



Inspired by her Extension 4-H experience, Audrey Lane entered the University's College of Biological Sciences, where she is a student of genetics professors David Greenstein (above) and Perry Hackett (see inside front cover).

# Building the next generation of STEM leaders

Extension's 4-H youth take their excitement for science to the University of Minnesota



**STEM =**

Science +  
Technology +  
Engineering +  
Math

STEM-related jobs are growing three times faster than other industries, but only 5 percent of U.S. students get their undergraduate degree in science and engineering. Hands-on experiences in 4-H STEM set Minnesota youth on a path to continued learning in college and careers.

Audrey Lane didn't care about genetics when her high school class was learning how a parent's genes determine their child's eye color. Her "aha" moment came during the Dakota County 4-H dairy project. Audrey learned how genetics factor into raising a healthy cow, including milk production values, which she was evaluated on during the Minnesota State Fair.

"4-H was the first place I learned the practical application of studying genetics," says Audrey, now 19 years old and majoring in genetic cell biology and development in the College of Biological Sciences at the

University of Minnesota. “4-H made the science real. Learning how genetics was used in the dairy industry made it seem much more important.”

In Waseca County, Ryan Strobel’s first in-depth experience learning about animal health came through the 4-H swine project. “In 4-H, I got to work with a vet and manage the pigs on my own. I learned how quickly their health could change, and the signs to watch for.” Ryan is now in his first year of the U’s VetFAST program, which was created to address the shortage of livestock veterinarians. VetFAST is a collaboration of the College of Veterinary Medicine and the College of Food, Agricultural and Natural Resource Sciences.

Sparkling interest in STEM is a priority for 4-H. “There is a critical need for skilled STEM professionals, nationally and in Minnesota,” says Dorothy Freeman, Extension associate dean for youth development and state 4-H director. “We know engaging youth in STEM at an early age increases the likelihood of their continued interest.”

“Kids sometimes think scientists just do experiments in labs, and engineers only

build and fix trains,” says Hui Hui Wang, STEM educator for Extension 4-H youth development and the University’s STEM Education Center. “When youth get to try and figure out how to design and build a robot that can collect water samples in a lake, they’re getting excited about engineering without realizing it. Then they learn that scientists and engineers are just like them, people skilled at asking questions, identifying problems and finding creative solutions.”

Building skills that can transfer to many careers is what 4-H does through its youth-driven experiential learning model. In fact, 4-H youth are more likely to pursue future study or careers in science, engineering or computer technology, according to a national study by Tufts University.

“The STEM jobs of 20 years in the future



Ryan Strobel, 4-H alum from Waseca County, continues his hands-on learning experience at the University of Minnesota.

don’t exist yet,” says Gillian Roerhig, associate director of the University of Minnesota’s STEM Education Center. “Youth need to learn critical thinking and problem-solving skills, which are necessary to succeed in any STEM-related job.”



## WANTED: Future scientists and engineers

For the U.S. to generate 20 percent of its electricity from wind power by 2030, utilities, manufacturers and communities will need hundreds of additional wind power professionals.

## Harnessing the power of 4-H youth

Layton Wittnebel, age 12, has always loved robotics, so he jumped at the chance to learn the newest twist—4-H Turbotics—applying robotics to wind energy.

It’s easy to see why 4-H, part of University of Minnesota Extension, is like a 4-H’er’s first University of Minnesota class.

Layton’s 4-H Turbotics class was held at the University of Minnesota West Central Research and Outreach Center (WCROC) in Morris. In 4-H Turbotics, 4-H’ers gain engineering skills and explore alternative energy technology using Lego Robotics, wind turbines and solar panel kits. They compete in a challenge to design a machine that yields the highest energy output.

They also learn about research and careers from Joel Tallaksen, a renewable energy scientist at the WCROC. Tallaksen is one of the scientists involved in the University’s recent success producing fertilizer from wind. It’s another example of 4-H’s connection to University research.

4-H youth also have a chance to take on leadership roles and help educate others. As a Lac qui Parle County 4-H youth leader, Layton will guide his club in the newest 4-H STEM project. “We learn how to help without taking over,” says Layton. “It’ll be fun to help the younger members progress, like other people did for me.”