Applications Data Sheet
Low Voltage Transmission Imaging with Hitachi's S-4800 FE-SEM

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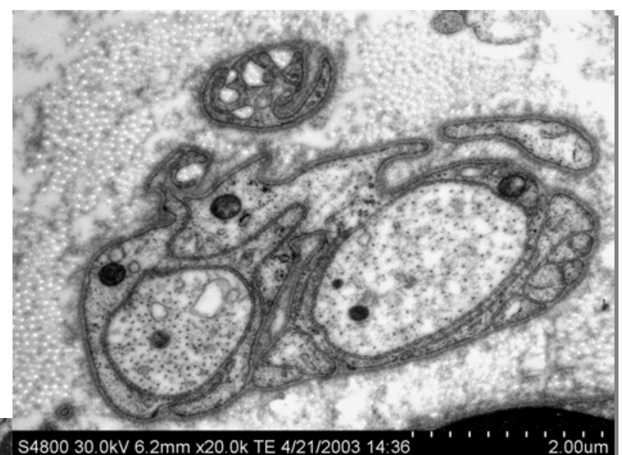
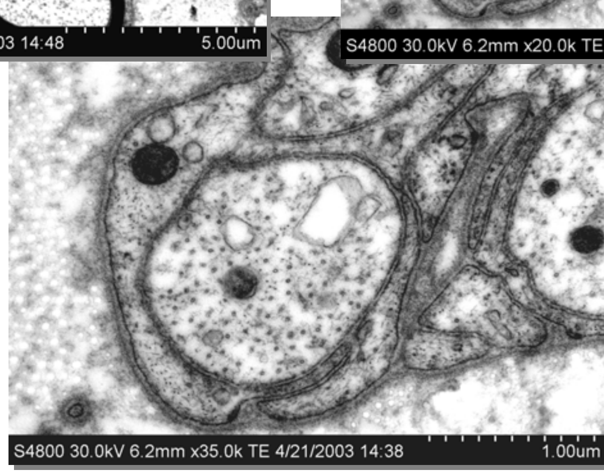
Low kV transimission imaging expands the capabilities of the analytical laboratory.

STEM (Scanning Transmission Electron Microscopy) on a conventional SEM is a useful tool for biological applications. With the Hitachi STEM detector on the S-4800 FESEM images, comparable to a dedicated TEM or STEM results, are easily obtainable without the need for an advanced experience in TEM or the large budget for such high-end equipment. The STEM detector is designed so that the specimen and area of interest are quickly found. Alignment follows normal SEM operation routines. The operator can also easily switch back and forth between STEM and SEM mode with just a click of the mouse.

Some of the advantages of using the STEM mode are: higher spatial resolution than bulk sample imaging, greater contrast of low-Z materials than high kV TEM and a more gentle investigation of sensitive or thin materials than higher kV TEMs. Other benefits include: reduced effects from contamination, less charging, and minimized beam damage.

The following images were taken on the S-4800 using the Hitachi STEM attachment.





Human Nerve Tissue
Stained with Uranyl Acetate
Showing myelinated and unmyelinated nerve cells

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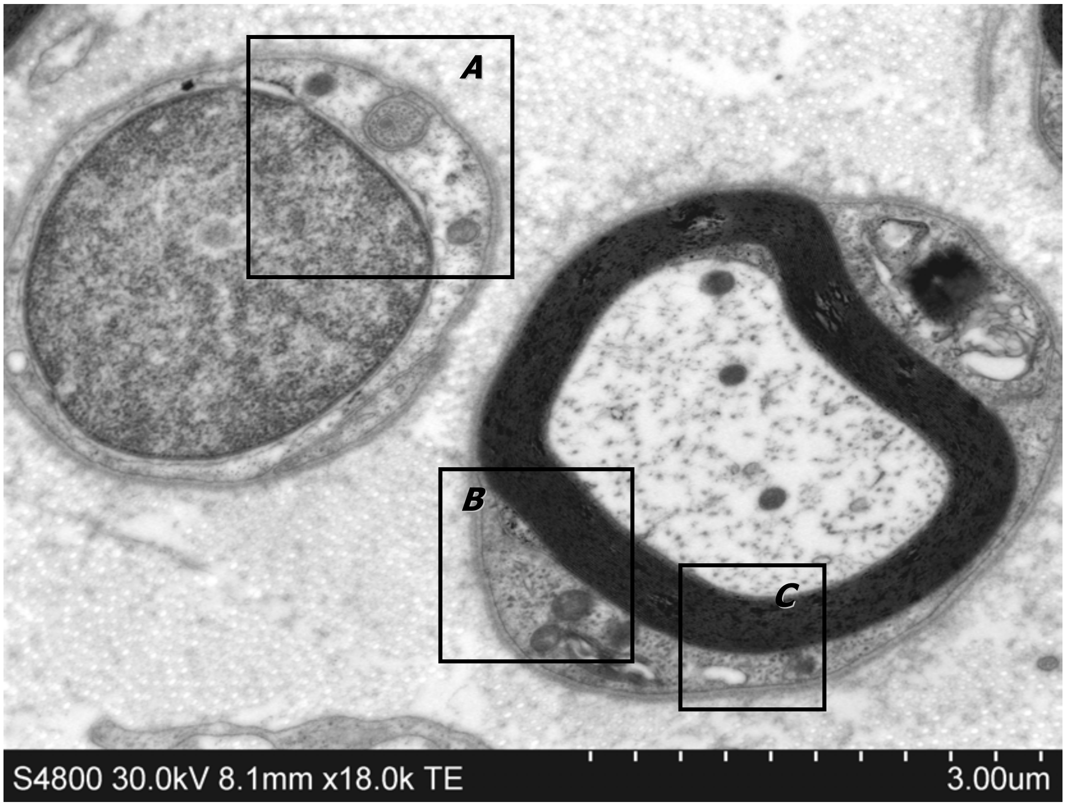
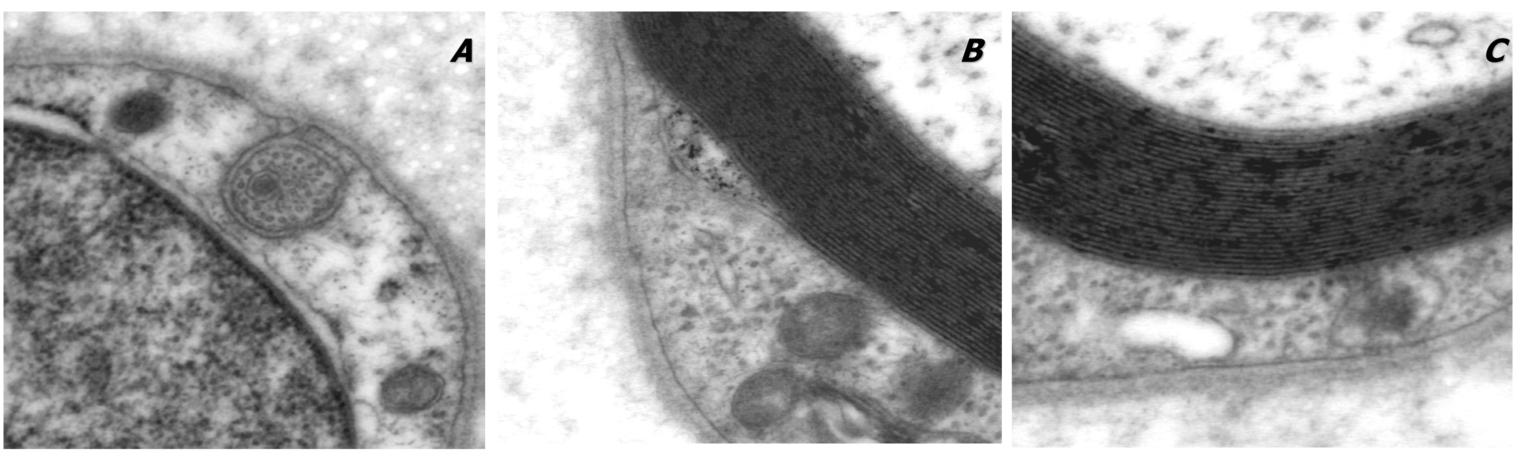
Low beam currents of the 30kV electron beam minimize damage to delicate samples, allowing stability and time to collect images with a high pixel density (2560x1920 and greater). The image below of human nerve tissue can be magnified to highlight regions of interest without suffering resolution limitations due to pixel size.





The high contrast in region A (unmyelinated nerve cell) is due to the low 30kV beam of the S-4800. In regions B and C Schwann cells are investigated with myelin sheath that change the way signals propagate along the nerve cells.

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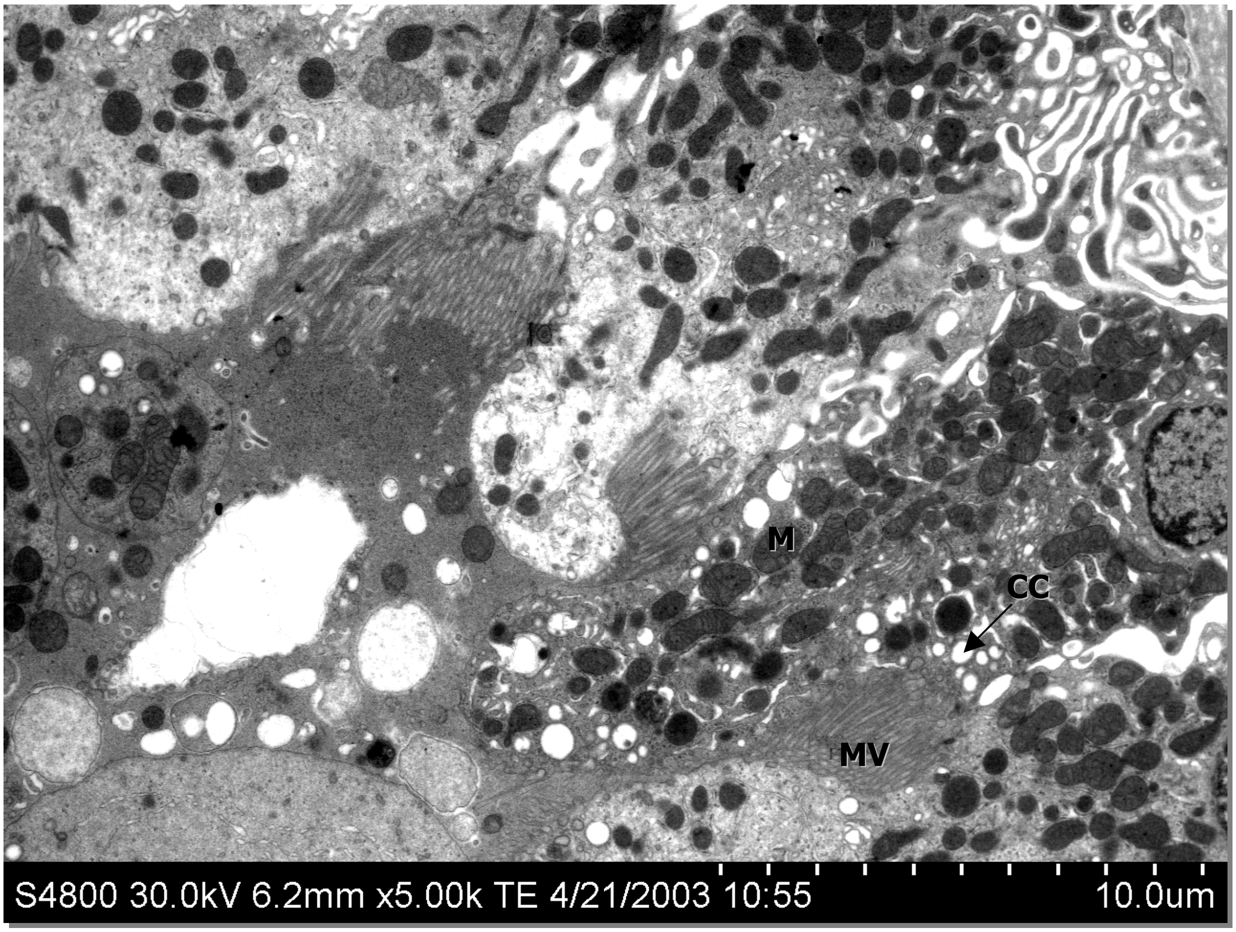
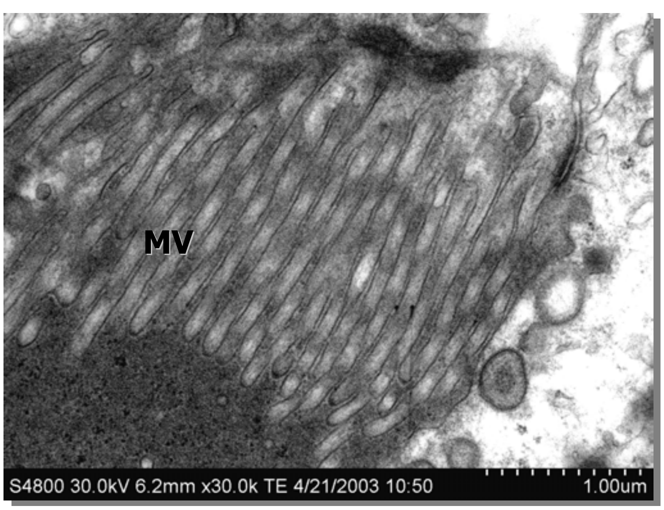
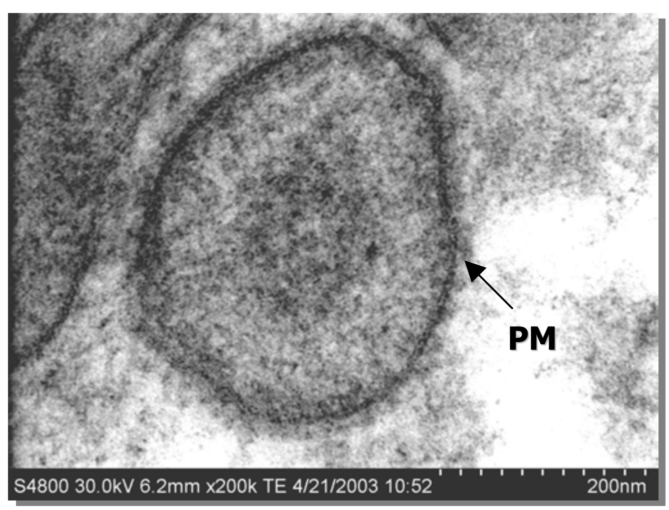
Specimen thickness is recommended to be less than 150nm for best imaging contrast. The rat kidney specimen (stained with Uranyl Acetate) below was roughly 100nm thick. Visible in the images are microvilli (MV), mitochondria (M), cytoplasmic compartments (CC), and other cellular structures.





Microvilli



Plasma Membrane (PM) structure

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