

Submitting applications for microscopy analysis: How much information is required by the microscopist?

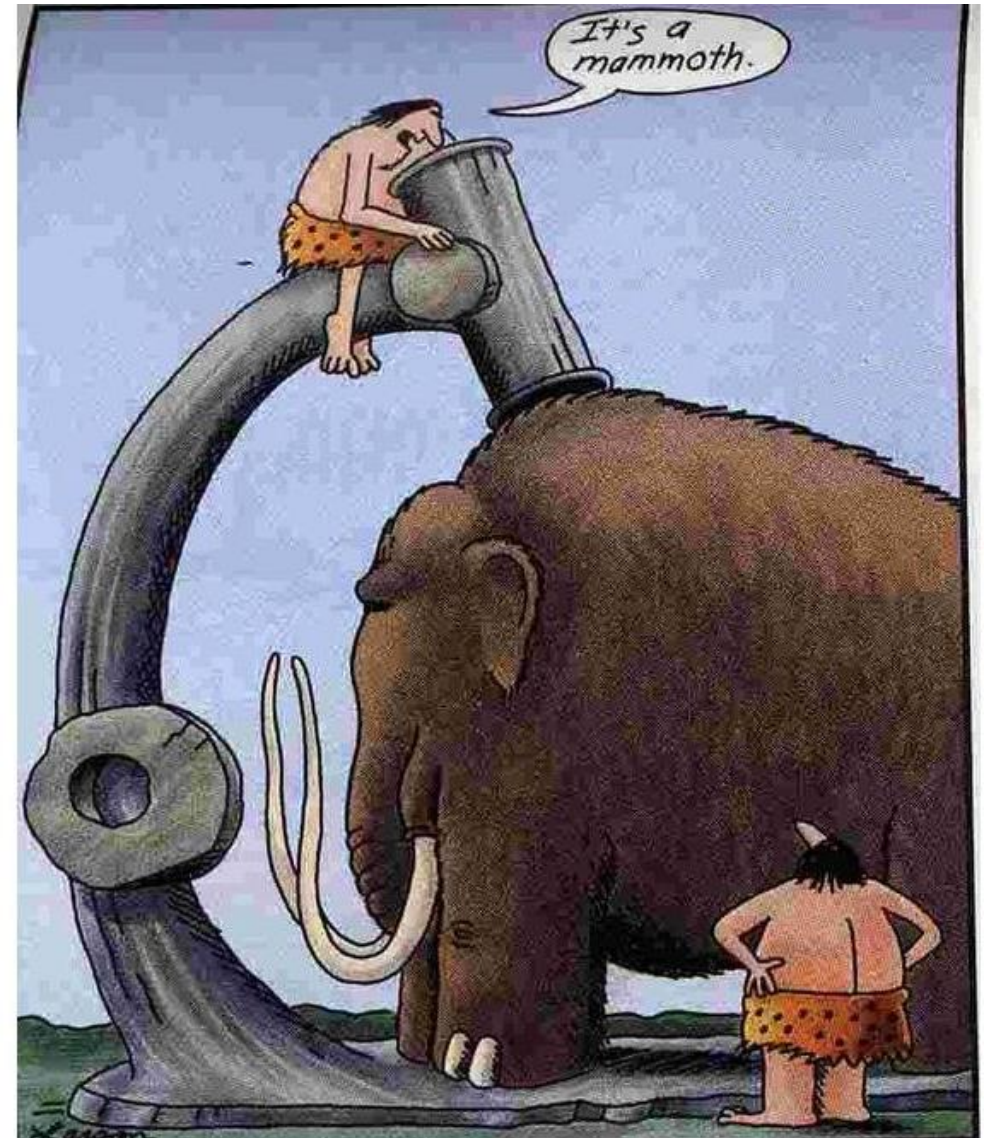
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Why do we require detailed information?

- The summary presented today is based on the submission for numerous applications for analysis at the Centre for HRTEM over the past 8 years
- The motivation for this presentation is based on some of the following “real” requests from external users:
 - “I want HRTEM analysis for my samples”
 - “How much will it cost for HRTEM for my samples?”
 - “I want HRTEM analysis for my samples to see what we will find”
 - “Why should I pay for the work, it is NRF funded after all?”
- In fact the user should be sure of the required technique: “Is TEM actually the required technique, possibly SEM, LM or confocal microscopy might be more than adequate. **AND** ”

- Do not waste valuable microscope time!
- “It will be nice to have a TEM or SEM image of the powder”
- These instruments are very expensive and to be used as scientific “selfie” devices!
- Does the image contribute to the scientific outcomes or is it just for space filling in the publication?
- Why request a SEM-EDS elemental map for a rough GaAs surface?



Make sure you clearly describe your analysis requirements

- Provide a brief background to the project with reference to microscopy requirements
- Description of the physical nature of the material
- Provide an experimental matrix of the analysis required.
- Provide useful literature on similar work if relevant.
- List anticipated scientific outputs.

IF YOU DO NOT PROVIDE THE ABOVE INFORMATION. THEN -----

THEN YOU WILL GET WHAT YOU REQUESTED!

SO TO HELP YOU TO ASSIST US, WE ARE PRESENTING YOU WITH A _____

JUST KIDDING



REQUEST SUBMISSION TEMPLATE



Analysis Request	Material to be analysed	Number of specimens (including samplings per specimen)	Specimen processing or history	Sample preparation required (Yes, No, Not sure)	Techniques Required (eg. TEM, HRTEM, HRSTEM, STEM, EDS, EELS, SEM, EBSD, WDS etc.)	Analysis required (eg. Imaging, Spectroscopy, Diffraction, Tomography, Mapping etc.)	Expected scientific outcome
1	eg. ZnO nanoparticles	3	Calcined 350 °C	Yes – Placing of sample material on TEM support grid	TEM, HRTEM, STEM, EDS	Imaging, diffraction, mapping	Size and distribution, Crystal structure, Elemental distribution
2	Eg. Irradiated SiC	1	Irradiated with neutrons to a dose of 3.4×10^{21} n/cm ²	Yes – Focussed ion beam preparation (FIB)	TEM, HRTEM	Imaging	Density of crystal defects, Types of crystal defects
3							
...							

Sample description and preparation

- Bulk material or powders or specify the sample size $L \times W \times T$,
- Nature of the sample material - composition, stability, toxicity etc
- Sample preparation will depend on analysis required
 - SEM-EDS, EBSD, TKD and TEM-EDS
- Preparation by cutting, polishing, ion milling, jet etching and FIBSEM
- How many specimens? How many sampling sections (lamella) for each specimen - TEM and SEM-TKD
- The selected analytical technique and sample preparation protocol must provide relevant scientific data which is based on good statistics.

Complimentary data and relevant literature

- The user should provide complimentary analytical data such as XRD, Raman and FTIR spectroscopy - especially powder samples for crystallography, particle sizes and multiple phases
- XRD Scherrer equation will provide better statistics on particle sizes compared to TEM which will confirm the results and confirm multimodal particle distributions.
- Provide useful relevant publications on similar analytical work will be helpful to the microscopist.
- This will save time and emails - lack of communication is the mother of all "bad results".

Why do we need all this information?

- Makes it easier for the microscopist to deliver the required data
- Assist with providing a reasonable cost estimate and quotation for the work
- NRF require the data for all activities including postgraduate students, publications
- Information is used in fund applications for upgrading equipment
- The good reason why we make you fill in four forms. Try applying to the Diamond Centre, Harewell UK!
- **NO, THIS IS NOT BEAUROCRACY**_____



DEPT. OF
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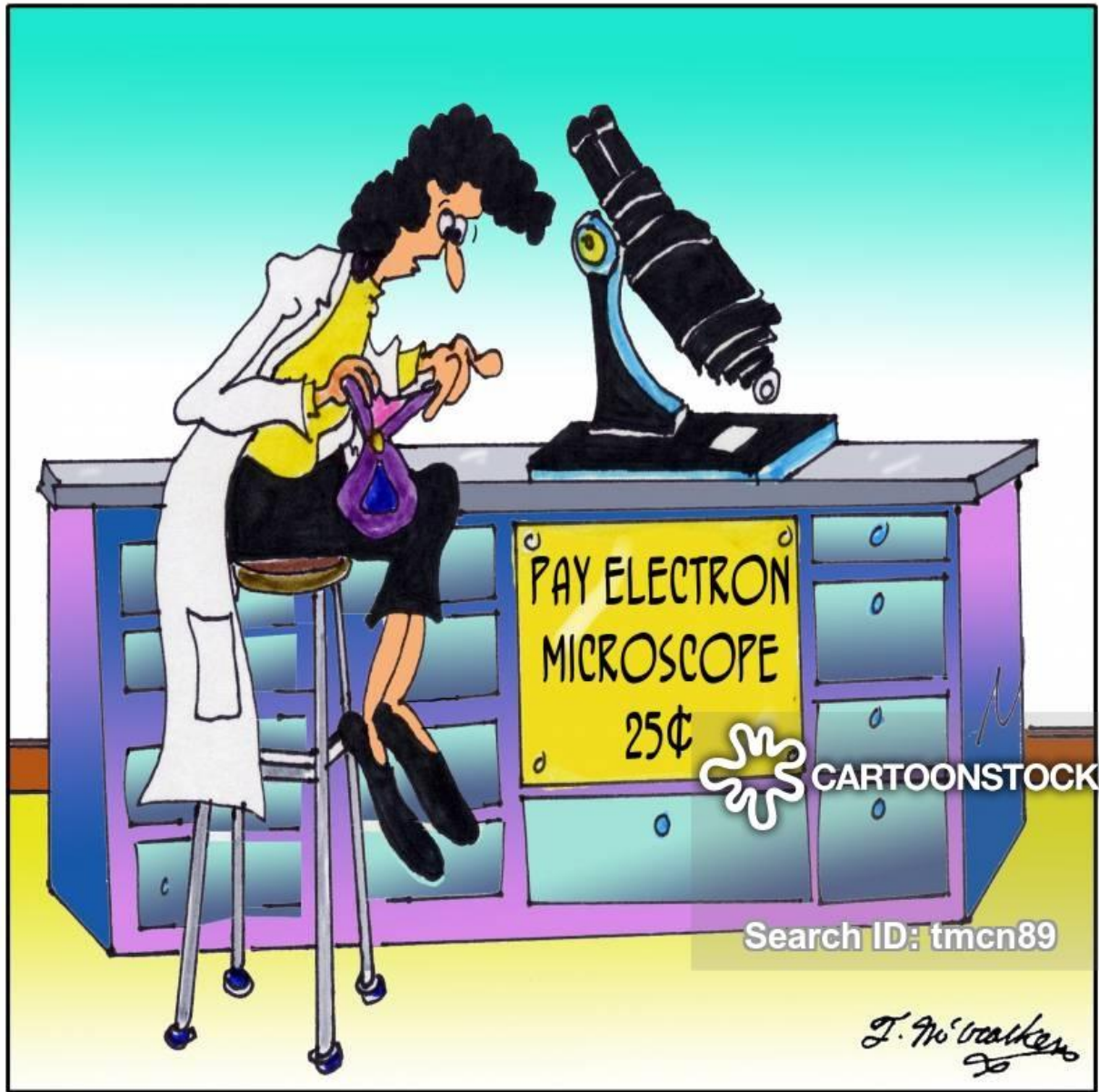
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Dave Coverly.

And why you should pay for the analytical services

- In most cases the equipment is partially funded by the NRF and the institution but the institution is liable to keep the equipment in good working order.
- However, there are a number of additional costs:
 - Service warranty contracts @ R1 million per year per instrument
 - Consumables especially LMIS and apertures for FIBSEM @ R160k per 1000 hours
 - Salaries for operators (confidential)
- Paying part of the costs or do you expect to have a _____



So you want a pay as you go data dispensing device?

"Damn. Out of quarters again."

CONCLUSION

- If you want to obtain good results from the microscopist, then you should consider the project as a collaboration and not a service.
- Do not expect the microscopist to do your literature research on your behalf
- The microscopist will give you a full data report with images and interpretations which is therefore scientific contribution to the project and requires co-authorship.
- If you want the results without a report and use the data to write a report/publication then commercial rates are applicable.
- **AND DO NOT COMPLAIN IF _____**

___ the EM results do not fit your theory!



THANK YOU

On behalf of all the abused
microscopists!