Scientists use a custom-designed machine and a reprogrammed Xbox controller to create atomically precise lenses

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Unleashing some of the most promising energy technologies of tomorrow—from electric vehicle fuel cells to photovoltaics—hinges upon understanding tiny structures spanning just billionths of a meter. One way to explore this critical nanoscale world is by sending high-intensity x-ray beams through materials, similar to the way doctors capture images of internal bone structure using large x-ray devices. The challenge with fringe physics, however, is that focusing that penetrating power on just a single nanometer takes an entirely different caliber of lens.

Using a massive, custom-built deposition device, Brookhaven Lab scientist Ray Conley and his team are able to grow special lenses one atomic layer at a time. As intense x-rays pass through these multilayer Laue lenses (MLL), the light diffracts and bends toward a single point. Creating these atomically precise optics is no small feat, and Conley continues to tweak the process of growing light-bending films and carving them into precise lenses.

Check out the video above for an introduction to the lens-growing device used at Brookhaven Lab, and get an insider's look at the most unexpected tool of the trade: a wireless Xbox controller.

Inside the room-length deposition system, a transport car travels through a vacuum-sealed chamber, collecting the lens layers brick by atomic

brick to form a completed MLL. Initially, that car could only be manipulated by repeatedly entering commands directly into a nearby computer. To increase efficiency and provide tactile control while he works, Conley's team reprogrammed an Xbox controller to move the transport car at variable speeds based upon which analog joystick he uses, control plasma deposition with different buttons, and even provide variable rumble feedback.

The completed MLLs will be deployed on beamlines at Brookhaven Lab's forthcoming National Synchrotron Light Source II, one of the world's most advanced light sources, to reveal unparalleled details of nanomaterial structures.

Provided by Brookhaven National Laboratory