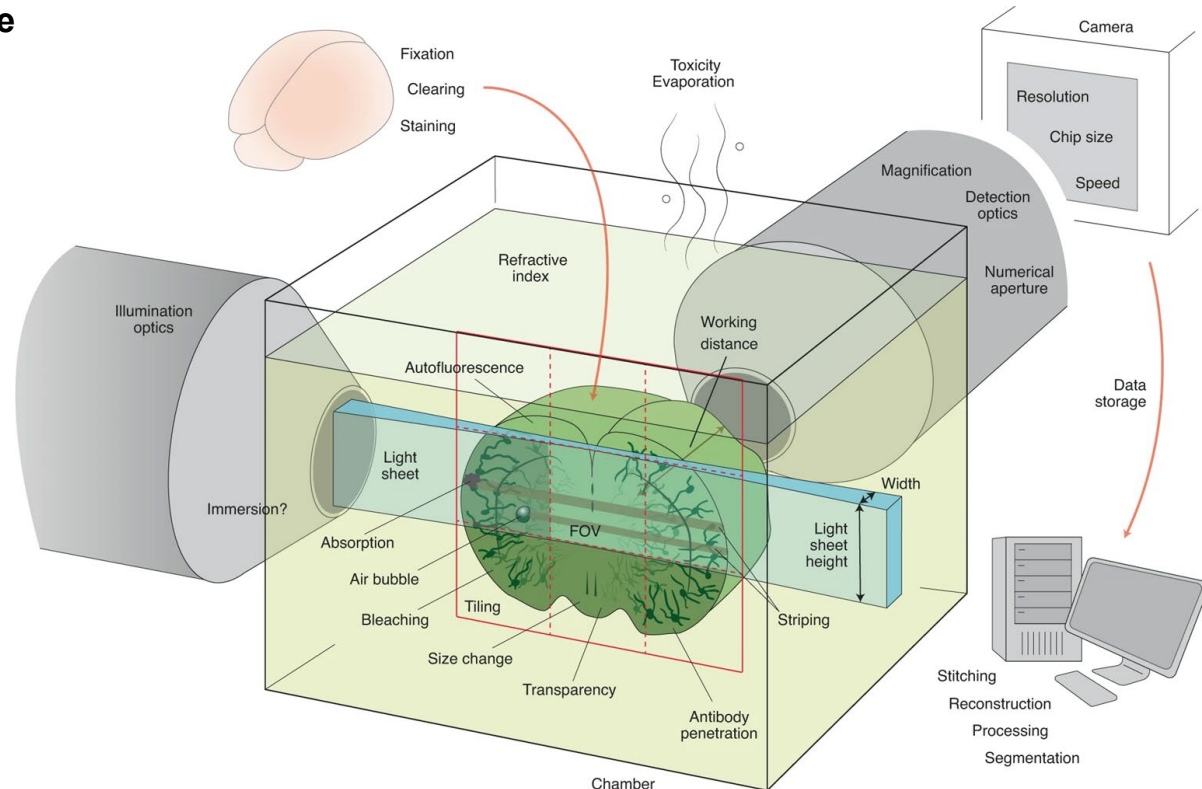
Histology at a Technological Crossroads



Transformative Histology & Imaging Te

Advances in histology (tissue clearing), and microscopy (optical sectioning, multi-photon)

enable high quality 3D reconstructions of biological structures



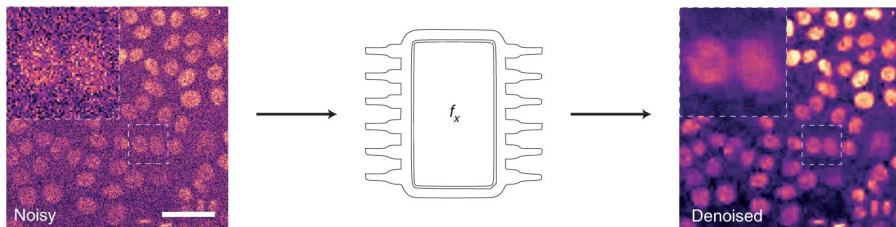
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Histology at a Technological Crossroads



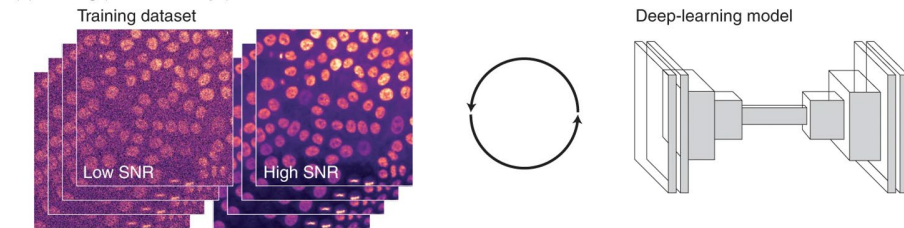
AI Enhanced Analysis:

Classical algorithm

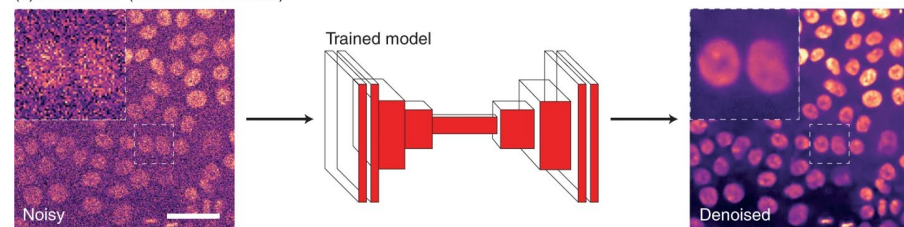


Deep-learning algorithm

(1) Training (minutes to days)



(2) Predictions (seconds to minutes)



Deep learning potentially offers advantages in data processing, but must be deployed responsibly to yield valid insights

Laine, R.F., Arganda-Carreras, I.,
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Why a Histology FIG?

Reproducibility in Histology



Why Reproducibility Matters

Variability in histological procedures directly impacts:

- Signal-to-noise ratio (SNR)
- Geometry of biological structures
- Interpretability of labelled structures

Without reproducibility:

- True structure vs. Artefact?
- Cross-lab: systematic differences in procedures
- Biological insight becomes unreliable

Pathways Toward Reproducibility

Ideal Goal: Standardisation of Protocols

- Enables direct comparison of data
- Ensures known effects of each step
- ⚠ *Challenging to achieve across labs/departments*

Practical Goal: Quantifying Procedural Variability

- Document procedural metadata per dataset
- Characterise how variations in steps affect outcomes
- **Community Standard:** Define **tolerance intervals** for key parameters (e.g. fixation time, section thickness, antibody dilution)

Why a Histology FIG?

Histology as a Scientific Discipline



Histoarchitecture

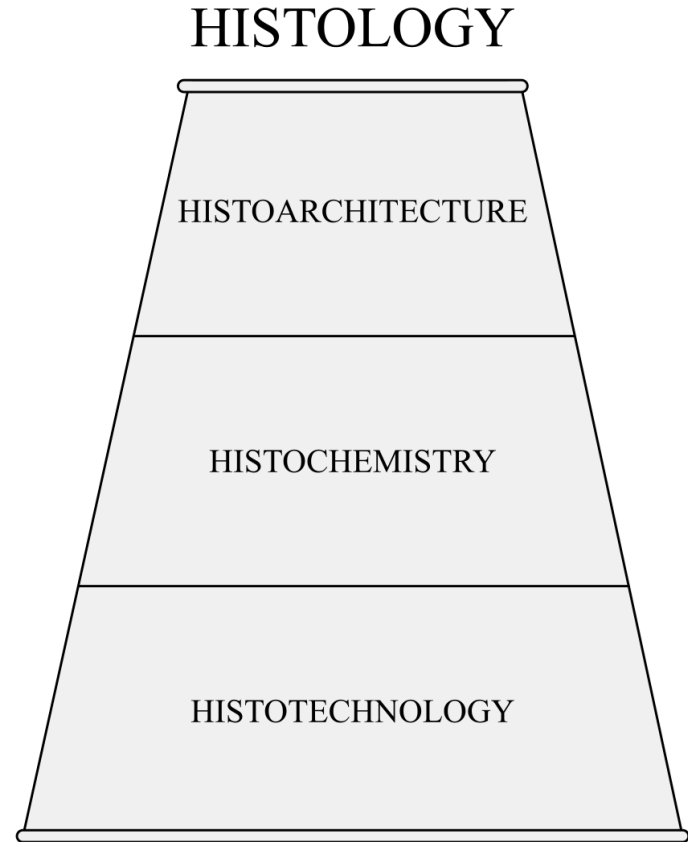
The study of biological structure revealed by histology methods

Histochemistry

The study of the chemical principles underlying histology methods

Histotechnology

Implementation of optimal procedures for consistent, high-quality results



What is the Histology FIG?

- A new Focused Interest Group (FIG) under RMS
- Open to: researchers, technicians, microscopists, core facilities, clinicians
- Aims to unify efforts in:
 - Technique sharing
 - Training
 - Data + equipment resource visibility
 - Best practice development



The screenshot shows the RMS website header with the logo and navigation links: Events, Community, Library, Opportunities, Outreach, Corporate, Membership, About, and Journal of Microscopy. Below the header is a breadcrumb trail: Homepage → Library → Resource Library → Join a new Focussed Interest Group (FIG) for Histology!. The main content area features a large, vibrant histology image with blue, red, and green staining. Below this image is the article title "Join a new Focussed Interest Group (FIG) for Histology!" dated 20 Jan 2025. The article text describes the purpose of the group and includes a quote from Steven J. West. To the right of the article is a sidebar with the heading "Find out more" and a link "Open Call for members of new Histology FIG" with a right-pointing arrow. At the bottom right of the sidebar is a photo of Steven West, a man smiling, with a microscope in the background.

RMS

Login

Events Community Library Opportunities Outreach Corporate Membership About Journal of Microscopy

Homepage → Library → Resource Library → Join a new Focussed Interest Group (FIG) for Histology!

RMS News 20 Jan 2025

Join a new Focussed Interest Group (FIG) for Histology!

Express your interest by 28 February

The RMS is appealing for prospective members to join a new and exciting **Focussed Interest Group (FIG) for histology**.

Plans for the group have been put forward by Steven J. West, head of histology at the Sainsbury Wellcome Centre, University College, with the aim of bringing together like-minded professionals and helping to shape the future of the field.

Steven said: "This FIG will create an exciting platform for histologists to collaborate, innovate, and share best practices in histochemistry and microscopy. By signing up, you'll be part of a supportive network of professionals working to enhance the quality of histological research and data. This really is an incredible opportunity to collaborate, innovate, and make a lasting impact in the field of histology."

Find out more

Open Call for members of new Histology FIG →

Steven West

Core Mission of the FIG



Core Mission of the FIG

1. Connect People, Places, Platforms

1. Define & Share Best Practices

1. Data Standardisation & Sharing

Aim 1: Connect People Places & Equipment



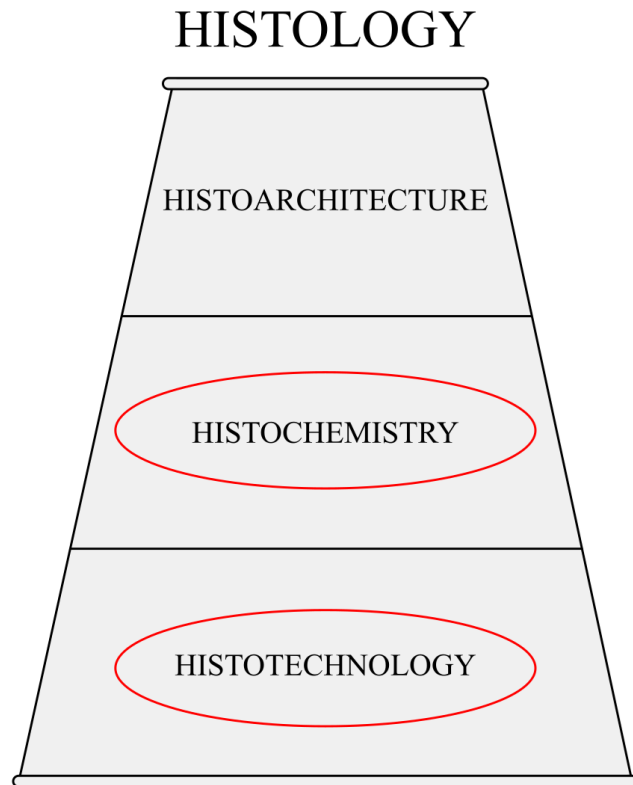
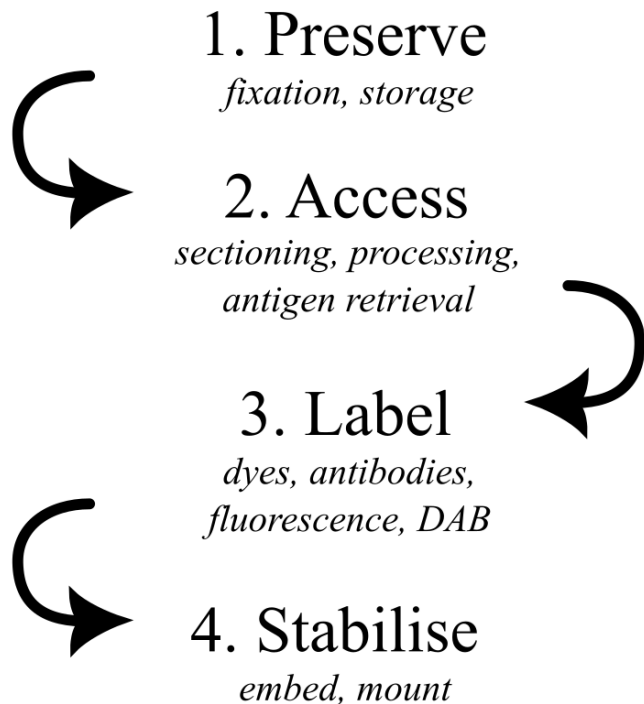
RMS Facilities Database

- Comprehensive database of facilities across UK

Aim 2: Establish Best Practice



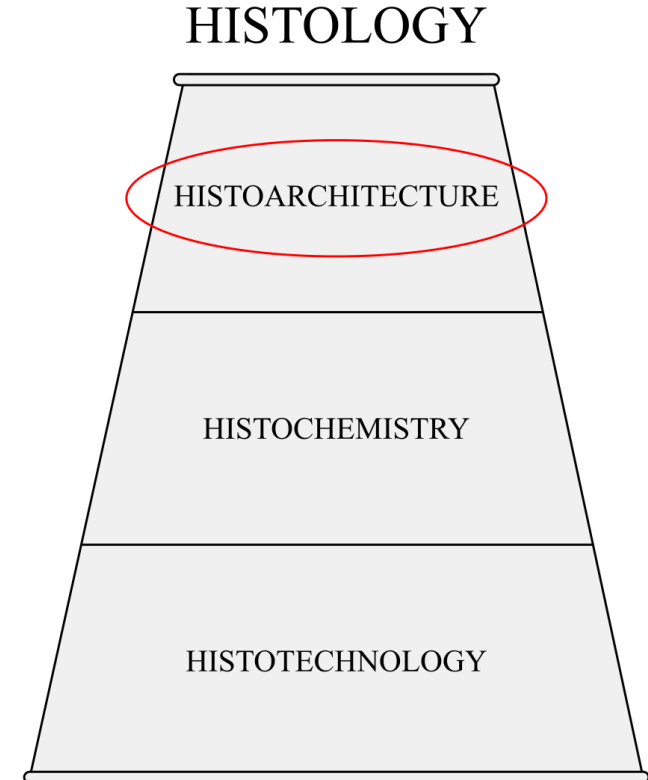
The Histochemical Workflow



Aim 3: Data Standardisation & Sharing



- **Standardisation**
 - Standardise reporting of histochemical procedures
 - Light-touch: key-value pairs in standardised metadata file
- **Data sharing: Database**
 - Centralised: github, g-node GIN
 - Decentralised: inter-University network of computers
 - Scope: antibody quality, protocol expected results, histo-architecture data sharing?



Open Forum: Thoughts, comments, ideas...



Histology Technological Developments

- *Omics, 3D reconstructions, Deep Learning*
- *Histology Newsletter*
- *Seminars on implementing new techniques*

Reproducibility in Histology Research

- *Characterise procedural variability*
- *H-Chem principles, H-Tech implementations*

Funding Opportunities

- *Improving reproducibility key concern of funders*
- *Histology cores as research hubs not just service units*

Aim 1: People Places & Equipment

- *Enhance Collaboration*
- *Showcase UK Histology*

Aim 2: Establish Best Practice

- *Histochemical Workflow: How much can we agree on procedure SOPs?*
- *Practitioners versus Developers*

Aim 3: Data Standardisation & Sharing

- *Balancing academic freedom & standardisation*
- *How best to structure & share this knowledge?*

Thank you!

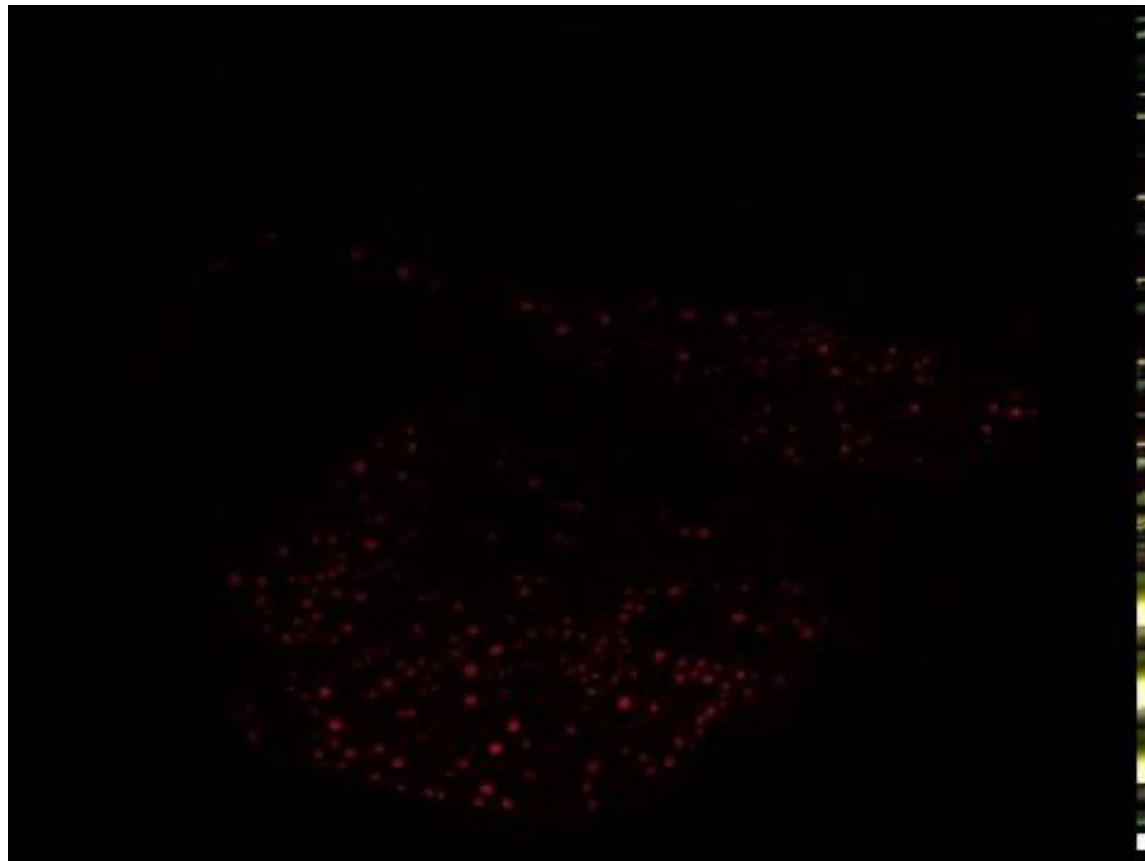
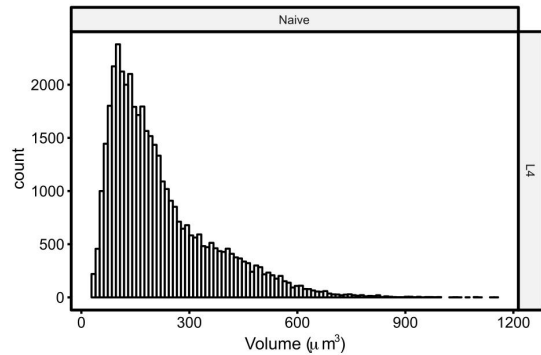
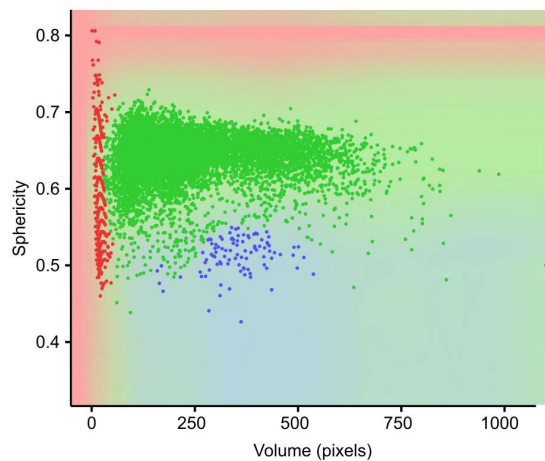


DRG reconstruction classification & insight



Classifier: KStar

ClassifierClass ● Connected ● Feature ● NonFeature



Open Forum: Thoughts, comments, ideas...



Aim 1: People Places & Equipment

- *How can we ensure this listing is useful in fostering collaboration and support research efforts?*
 - *Information finding, use-cases*
- *What is the purpose of this listing - connecting tools & expertise across the histology network with whom?*
- *How can we improve the listing?*
 - *Survey of techniques*
 - *Demonstration of recent projects & abilities?*

Aim 2: Establish Best Practice

- *How to define optimal protocol(s)?*
 - *Single optimal protocol?*
 - *Histochemical principles?*
 - *Evidence Base?*
- *How to write a useful protocol?*
 - *SOP, exp. Run LOGs, expected results?*
 - *Graphical summary, schematics, figures?*
 - *Quickstart guides?*
- *Can we agree on optimal steps & parameters?*
 - *Resolving differences enhances understanding*
 - *Domain-specific steps?*

Aim 3: Data Collection, Standardisation & Sharing

- **Data Collection**
 - Microscopy principles relevant to histology/biological structure
- **Standardisation**
 - Light-touch: key-value pairs in standardised metadata file
- **Data sharing: Database**
 - Centralised: github, g-node GIN
 - Decentralised: inter-University network of computers
 - Relational Database?
 - Scope: antibody quality, protocol expected results, histo-architecture data sharing?

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Histology at a Technological Crossroads

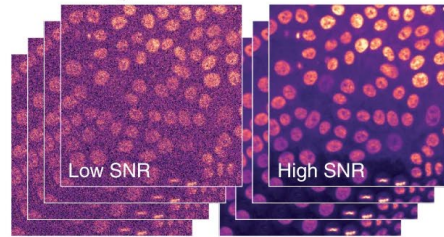


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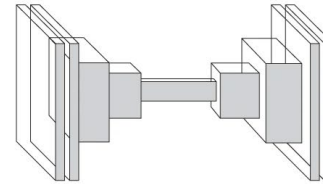
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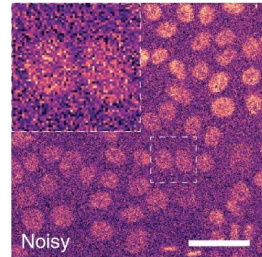
Training dataset



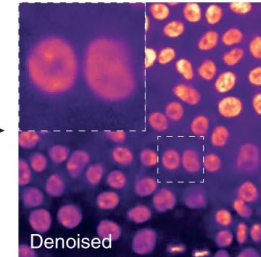
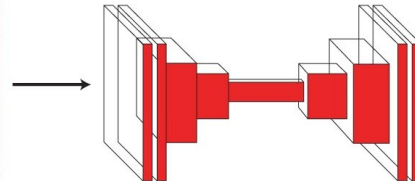
Deep-learning model



(2) Predictions (seconds to minutes)



Trained model



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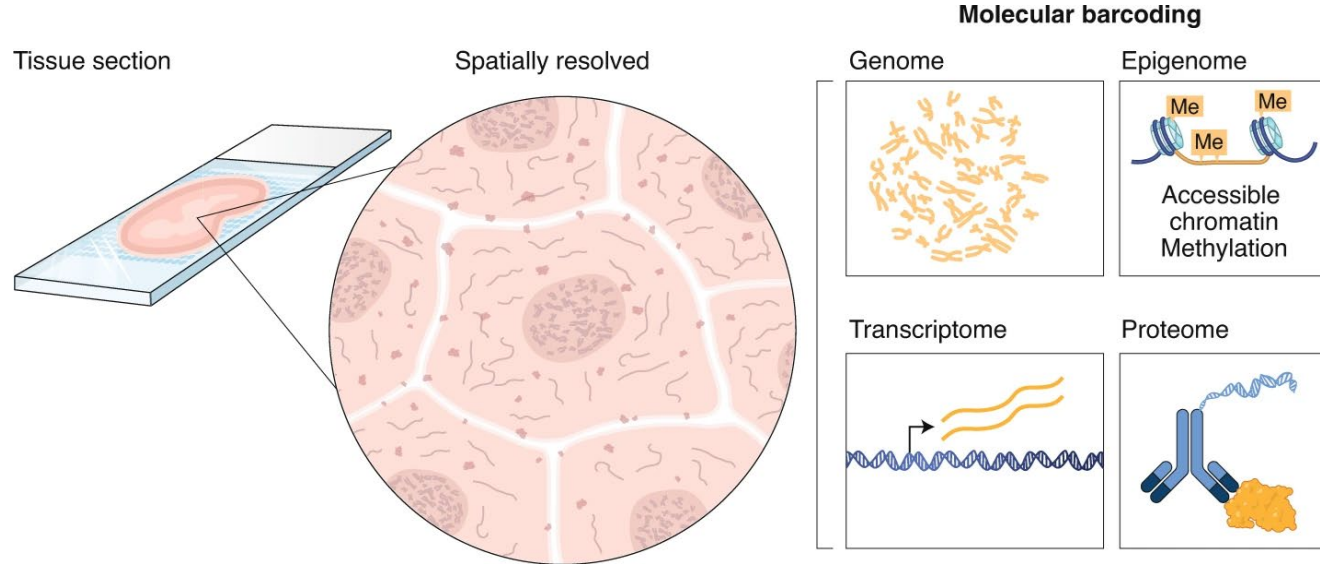
A Shared Response to a Changing Landscape



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Why a Histology FIG?

A Shared Response to a Changing Landscape

The Omics Revolution: From Hypothesis to Holism

- Traditional histology focused on testing predefined hypotheses (e.g. “does this treatment reduce neuron number?”)
- Now, biology increasingly uses *unbiased, high-dimensional data collection* — transcriptomics, proteomics, metabolomics
- This calls for **spatial context** — and that’s where histology becomes essential again

"Histology can anchor omics in structure."



Why a Histology FIG?

A Shared Response to a Changing Landscape

Exciting time in histology:

- Omics revolution & holistic tissue mapping technologies:

- Excellent histology & microscopy techniques for true 3D reconstruction

A brief intro to RMS and its role in scientific communities

Gap identified: No dedicated UK-wide forum for histologists

Histology is foundational but often fragmented across research, clinical, imaging, and pathology spaces

“We wanted a space to bring people together beyond the slide...”

Core Mission of the FIG

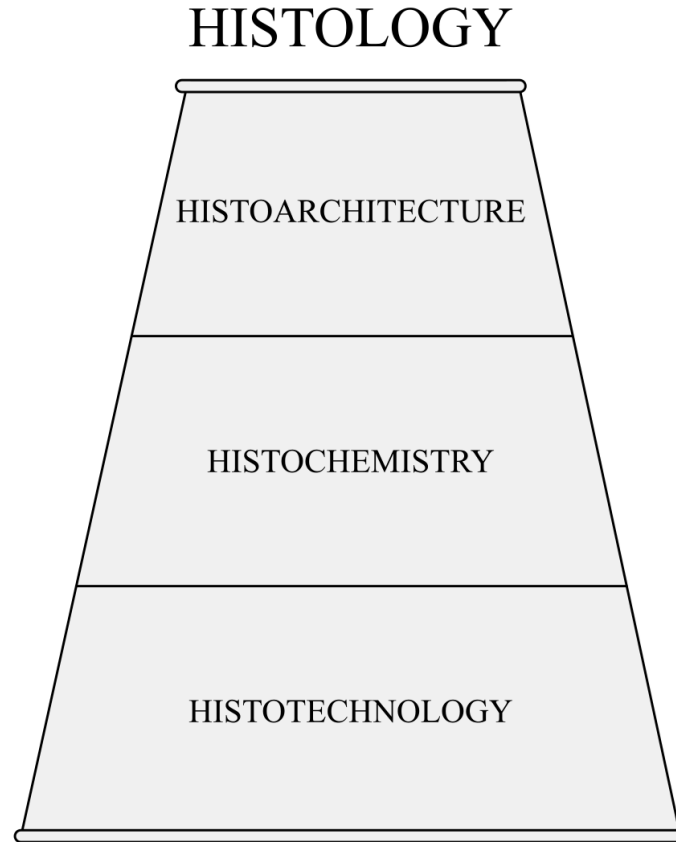


Core Mission of the FIG

Use icons or a 3-part visual to show these:

1. **Connect People, Places, Platforms**
2. **Define & Share Best Practices**
3. **Explore Data & Infrastructure Sharing**
Optional visual: A 3-circle Venn or triangle diagram

Aim 2: Establish Best Practice



Introduction: Histology Community @ RMS



- 30-seconds:
 - *Name*
 - *Institute*
 - *A technical development, research study result, histology dataset you're proud of?*



Why an RMS Histology FIG?



- Histology Technical Network
 - Connect Histologists: share resources and skills
 - Sharing protocols & defining best practices to improve reproducibility & data quality
 - Data sharing for insights beyond an individual lab
- BNA, UCL CoP
- RMS FIG -> 2024
 - **Objectives**
 - establish database of histologists, expertise, equipment
 - Working Group: for Best Practices in Histochemistry and Microscopy
 - Protocol sharing
 - Histology and microscopy metadata
 - data sharing

RMS Histology FIG Application



Focus and Aims of the FIG

List people, places, and equipment to establish a network for resource sharing & collaboration

Establish best-practices in histochemical procedures & practical implementations of experiments (histotechnology)

Define microscopy data collection, standardisation & sharing

Aim 1: List of People Places & Equipment



Aberdeen University Microscopy and Histology Core Facility

The Microscopy and Histology Core Facility is based in the Institute of Medical Sciences at the University of Aberdeen. We are pleased to welcome all users with all levels of experience in microscopy and/or histology from the university and also visiting scientists from other faculties, universities and hospitals. We have a wide variety of equipment available for use and staff members with many years of experience who are happy to help.



Expertise

Imaging Platforms

Keywords - Light Microscopy: Confocal Microscopy | Widefield Microscopy | Live Cell Imaging

Keywords - Electron Microscopy: Transmission EM | Electron Tomography | Scanning EM (Tungsten)

Keywords - X-Ray Microscopy: MicroCT

Confocal microscopy

- Zeiss LSM880 + Airyscan Laser Scanning Confocal Microscope
- Zeiss LSM710 Laser Scanning Confocal Microscope

Fluorescence microscopy

- Zeiss Imager M2
- Zeiss Observer Z1

Slide Scanner

- Zeiss Axioscan Z1

Micro CT

- SkyScan-1072 High-resolution desk-top micro-CT system
- Nikon XT 225ST

Live cell Imaging

- Perkin Elmer Ultraview Spinning Disk

Histology

- Tissue processors, standard and motorized microtomes for wax and resin sectioning
- Cryostat for frozen sectioning

Applications

Keywords - Biological: Cell Biology | Neurobiology | Developmental Biology | Plant Biology | Zebrafish | C.elegans | Microbiology | Histology/Pathology | Food

Keywords - Physical: Geology/Mineralogy

As a busy multi-user facility, we see a wide variety of samples passing through. We have the expertise to deal with many different sample types.

Sample Preparation

Keywords - Biological: Resin Embedding | Ultrathin Sectioning | Serial Sectioning | Tokuyasu Embedding | Cryosectioning | Immunolabelling | High Pressure Freezing | Freeze Substitution | Critical Point Drying | Sputter Coating | Negative Stain | Correlative Light and EM | Immunofluorescence | Cryostat Sectioning | H&E Staining | Live Cell

We are able to advise and assist users on the best way to prepare their samples.

Data Analysis

Keywords - Software: ImageJ | FIJI | Imaris | Amira | IMOD | Volocity | ImagePro | AxioVision | Zen

We can support users in the analysis of their data and there is a range of software packages available for use. Training can be given if required.

Point of Contact

Aberdeen University Microscopy and Histology Core Facility
Aberdeen University Microscopy and Histology Core Facility
Foresterhill Road
Institute of Medical Sciences
Aberdeen, AB25 2ZD, United Kingdom

Debbie Wilkinson

Gillian Milne

Staff List

Debbie Wilkinson

Gillian Milne

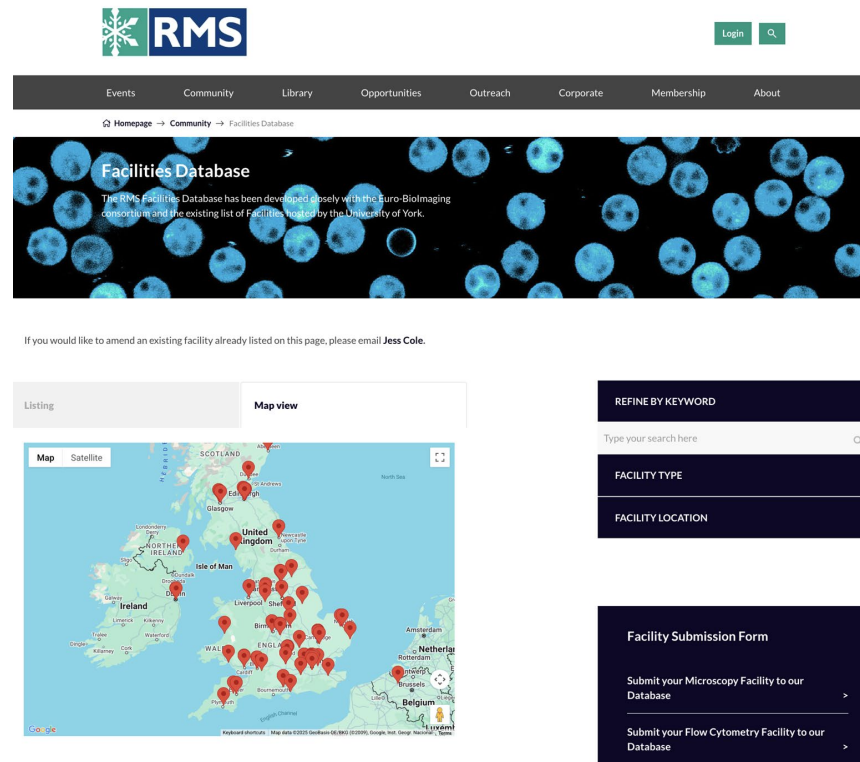
Lucy Wight

Aim 1: List of People Places & Equipment



- Discussion Points

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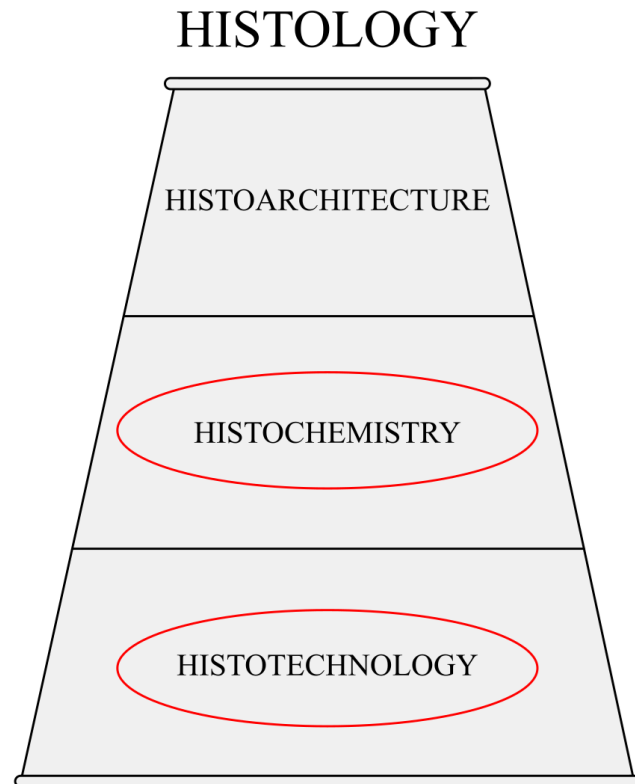


- Protocols

- Standard Operating Procedures:
 - *Blueprint of process steps & parameters*
 - *"Histochemistry" - Principles*
- Implementation:
 - *Equipment & consumables used*
 - *"Histotechnology" - Approaches*
- Evidence-based:
 - Technical Scientists
 - *The devil is in the detail*
- Reproducibility:
 - Willing to try new protocols: feasibility studies
- Divide & Conquer:
 - Leverage expertise across domains

- Record Keeping

- Lab Book Records: digital records with digital data?
- Experimental Run Logs

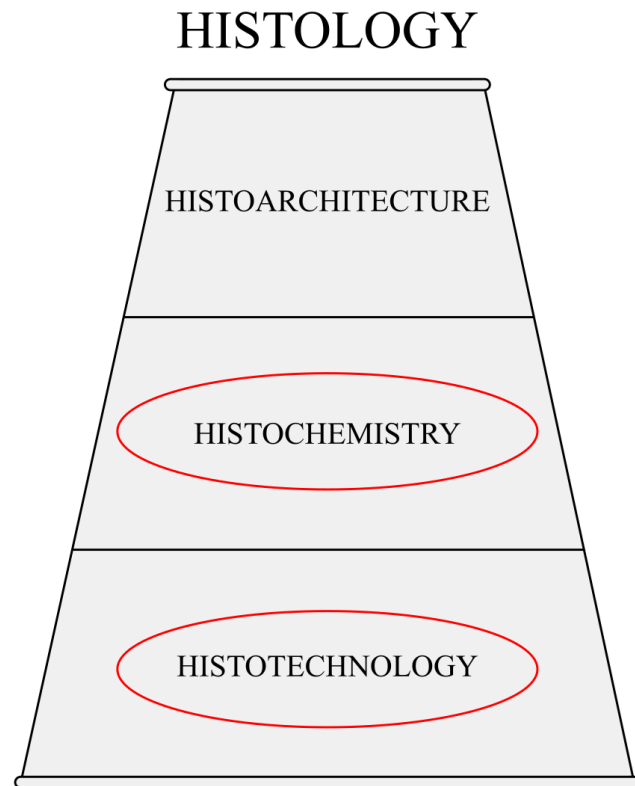


Aim 2: Establish Best Practice



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Final Points

- Profile bio & image for Histology FIG webpage
- **International Federation of Societies for Histochemistry and Cytochemistry**
 - <https://ifshc.com/>
 - 17th International Congress of Histochemistry and Cytochemistry:
 - <https://www.ichc2025.com/>
 - Rimini, Italy; 27-30th August 2025
 - **Young Histochemist Award:**
 - Nominate a promising “Young Histochemist” for a grant to support attendance at ICHC2025, provided the nominee is under 35 years of age at the time of the congress.
 - Nominations will still be accepted after this date but no later than **July 27, 2025** (one month before ICHC2025).
- Next meeting:
 - Discuss: Tissue Fixation?
 - Poll for date & time?