



HEALTH & LONGEVITY | CHI HWAN LEE

PHOTO BY VINCENT WALTER

EYES ON YOUR HEALTH

STILLWATER, OKLAHOMA | People with diabetes may soon be wearing soft contact lenses that can multitask — improving sight, monitoring glucose levels, and delivering drugs to the eyes all at the same time. Other patients may be fit with a skin-like electronic smart bandage that can monitor medical conditions. These high-tech steps towards personalized medicine are the work of **Chi Hwan Lee**, an assistant professor of biomedical engineering and mechanical engineering.

Lee's research group focuses on the development of advanced printing technology that enables the production of various kinds of wearable bioelectronics like the electronic bandage that can monitor electrophysiological

signals, eye-wearable healthcare systems such as the soft contact lenses, and bio-integrated nano-systems. His electronic bandage uses a mesh of conducting nanowires embedded in a thin layer of elastic polymer to mimic the elasticity and sensory character of skin.

The bandage was created using Lee's own patented controlled interfacial debonding process, which allows the physical separation of thin film electronics from their native fabrication wafers. The separated thin film electronics can be then pasted onto various kinds of receiver substrates. The flexible bandage material, developed in collaboration with researchers from *Oklahoma State University*, is superior to existing approaches using gold, silver and

copper that are susceptible to fracture from over-stretching and cracking.

Lee's most recent work has led to a novel method for attaching thin film sensors and other small devices to commercial hydrogel-based contact lenses, opening the door for numerous advanced eye care applications that include controlled release of ocular drugs, eye-wearable night vision and augmented reality.

"My work is dedicated to developing mechanically stretchable materials, mechanics and assembly techniques for creating a novel class of wearable biomedical devices that can address the important biomedical engineering challenges facing our society and the many people in need," Lee says.