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SCIENTIST AT WORK: STEPHEN KURTIN

Making Eyeglasses That Let Wearers Change Focus on the Fly



SEEING NEAR AND FAR Stephen Kurtin with a glass element that is part of the mechanically adjustable eyeglasses he created.

By **JOHN MARKOFF**

LOS ANGELES — As a promising Caltech graduate student in applied physics, Stephen Kurtin could have taken a job offer from [Intel](#) at the dawn of the microelectronics era 40 years ago.

Instead he followed the path of a lone inventor, gaining more than 30 patents in fields including word processing software and sound systems, culminating in the pair of glasses resting on his nose, which he believes can free nearly two billion people around the world from bifocals, trifocals and progressive lenses.

The glasses have a tiny adjustable slider on the bridge of the frame that makes it possible to focus alternately on the page of a book, a computer screen or a mountain range in the distance.

Dr. Kurtin, 64, has spent almost 20 years of his career on a quest to create a better pair of spectacles for people who suffer from [presbyopia](#) — the condition that affects almost everyone over the age of 40 as they progressively lose the ability to focus on close objects.

After many false turns and dead ends, he has succeeded in creating glasses with a mechanically adjustable focus. He says they are better than other glasses and some forms of [Lasik](#) surgery.

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And they make an intriguing fashion statement: a bit of [Harry Potter](#) with a dash of “Revenge of the Nerds.”

Dr. Kurtin did his graduate student research in applied physics for Carver A. Mead, an industry pioneer and a physicist. Later, a series of his innovations in software technology led to the Lexitron Videotype, the first stand-alone, paper-quality Wysiwyg word processor. And he created an early version of a surround sound system for Advent, a maker of speakers.

The glasses crusade has been his passion since 1992. This month, [TruFocals, the company he founded three years ago](#), has begun selling its first adjustable focusing [eyeglasses](#) through a small group of optometrists and will soon sell directly online. Dr. Kurtin said that with his wife he had invested several million dollars in the project, and he said private investors, including Jonathan Seybold, a computer industry publisher, had invested several million more.

The invention of the bifocal lens is credited to [Benjamin Franklin](#), who was pictured wearing an unusual pair of glasses as early as 1764. Since then meaningful advances have been slow in coming. Bifocals were followed by trifocals, and then, shortly after the turn of the 20th century, by the first progressive lens, which eliminates the sharp lines associated with bifocals.

“For more than 140 years, adjustable focus has been recognized as the Holy Grail for presbyopes,” said Dr. Kurtin, referring to the roughly one-third of the population that has lost some or all ability to focus on close objects. But there is a reason that better alternatives have not emerged: “It’s a blazingly difficult problem,” he said.

The idea of a fluid lens whose focal plane can be mechanically adjusted goes back at least to an 1866 patent awarded D. A. Woodward, a Baltimore inventor. Since then there have been a variety of attempts to commercialize the technology, but none have met all the criteria for success. The lens must be thin, light, durable and easily adjustable. Several years ago Dr. Kurtin had his epiphany. A magnetically attached removable front lens would make for a compact and durable system.

Others have done research on approaches that do not involve a fluid, like systems of lenses and electro-optical technologies. In 1964, for example, Luis W. Alvarez, who in 1968 won the [Nobel Prize](#) in physics, designed a two-part lens that changed focus by sliding two glass components of opposing “saddle-back” shapes across each other.

Several international efforts are under way to adapt both fluid lenses and the Alvarez approach to the 1.3 billion people at the bottom of the economic pyramid that the [World Health Organization](#) estimates as having no access to eyeglasses. Both the Center for Vision in the Developing World in Oxford, England, and U-Specs in Amsterdam are working on glasses that can be distributed at a fraction of the price that glasses cost in the developed world.

The TruFocals eyeglasses, which sell for \$895, are the first to become commercially available in the United States. The glasses consist of a lens that is comparable in thickness to that of commercial eyeglasses, but which has three components: a back glass, a fluid-filled inner membrane that is essentially a piece of plastic-wrap-like material stretched across a ring whose surface curvature can be altered mechanically, and an outer prescription lens attached with magnets to the eyeglass frame. To change the focus, the user moves the slider on the bridge.

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The TruFocals lens must be round to ensure that the curvature of the interior lens is correct, but the company's founders do not think the shape is a fashion obstacle. TruFocals come in a unisex frame with a variety of colors.

Even if TruFocals are not accepted as eyewear for all uses, they may find a market for a diverse set of wearers, like office workers who work at computer screens but who must also read books, magazines and newspapers, or people who have medical conditions that cause their vision to change.

"This is not going to break open the whole market, but they don't need to break open the whole market," said Eli Peli, a professor of ophthalmology at Harvard Medical School and an investor in TruFocals. For the moment TruFocals has the market to itself, but it may have competition next year. [PixelOptics, based in Roanoke, Va.](#), is pursuing an electro-optical approach, which will use a technology that is similar to an LCD display to change the refractive index of a transparent component that the company will embed in conventional lenses.

In principle, that will make the technology accessible to many frames and fashions. The goal is a system that will automatically determine focus by using an accelerometer, a sensor that measures changes in motion, said Ronald Bloom, the company founder. It would need recharging every two or three days. The company has not given out details or pricing of its technology, but has said that it is in user trials.

Dr. Kurtin is introducing his product into the market slowly, but he is hopeful that his new fashion look will catch on. He notes that when the members of one of his investor's families get together they like to joke that they look a little bit like a Devo fan club meeting.