The x-ray image formation and acquisition apparatus **160** can include any apparatus that can detect the image from the composite objective **120**. In one embodiment, as illustrated in FIG. **10**, the x-ray image formation and acquisition apparatus **160** includes a 2D imaging detector **162**, such as a phosphor screen and visible light CCD camera combination or an x-ray CCD array or x-ray CCD camera **162**. The 2D imaging detector **162** detects the plural 2D images produced by the composite objective **120**. Optionally the 2D image is stored in a storage device **164** that can be read by a processing device **166**. Any storage device can be used that can store the 2D image, preferably a digital storage device, such as a computer readable media. Examples of suitable media are magnetic or optical media such as hard disks, floppy disks, CD-ROMs, flash memory, RAM etc. Likewise any processing device **166** can be used, but preferably is a computing device that includes a processor and which also can display images on a display **168**. Plural 2D images are combined in the processing device **166** to create a 3D image. The display **168** can include any form of display that can depict a desired image. Examples of such displays include a printer to make a hard copy, or a display screen, such as a CRT monitor, television monitor or LCD display.

A system of apertures **140**, as illustrated in FIG. **7**, allows the image forming positive $1^{st}$ diffraction orders to pass through the system, but blocks the $0^{th}$ and all odd orders of diffraction, including negative $1^{st}$ orders, from reaching the image areas within the common image plane. When the width ratio of alternating zones in a zone plate is close to **1**, the even orders are generally significantly reduced or substantially absent.

In operation, the present invention is practiced using steps such as illustrated in FIG. **8** in which an image of a sample is formed by providing x-rays **310**, exposing the sample to the x-rays **320** such as by positioning it in the path of the x-rays, and focusing the x-ray light downstream of the sample using a composite objective lens comprising a plurality of micro-objectives, such as Fresnel zone plates **330** and forming an image based on the x-rays **340**. The step of forming the image **340** includes in the preferred embodiment recording a plurality of 2D images using the 2D image detector **162** and optionally storing them in storage device **164**. Then the 2D images are combined to create a 3D image or images using an image reconstruction processing conducted by processor **166**. Then the image is optionally displayed or printed out using display device **168**. As discussed above, the Fresnel zone plates **210** preferably are arranged in an array **200** such as a generally hexagonal and/or substantially planar array as illustrated with step **330** in the figures. Another illustration of the practice of the present invention is illustrated in FIG. **9**. As seen in FIG. **9**, an image of a sample is formed by providing x-rays **310**, collecting the x-rays **350** and transmitting or reflecting them in a desired fashion so that they can go to the sample, positioning the sample in the path of said transmitted or reflected x-rays **320**, imaging the x-rays downstream of the sample using a composite objective lens comprising micro-objectives, such as a plurality of Fresnel zone plates **360** and forming an image using the imaged x-rays **380**. Optionally the x-rays are refined using one or more apertures **370** between the composite objective lensing step **360** and the image formation **380**.

Thus it is seen that a tomography imaging method and apparatus is provided. One skilled in the art will appreciate that the present invention can be practiced by other than the preferred embodiments, which are presented in this description for the purposes of illustration and not limitation. It is noted that equivalents for the particular embodiments discussed in this description may practice the invention as well.

What is claimed is:

**1**. A tomography imaging system comprising a composite objective lens assembly comprising a plurality of micro-objectives, each of the micro-objectives structured to block zero-order diffracted radiation.

**2**. The tomography imaging system of claim **1** wherein said micro-objectives in said composite lens are arranged in an array.

**3**. The tomography imaging system of claim **2** wherein said array of micro-objectives comprises a generally annular arrangement of said micro-objectives.

**4**. The tomography imaging system of claim **3** wherein the array of micro-objectives is substantially planar.

**5**. The tomography imaging system of claim **3** wherein the micro-objectives in the array of micro-objectives are mounted on a curved structure.

**6**. A tomography imaging system comprising:

a radiation source emitting light in a desired wavelength;

a collector optic positioned to collect said light and transmit or reflect it;

a sample holder positioning a sample to be imaged in the path of said light from said collector optic;

a composite objective lens system including an array of micro-objectives imaging said light in a desired fashion, each of the micro-objectives structured to block zero-order diffracted radiation; and

an imager.

**7**. The tomography imaging system of claim **6** further comprising a composite aperture between said composite objective lens system and said imager.

**8**. The tomography imaging system of claim **6** wherein said array of micro-objectives comprises an substantially planar and generally annular array of micro-objectives.

**9**. The tomography imaging system of claim **6** wherein said array of micro-objectives comprises a curved and generally annular array of micro-objectives.

**10**. The tomography imaging system of claim **6** wherein said radiation source comprises a laser light source.

**11**. The tomography imaging system of claim **10** wherein said radiation source further comprises an laser plasma x-ray source in the path of light from said laser light source.

**12**. The tomography imaging system of claim **6** wherein said imager comprises:

an image detector detecting two dimensional images based on said imaged light from said objective lens system;

an image memory storing images detected in said image detector; and

a processor constructing a three dimensional image from said two dimensional images.

**13**. The tomography imaging system of claim **6** wherein the radiation source comprises a synchotron radiation source.

**14**. The tomography imaging system of claim **6** wherein the radiation source comprises an x-ray tube including an electron beam excited x-ray source.

**15**. The tomography imaging system of claim **6** wherein the radiation source comprises a source of energy selected from a group consisting of an electron source, a neutron source, a positron source and a photon source.

**16**. A method of forming an image of a sample comprising the steps of:

providing x-rays;

exposing said sample to said x-rays; and