NetSEM - Remote SEM Control
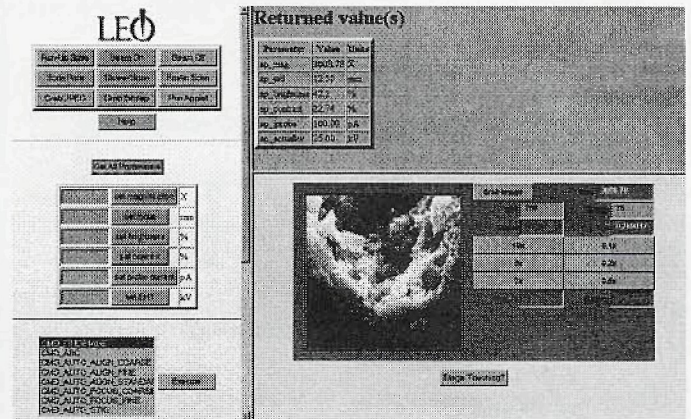### Gobal Chand, Leo Electron Microscopes

NetSEM for LEO 400 series microscopes makes the remote control of an SEM over the internet or telephone line a reality. Unlike current commercially available remote control applications which duplicate a Windows session on a remote PC, NetSEM presents a customizable interface which is accessed via a Web browser and uses lossy compression techniques to optimize SEM image transfer over high, variable and low bandwidth connections.

The NetSEM software package is usually, but not necessarily, resident in the SEM itself. In essence, it has three components, a set of Web pages which forms the remote control user interface, a Web server with password protection which transfers these pages to the remote user on demand and accepts requests from that user, and a translation program (a CGI or Common Gateway Interface program) which interprets the requests into actions to be undertaken by the SEM. The SEM must be connected to the appropriate network of interest, whether it be a Point-to-Point modem connection, local area network or the Internet. The remote user only needs a suitable graphical Web browser and network access to connect to the instrument site. The intervening network is handled with almost complete transparency by the network software using standard protocols.

A typical remote microscopy session using NetSEM would be as follows: The target SEM's control software would be started up and the NetSEM application launched. At his/her convenience, the remote user would launch a Web browser and enter the Web address (or URL - Uniform Resource Locator) of the NetSEM user interface for that particular instrument. Assuming a successful network connection is made, the user would then be challenged to supply a valid username and password pair, and only if the offered pair is correct, will the NetSEM interface be downloaded over the network onto the browser.
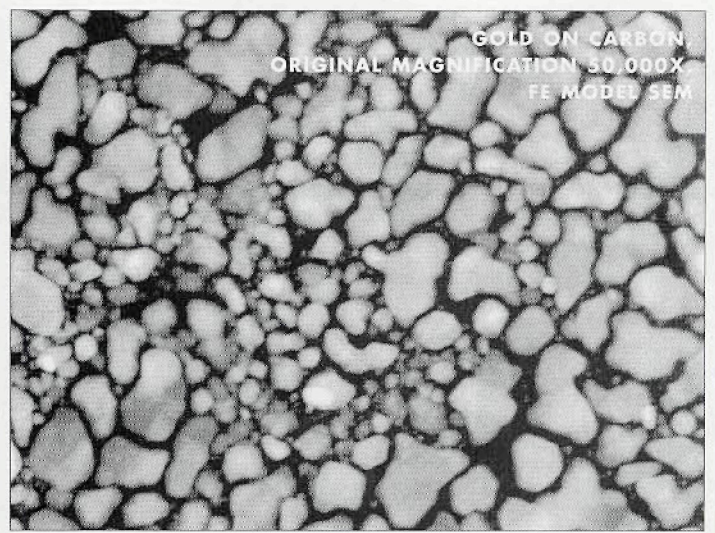
The NetSEM interface is displayed in most browsers as a single page separated into three distinct resizable frames or segments (following figure). This arrangement prevents the remote operator having to move between distinct pages in order to perform a series of related operational tasks. One frame provides access to the primary instrument parameters, allowing the operator to request the values of these by simply clicking on an icon, and to individually set the parameters by entering a desired value into the respective form and clicking the neighboring icon to confirm the request. A second frame displays resultant parameter value sets. The third frame is used to acquire images from the SEM with the size and the amount of compression of the images specified by the operator. This is achieved using a Java applet which accepts instructions from the operator via its own interface of command buttons and data entry boxes, and when requested, sends an image transfer request. The applet receives the transferred image and is responsible for displaying it appropriately within its own frame. Ending the remote microscopy session is a simple matter of resetting the instrument to an appropriate standby state and closing the browser. An operator at the SEM can also terminate remote accesses by closing down the NetSEM package on the SEM. ∎