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*SPECIAL REPORT*

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# Bright Horizons™



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## NEWS SCAN

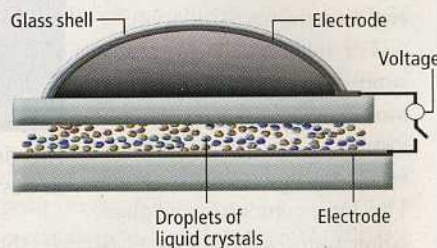
### OPTICS

# Liquid Zoom

Adaptive lenses change magnification without moving **BY STEVEN ASHLEY**

**C**amera bugs love zoom lenses, but they tend to be too bulky for cell phones and many miniature digital cameras. A research team at the University of Central Florida (U.C.F.) led by optics professors Shin-Tson Wu and Hongwen Ren has developed zoom lenses that can be dramatically smaller than conventional zooms. Whereas traditional zoom lenses move sets of lens elements mechanically to adjust focal length (and therefore magnification), the group's adaptive lenses alter focal length nearly instantaneously without changing the position of the lenses.

The U.C.F. team has two ways to make adaptive lenses. The first class, Wu explains, is based on the ability of a liquid-crystal layer to alter the degree to which it can refract (or bend) light when subjected to an electric field. In one version of this approach, the researchers adjust the layer's refractive index by varying the strength of the electric field in a concentric and graduated fashion. A change in the low voltage applied to a clear electrode modifies the focal length of the lens. Makers of cell phone lenses like to have a zoom magnification ratio of at least three and low voltages to save battery power, he says.



**ADAPTIVE LENS** uses a convex electrode that produces an electric field whose strength varies from center to edge. The light-refracting liquid crystals respond in kind, enabling changes in focal length (zooming).

The second approach "mimics the workings of the human eye," Wu states. It relies on a transparent fluid—water or oil—that is encapsulated between a see-through, flexible membrane and a flat glass substrate. When a tiny servomotor compresses a circular periphery seal that acts like an iris diaphragm, the shape of the membrane grows convex, modifying the fluidic lens's focal length.

The U.C.F. team has licensed five of its patented technologies to Holochip, a start-up company based in Albuquerque and San Francisco. It hopes to place the adaptive zooms, which can have apertures as small as a millimeter, into products sometime during the next few years.

ANN SANDBERSON

### ENVIRONMENT

# Toxic Bulbs

Recycling rules vary for mercury-containing fluorescents **BY DAVID APPELL**

**M**ore consumers are placing compact fluorescent lightbulbs (CFLs) in their shopping baskets. Using 25 percent the energy of standard incandescents (and lasting 10 times longer), the swirly little tubes have become a symbol of green

living and a means to fight climate change. Australia will require homeowners and businesses to replace all incandescents with CFLs by 2010, ultimately reducing greenhouse gas emissions by four million metric tons a year. At least four U.S.

