

# FLIPPING THE SWITCH(GRASS)

By AMP Staff

Arkansas' scientific contribution to cost-effective biofuels is rooted in a plant not commonly associated with energy: tobacco. A landmark \$206 billion settlement from the nation's leading tobacco companies triggered the Tobacco Settlement Proceeds Act, dispersing funds to states that included Arkansas.

A portion of those funds led to the creation of the Arkansas Biosciences Institute (ABI), a collaboration of scientists from Arkansas Children's Research Institute, Arkansas State University, the University of Arkansas and the University of Arkansas for Medical Sciences.

Located on the Arkansas State campus in Jonesboro, ABI is a spearhead of impactful science in Arkansas. ABI collaborative research has led to many successful collaborations, projects, discover-



Xu works with the Arkansas Biosciences Institute at Arkansas State University. (Photo provided)

ies and more than \$800 million in new research funding. A portion of that funding is from the U.S. Department of Energy (DOE), supporting breakthrough biofuel research from ARA Academy member, Dr. Jianfeng Xu.

"ABI is incredible," said Xu, who joined the College of Agriculture at A-State in 2008. "All the equipment and resources I need are here. And it's a great facility for my students, particularly undergraduate students. They are offered the remarkable opportunity to conduct real, world-class research here."

Xu's research centers on genetic engineering of plants for both biomedical and biofuel purposes. The latter is of great importance

to the DOE, which has helped fund Xu's research into plant cell wall biomass, specifically in a common and plentiful plant known as switchgrass, a lignocellulosic biomass.

"Switchgrass bears all the traits of an ideal source of biofuel," Xu explained. "It's abundant. It's renewable. It grows well in poor soils. It requires very little fertilizer. Basically, I'm saying switchgrass is cheap."

However, what's not "cheap" is the biomass-to-biofuel conversion processes, which includes pretreatment, saccharification and fermentation. The cost is the largest barrier to the commercialization of lignocellulosic biofuels.

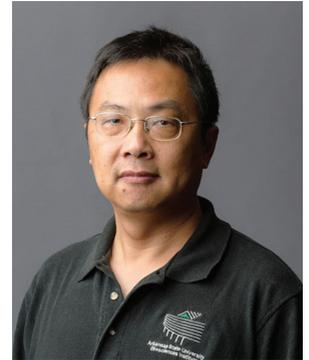
To address this challenge, Xu and his team at ABI are employing genetic engineering techniques to remodel the structure of the plant cell wall. The aim is to significantly reduce the cost associated with the biomass-to-biofuel conversion process by facilitating the breakdown of the recalcitrant cell wall structure (pretreatment) and aiding the saccharification process, thereby enhancing the economic viability and competitiveness of biofuel production.

As an added benefit, the technology goes beyond switchgrass and offers the capability to engineer the cell wall of any plant species.

The United States currently is the world's largest producer of biofuels, generating \$21.6 billion in economic output. While Arkansas is currently without an ethanol production plant, the state biodiesel production capacity totals 115 million gallons annually, the fifth highest of any state. Xu's research is significant in that it can reduce the cost of producing biofuels, giving renewable energy another edge over fossil fuels. It's not difficult to imagine innovation from ABI sparking biofuel production companies in The Natural State.

"Launching a startup biotech company in Arkansas is one of my goals," Xu said. "Arkansas State and ABI are creating collaboration that is building a biofuels research community from the ground up. That's makes us fertile ground for commercialization." 

*Discovery Economics is a monthly feature highlighting the work of the ARA Academy of Scholars and Fellows, a community of strategic research leaders who strive to maximize the value of discovery and progress in the state. ARA recruits, retains and focuses strategic research leaders to enhance the state's competitiveness in the knowledge economy and the production of job-creating discoveries and innovation. Learn more at [ARalliance.org](http://ARalliance.org).*



Dr. Jianfeng Xu