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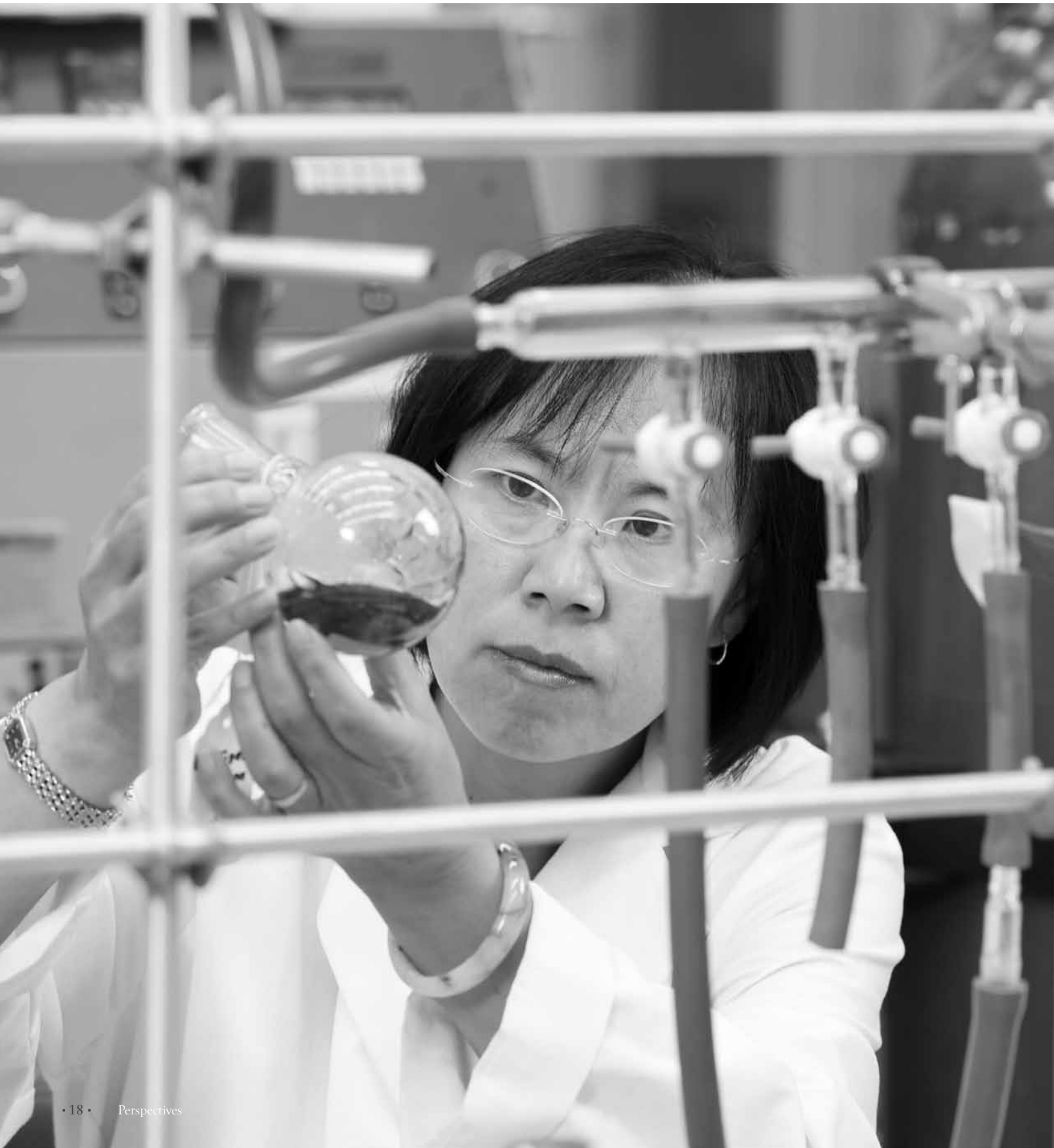
Greg Tammen



# Professor's work a patented success

Xiuzhi "Susan" Sun

In the 16 years Xiuzhi "Susan" Sun has been at Kansas State University, she's made a patent-worthy discovery nearly every year.

Sun is a university distinguished professor in grain science and industry and is an internationally recognized expert in bio-based materials — specifically in soy polymer structure, synthesis and adhesion. Her focus is on how various plant and grain molecules — like proteins, lipids and sugars — can be used to create bio-based materials that are safer, more durable and environmentally friendly.

Currently Sun's work has been granted eight patents, with six more pending.

The most recent patent covers a peptide-based adhesive that could be used in outer space, as its stickiness increases in drier environments. This ability means it could be ideal for affixing a heat-resistant tile to a spacecraft or a space station.

Some of her other patents cover edible and biodegradable feed packaging materials; an apparatus to form these packaging materials; a soy-based, formaldehyde-free adhesive that's water resistant; and high strength degradable plastics from the reactive blending of starch and poly(lactic acid).

But Sun's discoveries don't stop there. Her latest has potential human health applications, including repairing and replacing whole tissues.

By introducing a calcium ion to a protein molecule, Sun and her colleagues found that the molecules form a thermostable, water-based colloidal gel, called a hydrogel. The interaction between the calcium ions and protein molecules creates tiny, cross-linking fine fibers with a nano scale diameter — around 10 nanometers. The resulting material has a consistency similar to jelly, even though it's nearly 100 percent water.

This novel hydrogel has unusual properties, including a rapid-recovery property, Sun said. Shaking it transforms the hydrogel into hundreds of colorless micro gels with a Newtonian flow. Though these micro gels aren't a liquid, they behave like water. After about 10 seconds, the liquid-like substance reforms into a hydrogel due to its rheological properties. Having rheological properties allows the material to be deformed into micro gels and back into a hydrogel with the shake of the hand.

"This discovery has great potential for drug delivery and 3-D cell growth for tissue engineering," Sun said. "Potentially, it could lead to repairing or replacing bone, cartilage, blood vessels and skin."

Based on published information, this is currently the only protein-binding calcium that's led to a hydrogel, as well as the fastest rapid-recovery speed and the smallest molecular weight.

Sun's work has also led to developing a novel soy oil-based resin that can be used for transparent duct and packing tapes.

"I have always felt so rewarded if any of the technologies developed from my laboratory have commercial values that improve our environment and make the world a better place," said Sun, who was inspired by stories about famous scientists like Sir Isaac Newton during her teenage years.

Sun established and leads the Bio Materials and Technology Laboratory and is co-director and founder of the Center for Biobased Polymers By Design.

*By Greg Tammen, Communications and Marketing*