CLAIMS

1. A device for imaging a sample, the device comprising:

a detector in line with an electron source;

a lens stack of silicon micro-electromechanical lenses between the detector and the electron source, wherein the lens stack comprises lithographically placed fiducials configured to align adjacent silicon micro-electromechanical lenses in the lens stack;

a magnetostatic objective lens in line with the detector, the magnetostatic objective lens including an aperture, wherein the magnetostatic objective lens is configured to focus an electron beam from the electron source as it passes through the aperture, wherein the magnetostatic objective lens comprises a permanent magnet lens lithographically placed to align with the silicon micro-electromechanical lenses of the lens stack; and

a post-lens element between the magnetostatic objective lens and the sample being imaged during operation, wherein the post-lens element is configured to dynamically focus the electron beam onto the sample to control backscattered electrons and/or secondary electrons from the sample that are received at the detector.

2. The device of claim 1, further comprising one or more electromagnetic shields between the magnetostatic objective lens and one or more other elements of the device.

3. The device of claim 1, wherein the lens stack comprises a micro-machined multi-layer structure including an aperture and one or more glass isolators.

4. The device of claim 1, further comprising one or more lithographically placed fiducials on the magnetostatic objective lens, the one or more lithographically placed fiducials configured to align with lithographically placed fiducials on the silicon micro-electromechanical lenses of the lens stack.

5. The device of claim 4, wherein the lithographically placed fiducials on the magnetostatic objective lens and the lithographically placed fiducials on the silicon micro-electromechanical lenses of the lens stack are configured to align centers of the silicon micro-electromechanical lenses and center of the magnetostatic objective lens along an axis.

6. The device of claim 1, further comprising a high mu metal configured to at least partially negate magnetic fields from the magnetostatic objective lens.

7. The device of claim 1, wherein the magnetostatic objective lens is round in shape.

8. A system for imaging a sample, the system comprising:

an electron source;

a detector in line with the electron source;

a lens stack of silicon micro-electromechanical lenses between the detector and the electron source, wherein the lens stack comprises lithographically placed fiducials configured to align adjacent silicon micro-electromechanical lenses in the lens stack;

a magnetostatic objective lens in line with the electron source and the detector, the magnetostatic objective lens including an aperture, wherein the magnetostatic objective lens is configured to focus an electron beam from the electron source as it passes through the aperture, wherein the magnetostatic objective lens comprises a permanent magnet lens lithographically placed to align with the silicon micro-electromechanical lenses of the lens stack;

a post-lens element between the magnetostatic objective lens and the sample being imaged during operation, wherein the post-lens element is configured to dynamically focus the electron beam onto the sample to control backscattered electrons and/or secondary electrons from the sample that are received at the detector; and

a stage upon which the sample being imaged is disposed during operation, the stage configured to translate/rotate relative to the electron source, the detector, the magnetostatic objective lens, and the post-lens element.

9. The system of claim 8, wherein the lens stack comprises a micro-machined multi-layer structure including an aperture and one or more glass isolators.

10. The system of claim 8, further comprising one or more lithographically placed fiducials on the magnetostatic objective lens, the one or more lithographically placed fiducials configured to align with lithographically placed fiducials on the silicon micro-electromechanical lenses of the lens stack.

11. The system of claim 10, wherein the lithographically placed fiducials on the magnetostatic objective lens and the lithographically placed fiducials on the silicon micro-electromechanical lenses of the lens stack are configured to align centers of the silicon micro-electromechanical lenses and center of the magnetostatic objective lens along an axis.

12. The system of claim 8, further comprising a high mu metal configured to at least partially negate magnetic fields from the magnetostatic objective lens.

13. An electron beam column for imaging a sample, the electron beam column comprising:

an electron source;

a detector in line with the electron source;

a lens stack of silicon micro-electromechanical lenses between the detector and the electron source, wherein the lens stack comprises lithographically placed fiducials configured to align adjacent silicon micro-electromechanical lenses in the lens stack;

a magnetostatic objective lens in line with the electron source and the detector, the magnetostatic objective lens including an aperture, wherein the magnetostatic objective lens is configured to focus an electron beam from the electron source as it passes through the aperture, wherein the magnetostatic objective lens comprises a permanent magnet lens lithographically placed to align with the silicon micro-electromechanical lenses of the lens stack; and

a post-lens element between the magnetostatic objective lens and the sample being imaged during operation, wherein the post-lens element is configured to dynamically focus the electron beam onto the sample to control backscattered electrons and/or secondary electrons from the sample that are received at the detector.

14. The electron beam column of claim 13, further comprising one or more lithographically placed fiducials on the magnetostatic objective lens, the one or more lithographically placed fiducials configured to align with lithographically placed fiducials on the silicon micro-electromechanical lenses of the lens stack.

15. The electron beam column of claim 14, wherein the lithographically placed fiducials on the magnetostatic objective lens and the lithographically placed fiducials on the silicon micro-electromechanical lenses of the lens stack are configured to align centers of the silicon micro-electromechanical lenses and center of the magnetostatic objective lens along an axis.

16. The electron beam column of claim 13, further comprising a high mu metal configured to at least partially negate magnetic fields from the magnetostatic objective lens.

17. The electron beam column of claim 13, wherein the magnetostatic objective lens is round in shape.

18. The electron beam column of claim 13, wherein the lens stack comprises a micro-machined multi-layer structure including an aperture and one or more glass isolators.