Lensless x-ray microscope focuses on biological samples

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[摘要] 26 January 2007. Lenses for x-rays are notoriously tricky to manufacture because they rely on nanometre-scale features. For this reason, physicists developing x-ray microscopes have been keen to adopt "lensless" designs that measure diffraction when x-rays are passed through samples. But while this principle has worked well for periodic structures such as crystals, methods for non-periodic structures such as biological materials have been ineffective.
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A crude analogy for this, according to Rodenburg, would be to imagine clapping you hands while blindfolded in a mountain range. If you were to remain stationary, it would be very difficult to work out the positions of the mountains by hearing the echoes alone. But if you were to steadily move around, it would be much easier to build up a rough picture of where they all are.

The key advantage of the technique when applied to x-ray microscopy is that the resultant image has a very wide field of view, so the portion of a sample under inspection can be immediately recognized. Not only does this enable biological samples to be examined in their natural environment, but the wavelength -scale detail is such that segments of the image can be enlarged to be viewed more clearly. Rodenburg said that a large-scale version of the device could be used to take 3D images like modern CT scans in hospitals. However, he added that the lensless design principle could be extended to other parts of the spectrum that are unable to be focused optically, such as ultraviolet or terahertz wavelengths. "We can get as good an image as the best optical microscope in the world," he said.

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