

# SYSTEM ALERT!

Tomorrow is almost here.

## Coming to a store near you A store coming near to you

What to do? You need a few items from the grocery store, but you are stuck at home. Easy. Make the grocery store come to you.

This service isn't a reality today. But it might be in the near future. That is the hope of a new start-up called Robomart, led by entrepreneur Ali Ahmed.

There has been much talk of the dawning era of self-driving cars. Generally, discussion centers on vehicles that drive passengers from place to place. But autonomous vehicles don't need to transport humans at all.

As imagined, Robomart would be a miniature store on wheels. It would likely be summoned to your location using a phone app. It would drive to you, navigated by a computer with the help of onboard sensors and GPS. When it arrives, you would head out to unlock its door and access the shelves of grocery items inside. Hmm. Which pun is better here? The *ultimate convenience store* or *fast food*?

Robomart wants to be a player in the autonomous vehicle commerce scene. However, it is currently only in the prototype stage. But there will be no shortage of competition. It is well known in the industry that Toyota is developing vehicles for similar uses. Other automated delivery services such as Amazon's air drone delivery system are angling for a piece of the market as well. ⚠️

Source: Robomart



### Here are a few of the features that will help Robomart navigate the road:

- LIDAR (uses laser pulses to scan the environment)
- RADAR (uses radio waves to scan the environment)
- Camera (for identifying signs, spotting obstacles, and switching lanes)
- Electric power train (top speed of 25 miles per hour)

Technology and food have shared a close relationship since human prehistory. Some believe the discovery of cooking with fire propelled humans from wandering hunter-gatherers to architects of a planetary civilization. Agriculture, preservation, industrialization – the arrow of food innovation has never stopped. In this issue of *SySTEM Alert!*, see how emerging technologies are affecting what and how we eat. ⚠️

Interested in the science of food? Check out these STEM Expeditions® titles by Pitsco:

- **Bio Research:** Think like a grocery store owner and make decisions about genetically modified food.
- **Cultivating Our Future:** Learn how technology has changed farming and start your own radish garden.
- **Safe Food:** Become a health official and perform tests of various foods. ⚠️

# Automation, farm to table

Many believe we will need more efficient food production to feed the world's growing population. Under the right conditions, machines work with incredible efficiency. They are also tireless, do not complain, and work for free. Not all jobs in the food industry can be automated, but machines are playing a bigger and bigger role in getting food from the farm to your dinner plate. Here are three interesting examples.

How fast do you think you can sort objects by color? You might be a speed demon, but you are still a slowpoke compared to the machines that sort ripe tomatoes from green ones as they are being harvested in the field. One such machine, manufactured by TOMRA, can sort hundreds of thousands of tomatoes per hour.

A large machine called a harvester drives through a field, separating tomatoes from the rest of the plant. The tomatoes go down a conveyor belt while still on the harvester. An electronic eye notices which tomatoes are red and which are still green. The green ones aren't ready to be sold. The conveyor belt ends abruptly. As the tomatoes fall off the edge, finger ejectors swing out and kick the green tomatoes away. Only the ripe tomatoes are kept.



Source: TOMRA

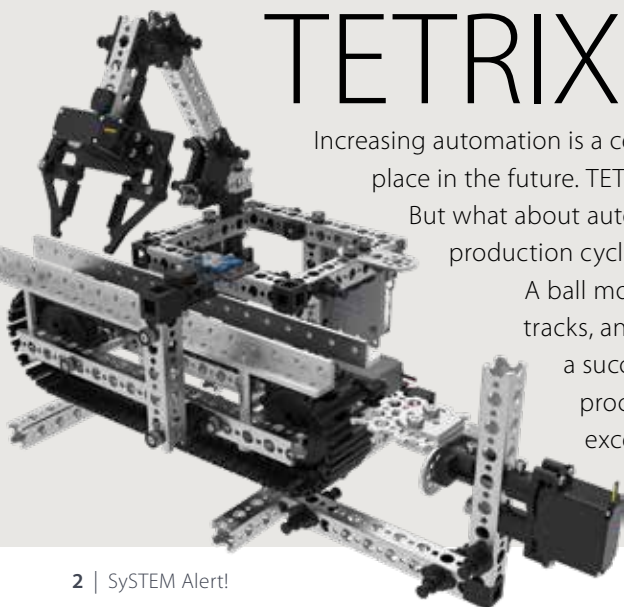
## TETRIX® WorkCell

Increasing automation is a certainty. Those who understand the reality of it will be better prepared to find their place in the future. TETRIX is recognized as an incredible tool for people learning the basics of robotics.

But what about automation? The TETRIX MAX WorkCell build with PRIZM® demonstrates a simplified production cycle while revealing how flexibility and decision-making still play a role.

A ball moves through an automated course with the help of conveyor belts, end effectors, tracks, and lifts. Visual scanning and programmed if-then logic keep the flow going. Creating a successful model requires holistic thinking – understanding how each part of the process affects the other parts. The model is not for beginners but could make an excellent class project with an emphasis on automation and troubleshooting.

For more about this build or to download the plans, visit [video.pitsco.com/default.aspx?VID=640](https://video.pitsco.com/default.aspx?VID=640). ⚠️





Source: SCOTT Automation & Robotics

Compared to some other food production practices, automated systems for cutting meat arrived a little late. There are big advantages to giving this work to robots, however. For one thing, the work can be dangerous. The powerful saws needed to cut a carcass, for example, occasionally cause serious injury to human operators.

The company SCOTT Automation & Robotics is debuting an automated system for cutting ribs from beef carcasses. The carcasses are suspended from above and moved down a line. They are scanned using multiple sensors. A 3-D image of the outside of each carcass is made, and an internal view is provided by X-rays. The data is fed to a computer that determines precise points for making the most efficient cuts. A robotic arm with a circular saw as an end effector is able to make the cuts as the carcasses are still moving.



Source: Lely

Over 20 billion gallons of milk are produced annually in the United States. One big challenge to automating milking? Cows have minds of their own and don't always follow the rules!

One solution, the Lely Astronaut, keeps the process flowing by building in flexibility. Cows come to milking stalls of their own free will, coaxed by food. An array of sensors monitors every move of the cow in order to adapt to the cow's movements. A robotic arm scans the cow's teats in 3-D before attaching the suction cups that perform the milking. The milk is tested for signs of disease right at the milking site. ⚠️



# The meat of tomorrow?

Cultured meat isn't a hamburger that enjoys watching opera. *Cultured meat* refers to the use of just a few cells from an animal to grow an entire piece of meat.

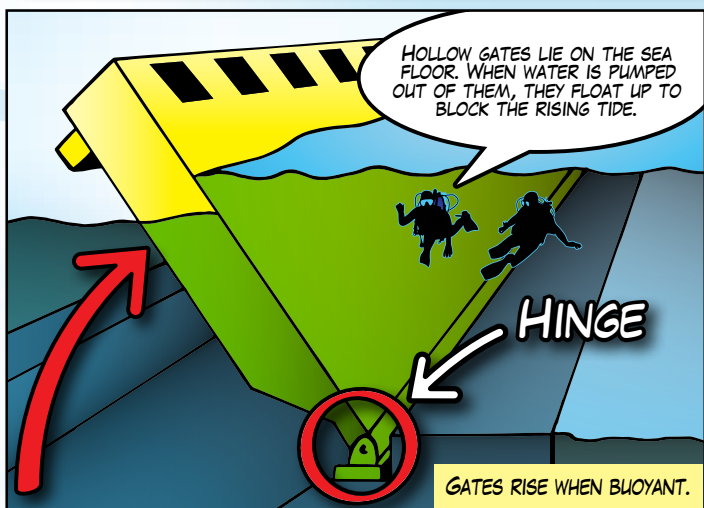
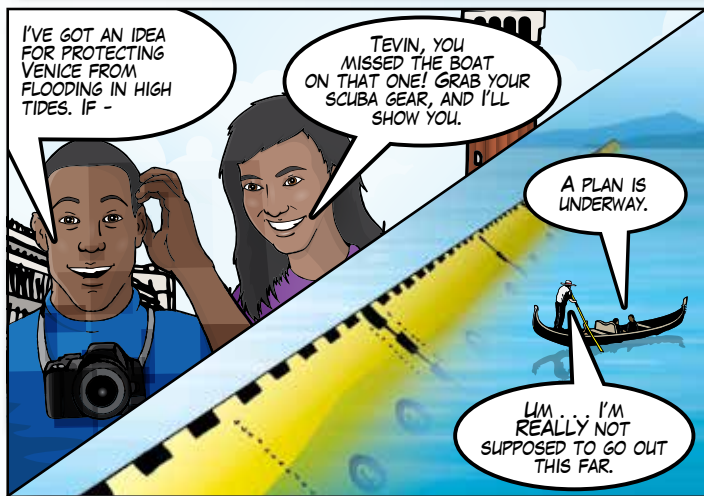
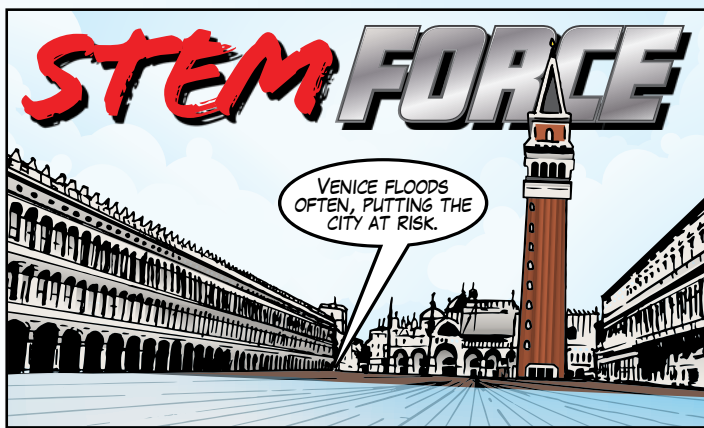
The technique is being perfected in a few laboratories around the world. Cells are extracted from a living animal. Adult stem cells are useful because they can be transformed into any other type of cell. The cells are placed in a nutrition bath in a device called a bioreactor. As the cells multiply, they are stretched to simulate the conditions that develop muscle tissue in an animal.

In theory, cultured meat could produce many tons of meat from just a few cells. Some believe it would have benefits for the environment and for animal welfare as well.

But there are challenges. As with many potentially revolutionary products, the greatest difficulty is not creating the product in the lab. The greatest difficulty is engineering a way to produce it on a massive scale for sale to the public. These are often very different problems! And there is also a lingering question: Will consumers buy meat that has been grown this way? ⚠️



This fried chicken was grown in a lab using cells from a chicken. Is cultured meat the future of omnivorism? (Source: Memphis Meats)



STORYLINE: TERRY CARTER AND CODY WHITE | ARTWORK: JASON REDD | ©2018 PITSKO EDUCATION



## Fond farewell

The world says goodbye to physicist Stephen Hawking, who died on March 14, 2018.

Hawking had many achievements, including the discovery that black holes emit radiation. He also helped describe the mathematical notion of a singularity. A singularity is a point so small that it takes up no space. Despite being so small (actually, because they are so small) singularities can have infinite density and gravity. It is speculated that the center of a black hole might be a singularity.

Hawking once said, "I am just a child who has never grown up. I still keep asking these 'how' and 'why' questions. Occasionally, I find an answer." ⚠

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Student name: \_\_\_\_\_ Class/Hour: \_\_\_\_\_

## ***SySTEM Alert! Quiz (Volume 6, Number 5)***

1. The TOMRA tomato-sorting machine can sort \_\_\_\_\_ of tomatoes per hour.
  - A. hundreds
  - B. thousands
  - C. hundreds of thousands
  - D. millions
2. The SCOTT rib-cutting robot uses \_\_\_\_\_ to get an internal view of the carcass it is cutting.
  - A. LIDAR
  - B. RADAR
  - C. 3-D camera
  - D. X-rays
3. In \_\_\_\_\_, underwater gates are being constructed to keep the tide from flooding the city.
  - A. Venice, Italy
  - B. Pittsburg, Kansas
  - C. Hong Kong, China
  - D. New York, New York
4. Why are adult stem cells used to create cultured meat?
  - A. They can be transformed into any other type of cell.
  - B. Meat grown from these cells is more nutritious and less fatty.
  - C. Meat grown from these cells has the most realistic texture.
  - D. These are the easiest cells to extract.
5. What characteristic does the TOMRA tomato-sorting machine use to sort tomatoes?
  - A. circumference
  - B. color
  - C. weight
  - D. firmness



6. LIDAR uses \_\_\_\_\_ to scan the environment.
  - A. sound waves
  - B. radio waves
  - C. laser pulses
  - D. static electricity
  
7. According to scientist Stephen Hawking, what is a singularity?
  - A. a star that no planet orbits
  - B. a scientific question with only one possible answer
  - C. a hypothetical computer more powerful than any currently on Earth
  - D. a point so small that it takes up no space
  
8. RADAR uses \_\_\_\_\_ to scan the environment.
  - A. sound waves
  - B. radio waves
  - C. laser pulses
  - D. static electricity
  
9. Some believe the discovery of \_\_\_\_\_ propelled humans from hunter-gatherers to architects of a planetary civilization.
  - A. music
  - B. cooking with fire
  - C. the scientific method
  - D. iPhones
  
10. The prototype vehicle Robomart would deliver \_\_\_\_\_ to the homes of shoppers.
  - A. hardware
  - B. clothing
  - C. electronics
  - D. groceries

**Bonus:**

More and more aspects of life are becoming automated (performed by machines). List four ways you think this will affect your life in the future.