In order to generate large volumetric datasets of brain tissue, we have developed an automated pipeline to section, and image neural circuits in brain samples. We prepare standard resin embedded blocks of brain samples that are stained with heavy metals. These blocks are sectioned using a diamond knife ultramicrotome that is modified so that it automatically picks of the samples and puts them on a conductive tape substrate (“ATUM”; see panels A and B below). These samples are sectioned below 30nm in thickness and are each typically more than a square millimeter in area. The tape pickup allows up to ~12,000 sections to be collected per day. The tape is then cut into strips, adhered to a flat silicon wafer, for further enhancement staining and mounting on the stage of a scanning electron microscope. To automate image acquisition we developed software to locate the positions of sections in the scanning electron microscope and make montaged images of each section (a program called “Wafermapper”, Hayworth, Morgan et al., 2014). To speed further speed image acquisition throughput, we participated in the development of a multibeam scanning electron microscope (Carl Zeiss Inc.;) optimized for imaging brain samples. This device, now resident in the Harvard lab (see panel C below), uses multiple scanning beams arranged in a hexagon to image in parallel at a rate that may approach 1 billion pixels per second. The device uses 61 low (several kilovolts) electron beams each scanned at 10-20 M pixels per second to generate secondary electrons from each site that are detected without cross talk. Lateral image resolution is 4nm per pixel (see panel D below). This suite of methods and tools may be useful for the acquisition of large brain samples at high resolution.