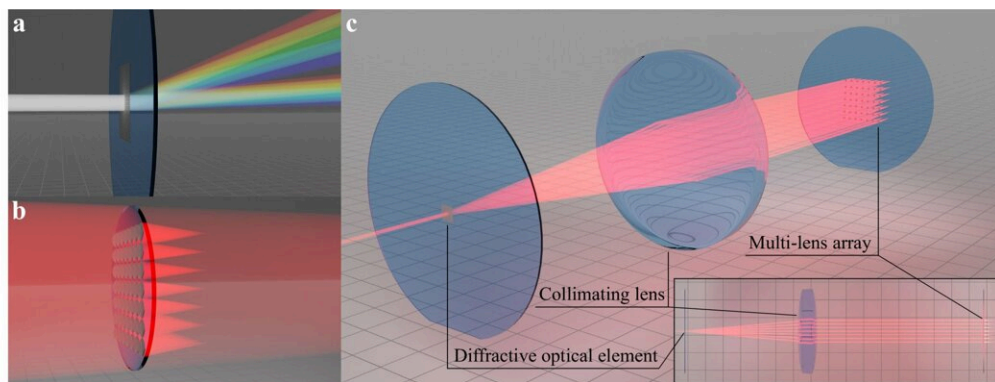


Microprinting millions of microparticles in the blink of an eye through multi-photon 3D laser printing

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A multi-photon (7×7)-focus 3D laser printer based on a 3D-printed diffractive optical element and a 3D-printed multi-lens array. Credit: Light: Advanced Manufacturing (2024). DOI: 10.37188/lam.2024.003

Multi-photon 3D laser printing has revolutionized miniature fabrication, but limitations in speed and material compatibility have held it back. Now, researchers have taken a giant leap forward, achieving a tenfold increase in print speed while maintaining exquisite detail.

This breakthrough, presented in a new study, utilizes multiple focused beams instead of one, dramatically boosting voxel throughput. Imagine meticulously crafting millions of microscopic parts, like intricate

medical devices or tiny, customized drug delivery drones, all within minutes. This is the future made possible by this innovative approach.

The researchers strategically arranged these [laser beams](#) using custom-made optical components, ensuring optimal focus and power delivery. Their high-precision system not only prints faster but also handles a wider range of materials, opening doors for diverse applications.

The study, [published](#) in *Light: Advanced Manufacturing*, showcased its power through two impressive demonstrations. First, millions of custom-designed microparticles were printed, paving the way for personalized medicine and revolutionary drug delivery solutions. Second, the researchers unveiled a massive, complex metamaterial containing over 1.7 trillion voxels—a record-breaking feat in microprinting.

This advancement is not just about speed and complexity. It pushes the boundaries of affordability and accessibility. The critical optical components for this high-tech system were themselves printed using a commercially available laser printer, demonstrating the technology's potential for wider adoption and democratization.

This research paints a vibrant picture of the future. Imagine seamlessly printing intricate micromachines, personalized medical implants, and groundbreaking materials, all thanks to this multi-beam laser printing revolution. By pushing the limits of [speed](#) and precision, researchers are paving the way for a future where microprinting shapes the world—one tiny, meticulously crafted voxel at a time.

More information: Pascal Kiefer et al, A multi-photon (7×7)-focus 3D laser printer based on a 3D-printed diffractive optical element and a 3D-printed multi-lens array, *Light: Advanced Manufacturing* (2024).

[DOI: 10.37188/lam.2024.003](https://doi.org/10.37188/lam.2024.003)

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