

# IOWA STATE UNIVERSITY

## Biosciences, Economic Development, and New Technologies

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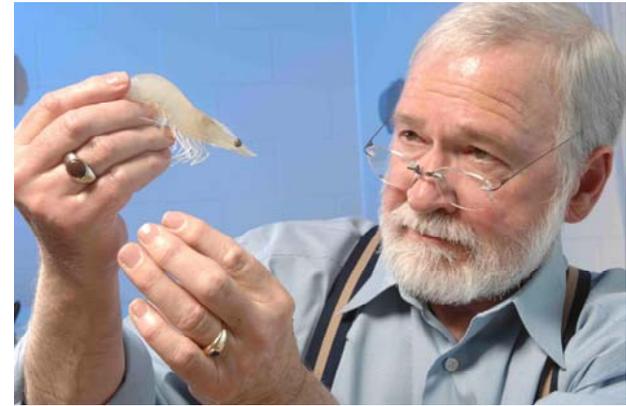
College of Liberal Arts and Sciences

# Biosciences hold the promise for Iowa's future

- Iowa is home to the nation's largest biotechnology enterprise, leading the nation in the production of food, feed, and biofuels
- The *biosciences* – biology combined with chemistry, computation, engineering, technology, and numerous other disciplines – provide innovations to keep our bioeconomy moving forward
- Iowa State plays a leading role
  - 450 faculty in 25 departments and five colleges
  - 6,000 students
  - \$85 million in sponsored research funding

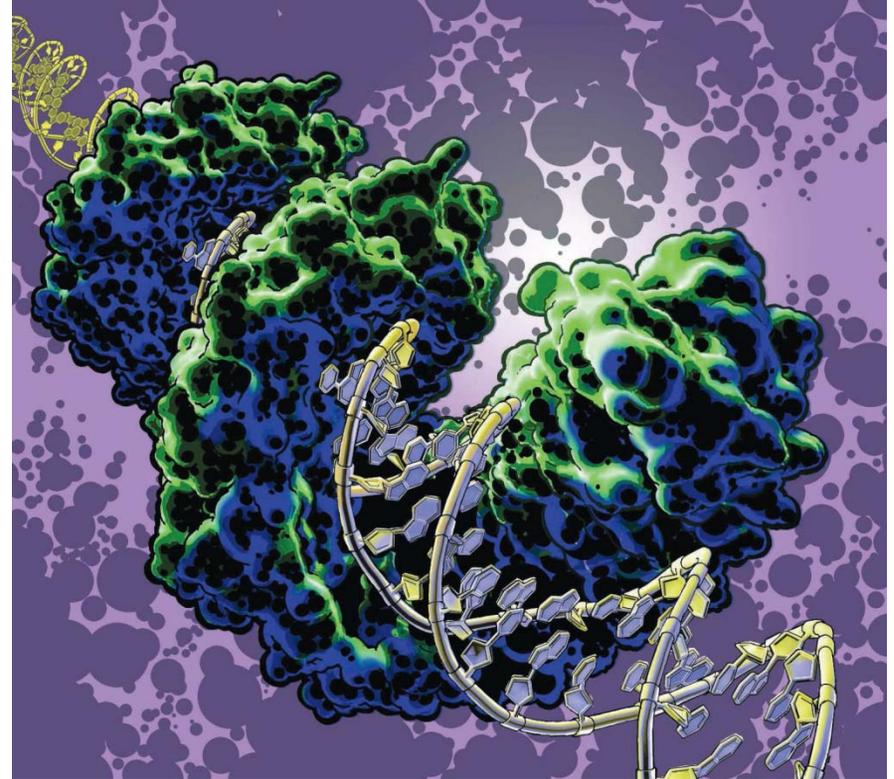
# Basic research leads to economic development

- Technology transfer and economic development depend on a foundation of basic and targeted research
- ISU researcher Hank Harris founded HarrisVaccines, a start-up in the ISU Research Park, for R&D of novel vaccines for swine, cattle and farm-raised shrimp.
- ISU researcher Byron Brehm-Stecher and local company Advanced Analytical collaborated to develop a new, faster technology for salmonella detection in the food supply



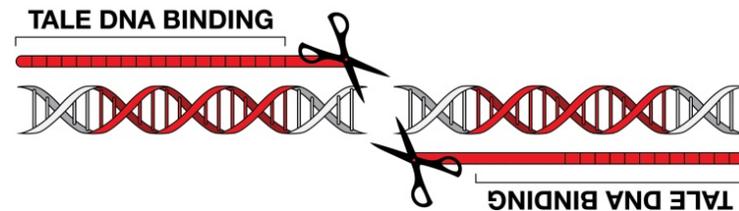
# TALEN Technology

- Named 2011 “Method of the Year” by the journal *Nature Methods*
- Named 2012 runner-up “Breakthrough of the Year” by the journal *Science*
- Pioneering work by Iowa State faculty in genetics and plant pathology
- TALENs can be used for non-transgenic (non-GMO) genetic improvement



# Enabling precise, specific DNA changes

- Research on rice blight led to the discovery of TALEs, which bacteria use to control the sugar supply in infected plants
- TALENs combine TALEs with DNA cutting “nucleases”
- TALENs can be used to make specific changes in the genetic blueprint of plants in beneficial ways, such as increasing disease resistance or improving productivity



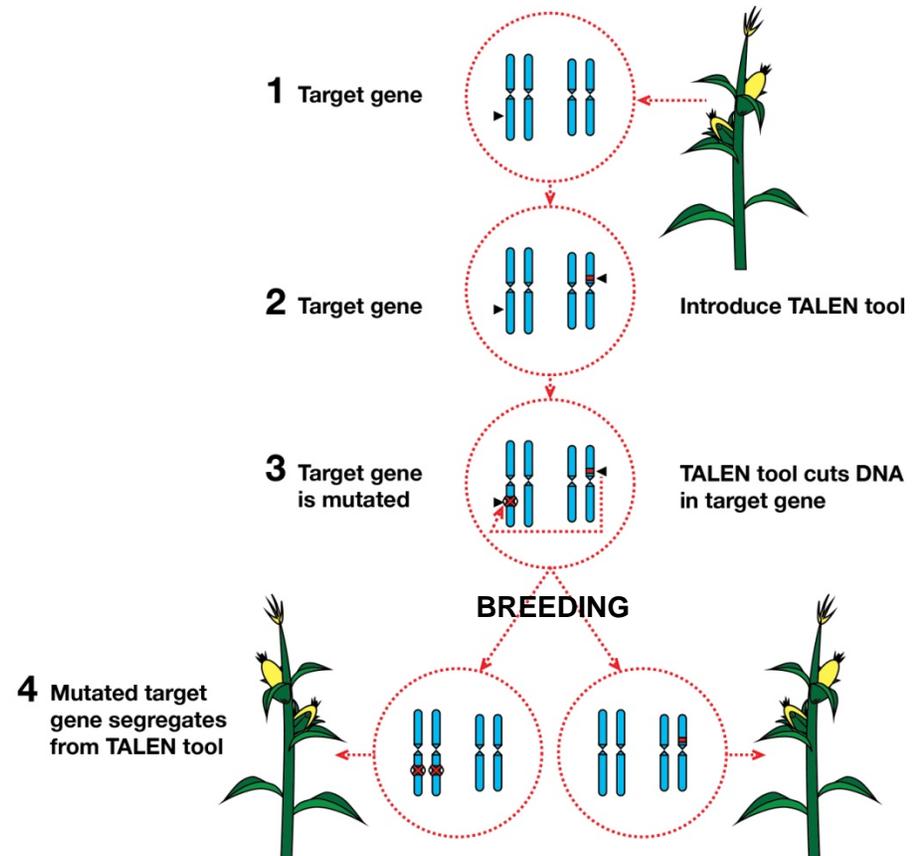
# Using TALENs for crop improvement and biomedical advances

- ISU researcher Bing Yang and colleagues are using TALENs for genetic improvements in corn and soybeans, as well as to develop rice plants resistant to rice blight, improving global food safety and productivity
- ISU researcher Jeff Essner is a founder of Recombinetics, a company using TALENs to guide genetic improvement of large animals for biomedical and agricultural uses



# TALENs: non-transgenic (non-GMO) genetic improvement

- The TALEN “tools” can be removed from genetically modified crops through breeding
- TALENs can be used to develop non-transgenic (non-GMO) crops with disease-resistance, stress-resistance, etc.



# TALEN Summary

- Pioneering research at Iowa State enabled by research on rice blight disease
- Major national/international visibility
- Can make precise, rapid modifications to the genome of plants and animals
- Importantly – genetic segregation of TALEN “tools” from targeted modifications results in “non-GMO”
- Current research at Iowa State to enable basic gene discovery and to modify crops and develop animal models for biomedicine