Self-powered system makes
smart windows smarter

A NEW SOLAR CELL technology could make it inexpensive to create and install smart windows that automatically vary their tint to augment lighting, heating and cooling systems in buildings.

The new transparent solar cells selectively absorb near-ultraviolet (UV) light and convert it to electricity that powers chemical reactions to lighten or darken the glass of the smart window as needed. Smart windows are usually bulky to install because they require an external power source. The new solar cells allow smart windows to be self-powered and occupy the same footprint as the glass.

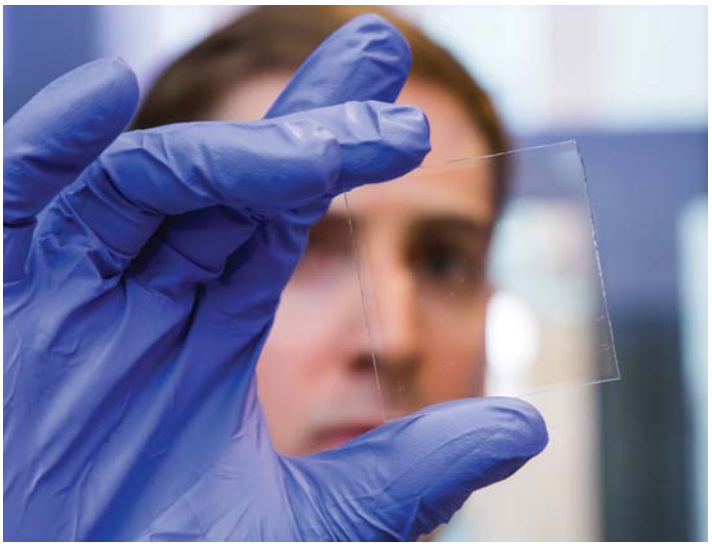
"We wanted the smart window to dynamically control the amount of natural light and heat that can come inside, saving on energy costs and making the space more comfortable," said Yueh-Lin (Lynn) Loo, director of the Andlinger Center for Energy and the Environment, the Theodora D. '78 and William H. Walton III '74 Professor in Engineering, and professor of chemical and biological engineering.

The study, published June 30, 2017, in the journal *Nature Energy*, received funding from the National Science Foundation.

Nicholas Davy, a doctoral student in the chemical and biological engineering department and the paper's first author, said the new transparent near-UV solar cells are better suited to power smart windows than existing transparent solar cells, which target the infrared portion of sunlight and thus complicate the control of heat.

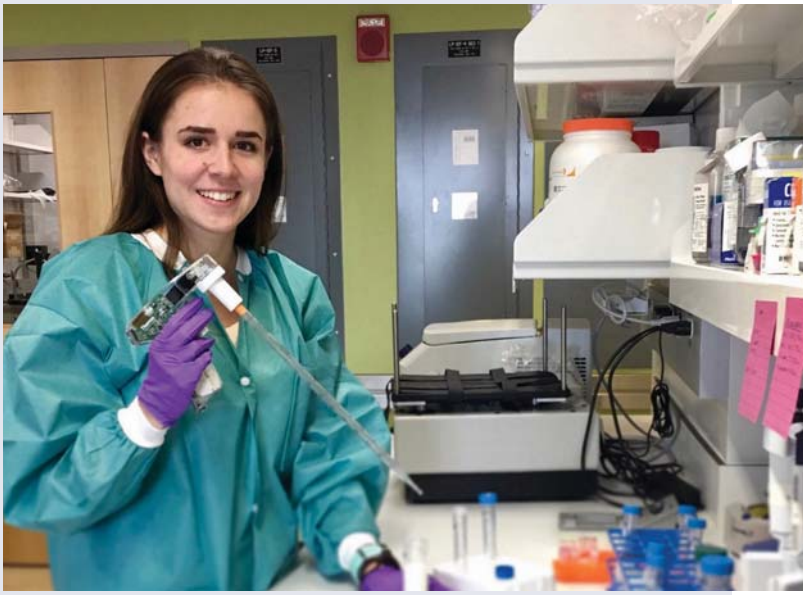
The Princeton team's aim is to create a flexible version of the solar-powered smart window system that can be applied to existing windows via lamination. Davy and Loo have started a company called Andluca Technologies to bring this energy-saving solution to residential and commercial buildings. **–By Sharon Adarlo**

PHOTO BY DAVID KELLY CROW



Graduate student Nicholas Davy holds a sample of glass that uses near-ultraviolet light to generate electricity, which powers chemical reactions that lighten or darken the glass.

PHOTO BY ALEXIS BAILEY



Emily Shuldiner, Class of 2016, was a co-first author on a study published in the journal *Science Advances* on genetic changes linked to dogs' social behaviors toward humans.

FOCUS ON UNDERGRADUATE RESEARCH

Probing the genetic basis for
dog-human relationships

A NEW STUDY has identified genetic changes that are linked to dogs' human-directed social behaviors and suggests there is a common underlying genetic basis for hyper-social behavior in both dogs and humans.

An interdisciplinary team of researchers, including those from Princeton University, sequenced a region of chromosome 6 in dogs and found multiple sections of canine DNA that were associated with differences in social behavior. In many cases, unique genetic insertions called transposons in the Williams-Beuren syndrome critical region were strongly associated with the tendency to seek out humans for physical contact, assistance and information.

In contrast, in humans, it is the deletion of genes from the counterpart of this region on the human genome, rather than insertions, that causes Williams-Beuren syndrome, a congenital disorder characterized by hyper-social traits such as exceptional gregariousness. The study, which was supported by the National Science Foundation and the National Institutes of Health, was published July 19, 2017, in *Science Advances*.

"It was the remarkable similarity between the behavioral presentation of Williams-Beuren syndrome and the friendliness of domesticated dogs that suggested to us that there may be similarities in the genetic architecture of the two phenotypes," said Bridgett vonHoldt, an assistant professor in ecology and evolutionary biology at Princeton and the study's lead author.

Emily Shuldiner, Class of 2016 and a co-first author, pinpointed the commonalities in the genetic architecture of Williams-Beuren syndrome and canine tameness as part of her senior thesis research.

VonHoldt's findings suggest that only a few transposons on this region likely govern a complex set of social behaviors. "We haven't found a 'social gene,' but rather an important [genetic] component that shapes animal personality and assisted the process of domesticating a wild wolf into a tame dog," she said. **–By Pooja Makhijani**