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A User's Perspective of Remote TEM

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ExxonMobil Chemical has an FEI Tecnai G^2 F20ST FE-TEM/STEM located in Belgium, which is also operated from Texas, USA. All functions of the microscope are computer-controlled and motorized, and it is equipped with a multi-sample Autoloader. In addition to the hardware/software enablers, the success of remote microscopy depends on success in four areas: people and geography (cooperation, trust, acceptance of responsibilities, etc.); on-site training; network support at each end of the connection; and the remote operating environment.

The time zones in which the instrument and remote operators reside control its availability to remote users. Different time zones will extend the daily operating time of the microscope. Our microscope, located in Belgium, is available for daytime use by our staff in Belgium and Texas; location of the instrument in the Texas would relegate the Europeans to midnight to early morning use.

People issues lie at the heart of remote microscopy. Relationships built on trust, open communication, and positive feedback between users are essential. Proper resourcing and maintenance at the microscope site is important. A key function of ownership that goes beyond staff resourcing and maintenance issues is that of facilitating the success of the remote users. Responsibilities required to enable remote operation include: nearly daily communication between on-site and remote users; set-up of the instrument for remote operation, i.e. load samples, fill dewars, set-up of the video camera for remote users to see the phosphor screen of the TEM; maintain the network; and archive original data from the microscope. The responsibilities of remote users are less demanding but no less important: adhere to best operational practices; schedule instrument time with consideration of the instrument owner; and communicate instrument and network problems to the owner.

The owner of the instrument must ensure adequate training for all users. This serves to protect the microscope from damage through ignorance and enables optimum productivity. Key users from remote sites should attend the comprehensive on-site vendor training. Remote users, being geographically and temporally distant from the on-site users, naturally do not have the shared learning environment enjoyed within the group of on-site users. Therefore, remote users must strive to become integral parts of the user community in order to achieve the same level of mastery and understanding of the microscope and its operation.

Requirements for successful remote access include a fast, reliable network connection and suitable networking platform. Together, these should allow full control to the microscope without excessive bandwidth requirements. A telephone for communication is essential for ready communication with the

instrument owner. An off-line computer, loaded with the essential software to access and manipulate image and spectral files, must be available to remote users for off-line data processing.

The principle short-comings of remote use are indirectly related to bandwidth. Time lags exist for most, if not all, operations. To the remote users in our lab, the time lags are more nuisance than impediments to operation. Inconveniences include the inability to refill dewars, change samples (beyond those pre-loaded in the Autoloader), or use non-motorized equipment parts such as the beam stop.

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