

Technology


# Liquid crystal lenses could make better bifocal glasses

A prototype of bifocal eyeglasses uses liquid crystals and electric fields to switch between modes that aid in nearby and distance vision

By [Karmela Padavic-Callaghan](#)

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 The first prototype of the liquid crystal bifocals  
Lin et al/APS 2025

Lenses made with [liquid crystals](#) could lead to eyeglasses that can easily switch between correcting near- and far-sightedness.

Bifocal glasses date back to the 18<sup>th</sup> century, and their design has not fundamentally changed since. Typically, the lower halves of their [lenses](#) are shaped for looking at objects that are close, while the upper halves are tailored for distant ones – so a person wearing them must keep shifting their gaze, which can be uncomfortable. [Yi-Hsin Lin](#) at National Yang Ming Chiao Tung University in Taiwan and her colleagues built glasses that can switch between the two modes at the tap of a button.

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Instead of fashioning lenses just from glass, which must be made convex or concave depending on its function, the researchers filled them with a thin layer of liquid crystal. The crystal’s molecules bend light differently depending on [their arrangement within the layer](#), and this can be controlled with electric fields.

Lin says the idea for switchable eyeglasses based on this principle, where thin electrodes in the frame would create the necessary electric fields, is almost 50 years old, but technical challenges stalled their development. Her team overcame some of these and made a wearable prototype.

These eyeglasses currently only reach a limited range of power, have a functional viewing region of about 10 millimetres – three to four times smaller than conventional eyeglasses – and take about 5 seconds to adjust after you tap the button on their frame. But Lin says her team has fully characterised the physics principles that make the glasses work, and the group has a sense for how to improve them going forward, including shortening the switching time by optimising the electronics. “Sooner or later almost everyone needs prescription glasses, so the potential market is huge,” says team member [Victor Reshetnyak](#) at the Taras Shevchenko National University of Kyiv in Ukraine.

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[Viola Kanevsky](#), an optometrist in New York, says people who could benefit most from switchable glasses hold technical jobs where small objects may be at the top of their field of vision. They may also be in a job that requires a [wide view](#) – for instance, architects who need to judge wide, straight lines or stockbrokers who may need to view multiple large screens, both near and far, without constantly turning their heads, she says.

But the new prototype is far from being clinically ready, in part because of the lenses’ small operational area, says [Mark Rosenfield](#) at the SUNY College of Optometry in New York. Using electronic components also drives up the cost and complexity of liquid crystal eyeglasses production, which may be an obstacle to quickly getting them to billions of potential users, says [Joshua Silver](#) at the University of Oxford. In 2004, he and his colleagues developed a different self-adjustable eyeglass design that uses fluids.

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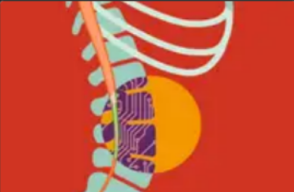
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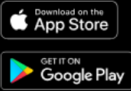
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