



# Heartland Science

Ohio's Legacy of Discovery & Innovation



## Agriculture & Food

From Aquaculture to Hot Dogs

### 4-H Club Movement



Albert B. Graham started the international 4-H Club movement in Springfield in 1902 by forming an "Agricultural Club" to teach boys and girls better farming and home management techniques. From that first club meeting with 30 young people, held in the basement of the Springfield Courthouse, Graham's idea grew into a national phenomenon. Today about 7 million youth are involved in 4-H programs each year. Programs thrive in all 3,067 counties of the United States, District of Columbia, commonwealth of Puerto Rico, and five territories as part of the Cooperative Extension Service. The Cooperative Extension System is a partnership between the United States Department of Agriculture, state land-grant universities, and local county governments. More than 80 other countries also have 4-H programs.

The Ohio State University learned about Graham's "out-of-school education program" and invited him to supervise agricultural clubs for boys and girls throughout the state as part of the University's Land Grant mission. He became superintendent of extension in Ohio in 1905 with goals that included:

- To elevate the standard of living in rural communities.
- To acquaint boys and girls with their environment and to interest them in making their own investigations.
- To inspire young men and women to further their education in the science of agriculture or domestic science.
- To cultivate a taste for the beauty of nature.
- To educate adults in the elementary science of agriculture and in the most up-to-date farm practices.

Graham kept those goals in organizing his agricultural clubs on a national basis, where they eventually became known as 4-H Clubs.

### Fun Facts About 4-H

- The National 4-H emblem is a four-leaf clover, which represents the four-fold development of Head, Heart, Hands, and Health. Youth learn the importance of each and how they work together to produce a well rounded person.
- The four leaf clover signifies "good luck" and "achievement." Like the clover, 4-H symbolizes a four-squared, well rounded life. If it is good luck to find a four leaf clover, it is far better luck to know and live each "H" on the clover.
- The 4-H Pledge, adopted in 1927:  
"I pledge . . .  
My Head to clearer thinking,  
My Heart to greater loyalty,  
My Hands to larger service,  
My Health to better living,

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for my club,  
my community,  
my country,  
and my world."

- 4-H Motto: "To Make The Best Better"
- The 4-H Slogan: "Learn by Doing"
- The 4-H Colors: Green and White

4-H continues that work in rural areas, but its focus goes beyond residents of agricultural areas. Membership is open to all youth aged 5-19, including residents of urban areas. Graham's original objective at the turn of the 20th Century, however, remains the same in the 21st: "The development of youth as individuals and as responsible, productive members of the community in which they live."

Graham, who was superintendent of the Springfield Township Schools, at that time, believed that agricultural production and rural life could be improved by applying scientific knowledge.

**Find out more...**

[Ohio 4-H Centennial](#)  
[National 4-H Centennial](#)  
[National 4-H Council](#)



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From Aquaculture to Hot Dogs

### Aquaculture Pioneers

Two Cleveland physicians, Theodatus Garlick and H. A. Ackley, performed the first successful artificial fertilization of fish eggs in the United States in 1853. They later built the nation's first fish hatchery. Garlick published results of their experiments in 1857 in the "Ohio Farmer," spreading the knowledge for others to use.



His treatise on artificial fish propagation and pisciculture encouraged others to begin artificially breeding fish. Aquaculture experts today sometimes call Garlick the "Father of American Fish Culture." Garlick and Ackley laid the foundation for the modern fish farming, or "aquaculture," industry. Aquaculture means raising aquatic animals or plants in a controlled environment for all or part of their life cycle. Most aquaculture is for commercial purposes, with the produce sold for use in recreation, food, or other products. Aquaculture's most popular fish include channel catfish, striped bass, rainbow trout, salmon, carp, and tilapia. Aquaculture also is a major source of water chestnuts, algae, water hyacinths, seaweeds, water lilies, and other wetland plants.

Thousands of fish farms are thriving today as a result of their work, producing heart-healthy, high-protein food for millions of people. Fish farms raise about half the oysters and almost all the catfish, crawfish, and rainbow trout sold in the United States. Worldwide, fish farming accounts for more than 70 million tons of fish each year, and aquaculture is the great hope for supplying hungry people with nutritious seafood, as natural catches from the oceans decline. The State of World Fisheries and Aquaculture website offers more information.



Artificial fish breeding in fish hatcheries also has become a key conservation tool. It allows restocking of natural populations of game fish that are depleted because of pollution and other problems. That helps sustain the sports fishing industry. Fishing is the nation's 5th most popular participation sport, ranking ahead of biking, bowling, golf, in-line skating, jogging, tennis, and skiing. Only walking, swimming, camping, and exercising with equipment are more popular. Fishing enthusiasts spend more than \$2 billion annually on tackle and other gear, and pump billions into the tourist industries in Ohio and other states.

Garlick and Ackley helped start all that by showing for the first time that people could raise commercial quantities of fish through artificial breeding. Fish farming certainly was not new when the two doctors started their experiments. People in ancient Rome and China, for instance, raised carp, oysters, and other fish in artificial ponds. Ostia Antica, port for the ancient City of Rome, had huge fish ponds to assure consumers the freshest possible seafood. Garlick and Ackley, however, were among the first individuals in the United States to rediscover and extend this knowledge. Previously, fish farmers caught fish in the wild and

transferred them to artificial ponds or other enclosures. Fish spent only part of their life cycle under artificial cultivation. Adult fish caught in the wild might be fattened or held for brief periods. Small fish, or fingerlings, grew to maturity. Imagine how expensive chicken or hamburgers would be if farmers had to start with wild birds or cows.

Fish farming really began to make sense from a monetary standpoint after these Ohio inventors realized that fish could be raised in artificial environments throughout their entire life cycle. They worked with brook trout *Salvelinus fontinalis*, which "spawn," or reproduce, when the female sheds eggs into the water and the male fertilizes them. Garlick and Ackley removed eggs from a female trout and sperm, or "milt," from a male and combined the two so fertilization could occur. The fertilized eggs hatched into small trout, or "fry." They realized that the young fish could be used to stock fish farms, and built the first fish hatchery on Ackley's farm near Cleveland, which had 3 fish ponds.



### The Science Behind the Invention

Theodatus Garlick and H. A. Ackley based their development of artificial breeding technology on the biology of fish reproduction. Not all fish, however, would have cooperated like the brook trout the Ohioans used in their experiments. Female trout lay eggs in the water, where males fertilize them. Sharks, however, use internal fertilization. Most sharks and a few other fish, including some popular aquarium fish, even give birth to live young.

However, brook trout are the rule of thumb in the fish world. Fertilization occurs after the female spawns, or deposits eggs in the water. Marine, or salt-water, fish must lay millions at one time, assuring that at least a few survive to adulthood. Their eggs contain tiny droplets of buoyant oil that helps them float freely in the water, offering a tasty snack to other fish. Predators also gobble up many newly hatched fish.

Most freshwater fish lay fewer eggs because they are better protected from predators. Their eggs have a sticky outer coating that clings to stones and other objects in the water. Many fish build "nests." They're not elaborate like bird nests, but usually just shallow holes at the bottom, serving to keep the eggs in one spot and protect them. Some adult fish even guard the nests.



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### Borer Resistant Corn

Glen H. Stringfield, of Wooster, in the 1950s developed techniques for hybridizing corn that doubled the yield, and made corn resistant to the European corn borer. He did that work at the Ohio Agricultural Research Station.



In the decade following the introduction of Stringfield's hybrids (1954), annual corn borer damage in Ohio diminished from \$8.5 million to only \$600,000. Stringfield's development of hybrid corn ranks as one of the most important achievements of the nation's agricultural experiment stations

### About the Corn Borer

The European corn borer, *Ostrinia nubilalis* (Hübner), attacks corn and many other crops including cotton, sorghum, and several vegetables. It gets its name from its method of attack - boring a hole through the husk of an ear. Damage is significant once European corn borers have invaded a field. It first appeared in U.S. fields in the early 1900s and has spread westward in the U.S. to the Rocky Mountains and has also invaded Canada. Some believe the first borers arrived with broom corn that was imported from Hungary and Italy for broom manufacture.



### Find out more...

- Wyandot Popcorn Museum  
([www.wyandotpopcornmus.com](http://www.wyandotpopcornmus.com))



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### Fast Ditcher

The Buckeye Steam Ditcher Company, founded by James B. Hill in Bowling Green, Ohio, in 1894, developed the world's first successful machine for digging drainage trenches. It grew into the largest tile ditching and construction trenching company in the world and held that position for more than a half century. Modern ditching machines still use the elements of the original Buckeye design.



### A "Ditching Machine?"

Stifle those 21st Century giggles. This ditch-digging machine solved tremendous problems that existed in the United States in the past, and still cause concerns here and in other countries. The steam ditcher filled a definite societal need at the time and had great beneficial impact. It transformed what people then regarded as wasteland into some of the nation's most productive farmland, stopped the spread of serious diseases, and made travel a lot easier.

People often invent new devices or technologies to solve problems. Swamps were a huge problem for early settlers in some parts of the United States. Few had it tougher than people living around the Great Black Swamp in the northwestern part of Ohio. It consisted of forest so thick that direct sunlight never reached the understory. The land was flooded for most of the year, and disease-carrying mosquitoes thrived there. So did biting flies, gnats, water rats, snakes, wildcats, wolves, and other animals. Even Native Americans were afraid to enter the forbidding region. Travel through the area was fine in winter, with ground frozen concrete-hard.



However, much of the rest of the year, it was horrible, with knee-deep mud covering the roads. Travelers were lucky to go a mile or two in an entire day.

Settlers around such regions dug drainage ditches to carry the excess water away. Some were open ditches. Others were dug to lay drainage "tiles," or pipe, and then filled in. It was backbreaking work. A crew of 50 strong men might be able to dig 300 feet of drainage ditch in a 12-hour workday. It took about 15,000 miles of ditches to drain that swampy area of northwest Ohio.

James B. Hill's machine was revolutionary. The original steam-powered machine had a big digging wheel that workers slowly lowered into the ground. View the American Society of Mechanical Engineers brochure, "Buckeye Steam Traction Ditcher" as a PDF for more information at [www.asme.org/history/brochures/h133.pdf](http://www.asme.org/history/brochures/h133.pdf). As the wheel turned, it scooped out dirt, and dumped it onto a conveyor belt that deposited it alongside the ditch. The machine used traction to move forward constantly, and some models could dig 3 feet per

minute. The machines worked in either soft mucky ground of swamps or hard-packed soil. In soft soil, they could dig 3 lineal feet per minute, up to depths of 12 feet, completing 1,800 feet of ditch in one working day. Many of the machines battled the Great Black Swamp, which was eventually drained and became some of the most productive farmland in the United States.

The earliest remaining Buckeye Steam Ditcher is on display at the Hancock County Museum in Findlay, where Hill moved his production plant in 1902. He later changed the company's name to Buckeye Steam Traction Company. The Findlay plant churned out ditching machines until 1973, and they were used as far away as Africa.

### **From Badlands to Goodlands: Wetlands**

Early settlers regarded swamps as their enemy, and did what came naturally. They attacked and destroyed – millions of acres of what we now term "wetlands." That would be unthinkable today because society recognizes the great ecological value of marshlands in nurturing biodiversity, protecting wildlife and protecting endangered species, and even shielding communities from hurricane storm surges. Until the 1970s, the U. S. Government encouraged the draining and filling of swamps to expand agriculture and make more land available for urban development. Now the government and other organizations such as the Sierra Club are working to protect wetlands.



According to The Ohio Department of Natural Resources, from the 1780's to the 1980's, Ohio wetland areas declined from about 5,000,000 acres to about 483,000 acres. Ohio's original wetlands were very large. Examples include:

The Great Black Swamp, which was once 120 miles in length and an average of 40 miles in width (about the size of Connecticut).

The Scioto and Hog Creek marshes of Hardin County, which once covered 25,000 acres or 39 square miles.

For research and educational purposes, the Olentangy River Wetland Research Park at The Ohio State University is one of the most comprehensive wetland research and educational facilities in the nation at a major university.



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### The Durham Wheat Industry

Mark A. Carleton, a native of Jerusalem, Ohio, in the late 1800s brought back to the United States seed from hardy varieties of disease-resistant "durham" wheat growing in harsh climates in Russia. Carleton's work started the United States durum wheat industry, allowing farmers to grow wheat on vast expanses of land in the Great Plains that were too cold and dry for traditional varieties.



Carleton worked for the U.S. Department of Agriculture (USDA) in the 1890s, when scientists were concerned that population growth would outstrip wheat production. Some believed that widespread food shortages would occur by the 1930s unless researchers found ways of increasing wheat production. So in 1898, the USDA sent Carleton on expeditions to Russia to search for new varieties of wheat that yielded more bushels per acre, produced good crops despite drought, and resisted damaging diseases.



In 1899, he brought back seeds of Kubanca, spring wheat that started the United States durum wheat industry. "Durham" comes from a Latin word meaning "hard" and the new wheat had a very hard grain. A year later Carleton returned to Russia, coming home this time with a hard winter wheat called Kharkov that also became popular. Farmers plant "spring" wheat in the spring and harvest it in autumn. "Winter" wheat goes into the ground in the autumn, and is ready for harvest the following spring. USDA appointed Carleton chief of its Office of Cereal Investigation, where he was responsible for other innovations in grain cultivation. He helped make the Sixty-Day oat the most popular variety grown in the U.S., for instance, and introduced winter barley cultivation to the Midwest.

Mark Carleton was not the first person to bring those new wheat seeds to the United States. In the 1870s, for instance, Mennonite immigrants came to the United States with seeds of hard winter wheat. However, almost nobody knew about it, or the benefits of switching to the new wheat. Carleton, in contrast, followed up with a relentless campaign to convince farmers, millers, and consumers that his new wheat was superior.



## Wheat Factoids

Wheat comes in 2 major types, winter wheat and spring wheat.

- Winter wheat is planted in the fall, goes dormant during the winter, starts growing again in the spring, and is harvested in the summer.
- Spring wheat is planted in the spring, grows throughout the summer, and is harvested in the fall.

The United States produces 5 main classes of wheat, named according to the color of its kernels. Each needs a specific set of growing conditions, is grown in a specific region, and has its own special uses.

- Soft red winter wheat grows in the eastern third of the United States and is used in cakes, cookies, crackers, snack foods, and pastries.
- Hard red winter wheat grows in the southern and central plains and accounts for most of the wheat produced in the United States. Its flour is used mainly in bread.
- Hard red spring wheat and Durham wheat are both grown in the northern plains. Flour from hard red spring wheat makes bread, while Durham wheat flour makes spaghetti, macaroni, and other pasta products.
- White wheat grows mainly in the Pacific Northwest, and is used much like soft red winter wheat.



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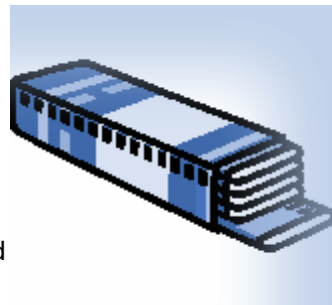


## Agriculture & Food

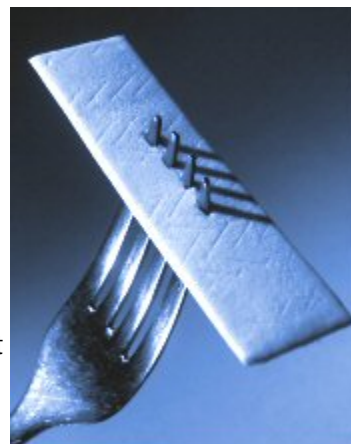
From Aquaculture to Hot Dogs

### Chewing Gum

William Finley Semple, of Mount Vernon, got the first United States Patent on chewing gum in 1869. Semple's process involved dissolving vegetable gums in naphtha and alcohol until they reached the consistency of jelly. Then he mixed in powdered chalk, powdered licorice root, and other materials to provide texture and flavor. Those included sugar, orris root, and myrrh. Finally, he evaporated the solvents -- naphtha and alcohol -- so that the jelly-like material dried and hardened. Semple thought that people would buy the gum not just to chew for fun, but to help keep their teeth clean and breath fresh. The chalk would have a scouring effect in rubbing away food particles and dental plaque, the sticky film that forms on teeth and causes tooth decay and gum disease.



Another Ohioan, Dr. Edward E. Beeman, gave the world one of the most popular kinds of chewing gum. Consumers today buy millions of dollars worth of Beeman's Pepsin Chewing Gum each year. Dr. Beeman was selling bottles of powdered pepsin, which people took to aid to digestion. Pepsin is an enzyme found naturally in the stomach that breaks down proteins. Nellie Horton, Dr. Beeman's bookkeeper, suggested that he put the pepsin into gum "since so many people buy pepsin for digestion and gum for no reason at all." He blended his pepsin compound with chicle, a natural substance obtained from the sapodilla tree, which is used in chewing gum. He sold the gum in a wrapper that showed the picture of a pig and carried the slogan, "With Pepsin, You Can Eat Like A Pig." The gum sold even better after a businessman bought the company and replaced the pig with a wrapper showing Dr. Beeman's kindly bearded face.



### Who Dunnit? Who Really Dunnit?

Who "invented" chewing gum? Does Ohioan William F. Semple really deserve the credit? Or should credit go to other individuals – maybe John B. Curtis who in 1848 sold the first commercial chewing gum in the United States. It was made from tree sap and called "State of Maine Pure Spruce Gum." What about Thomas Adams, who in 1871 patented the chewing gum that people now spend about \$2 billion a year on. Adams' recipe also used chicle, along with sugar and sassafras flavoring. Chicle gave gum the right chewing properties, and eliminated the harsh taste and unpleasant texture in Semple's gum. His Chiclets, those little chunks of gum with a hard sugar coating, are still best-sellers. Adams also invented the first machine for mass producing gum.

People had been chewing gum for thousands of years before inventors like William F. Semple, John B. Curtis, or Thomas Adams lived. The ancient Greeks munched on chewed mastic gum, or mastiche, (pronounced "mas-tee-ka"). They made it with sticky resin obtained from the bark of the mastic plant, a shrub-like tree. The ancient Maya chewed sapodilla tree sap – the same chicle used in modern chewing gum. Humans probably always

have had the urge to chew to keep their mouths moist when no water was available, or, psychologists think, because it brings back memories of nursing when they were infants.

Ohio can claim credit for an invention with global impact because Semple got the first patent on chewing gum. It was U. S. patent 93,304, issued on December 28, 1869. A patent is a document, granted by the government, which gives the inventor right -- for a limited period -- to stop others from making, using, or selling the invention without the inventor's permission. Patents cover products or processes that work in new ways or have new features. They involve how things work, what they do, how they do it, what they are made of, and how they are made.

A patent officially makes an invention the inventor's property. Like any other kind of property, the inventor can sell the patent to someone else or "rent" it. Renting out a patent is called "licensing" it. The owner charges a fee – a royalty – for others to use the patent so they can make and sell a product.

Remember that a patent doesn't automatically stop others from using the invention. It just gives an inventor the right to sue others who do, in a so-called "patent infringement" suit.

Semple's patent became a milestone in chewing gum history, an official record of his role. Because it was the first for chewing gum, the patent makes it convenient for people to identify Semple as chewing gum's inventor. We don't know if other chewing gum pioneers ever paid Semple royalties to use ideas in U. S. Patent 93,304.

Inventors often tweak the technology in an existing patent, making changes and improvements that allow them to get their own patent. The huge majority of new patents granted each year are for small improvements in existing technology. In science and technology, the wheels of progress turn a fraction of an inch at a time, and innovation usually is evolution rather than revolution.

### **Fun Factoids About Chewing Gum**

- The American colonists chewed the gum-like sap or resin that oozes out of cuts in the bark of spruce trees. Native Americans chewed that gum for as long as anyone could remember. People later chewed paraffin wax sweetened with sugar and honey.
- Modern chewing gum emerged from a flop. American inventor Thomas Adams tried for a whole year to use chicle as a substitute for rubber in waterproof boots, rainwear, and toys. Adams was frustrated when the experiments failed, and ready to toss the remaining chicle into the East River in New York City. Then a chance visit to a drug store and a little girl gave him that flash of inspiration.
- ABC gum (Already Been Chewed) has legendary properties as a quick fix-it for all kinds of emergency repairs that demand sticky material. Anecdotes tell of people using it to repair everything from broken dishware to the hydraulic lines in airplanes.
- Wrigley's gum got its start when William Wrigley Jr. offered Chicago merchants free chewing gum with each can of his baking powder. The gum became more popular than the baking powder. In 1893 he started selling two of the most popular gums in history -- Juicy Fruit and Wrigley's Spearmint Gum.
- Chewing gum was originally made from the natural gum chicle, found in the sapodilla tree. Chicle is expensive, however, and other natural gums and chewy synthetic materials also are used in gum today.

- If you think gum is a trivial product, chew on this: Americans buy more than \$2 billion worth of chewing gum each year.
- Dr. Grandma and Dr. Mom were wrong about chewing gum. It won't necessarily ruin your teeth. Studies have shown that chewing sugarless gum sweetened with xylitol has an antibacterial action. It fights bacteria that cause tooth decay. Gum also increases the flow of saliva, which dilutes acid produced by bacteria. Saliva also contains calcium and phosphorous minerals that can help to repair soft spots in tooth enamel, actually healing early tooth decay.
- People chew gum only one tiny stick at a time, but companies make it by the ton. Check out the Wrigley manufacturing process online at [http://www.wrigley.com/wrigley/about/about\\_story\\_plant.asp](http://www.wrigley.com/wrigley/about/about_story_plant.asp).



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## Agriculture & Food

From Aquaculture to Hot Dogs

### Honey Industry Pioneers

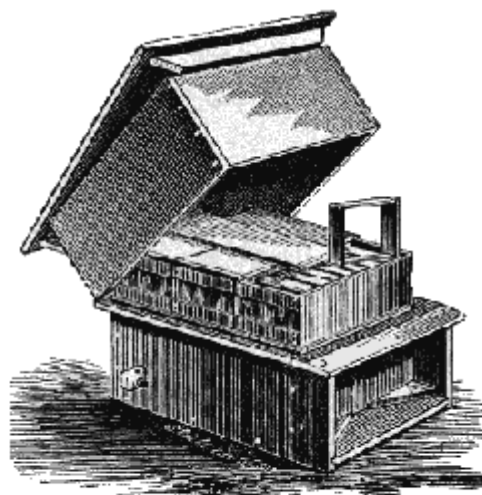
Lorenzo Langstroth, of Oxford, Ohio, was the "Father of American Beekeeping," developing techniques still used by beekeepers everywhere. He designed a new type of hive that incorporated frames that hung from the top but left a small (3/8") space between the sides and the frame. He figured out that bees don't usually construct any comb in 3/8" spaces, which would allow the frame to be safely handled by beekeepers. In describing his invention, Langstroth wrote in his publication *Langstroth on the Honey-Bee* (1860), "...the chief peculiarity in my hive was the facility with which they could be removed without enraging the bees .... I could dispense with natural swarming, and yet multiply colonies with greater rapidity and certainty than by the common methods .... feeble colonies could be strengthened, and those which had lost their queen furnished with the means of obtaining another. .... If I suspected that anything was wrong with a hive, I could quickly ascertain its true condition, and apply the proper remedies."



Another Ohioan, Amos I. Root, of Medina, was the founder of the American bee industry, and developed techniques for maintaining large numbers of tended hives. He also invented a new beehive that permitted honey to be extracted without damaging the hive. At the time, beekeeping was a key industry and important to many U.S. families, so the new techniques were of great importance to many people. His inventions allowed beekeeping to be more cost effective and practical. Root took up beekeeping in his mid twenties as a hobby which quickly grew into a business venture. He started a journal, "Gleanings in Bee Culture," and also sold equipment to 150,000+ customers. He passed the business on to his sons in 1880.

### Amos Root and the Wright Brothers.

Interestingly Amos Root was one of the first people to witness flight - and write about it. He wasn't the first to see the **Wright Brothers** fly, but his written account was the first description by a direct eyewitness to a flight. Amos Root predicted that the Wrights' invention, "may outrank the electric car, the automobile, and all other methods of travel, and one which may fairly take a place beside the telephone and wireless telegraphy."



Langstroth Hive

(Image from John's Beekeeping Notebook  
[www.outdoorplace.org/beekeeping](http://www.outdoorplace.org/beekeeping))

### Find out more...

- Langstroth, L.L. Langstroth on the Hive and the Honey-Bee; A Bee Keeper's Manual... Hopkins, Bridgman, Northampton : 1853.
- Root, A. I. The A B C of Bee Culture; a Cyclopædia of Everything Pertaining to the Care ... A.I. Root, Medina, Ohio : 1879.
- American Beekeeping History  
([www.outdoorplace.org/beekeeping/history1.htm](http://www.outdoorplace.org/beekeeping/history1.htm))



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### Hot Dog and Sports Concession Industry

"Take me out to the ball game,  
Take me out with the crowd.  
Buy me some peanuts and Cracker Jack,  
I don't care if I never get back."  
-- From Jack Norworth's famous baseball song, 1908



Make that peanuts, crackerjacks, and hot dogs, popcorn, nachos, pizza, fries, pretzels, and a host of other munchies that fans down at sports events, concerts, and other gatherings. And thank Ohioan Harry M. Stevens (1855-1934) for getting the ball rolling nationally on serving these popular foods in stadiums. Stevens, of Niles, Ohio, was the father of modern sports concessions, which now includes foods, souvenirs, and other goods sold at all kinds of big gatherings. Stevens also can claim a key role in naming America's No. 1 sausage, the hot dog.

Born in London, England, Stevens emigrated to Ohio in 1882 and went into the business of providing food to sports fans and conventioners. While at a baseball game in Ohio in 1885, Stevens noticed that there was no way for fans to identify the players and keep track of their performance. He seized the opportunity, and began printing programs. He made money by selling local merchants advertising space in the programs. That led to the modern scorecards used in baseball games from Little League on up. It also helped win Stevens concessions, or rights, to sell food, programs, and other items inside baseball parks.

Stevens went national, and by the turn of the century was running the concessions at the Polo Grounds in New York City, a field used by the New York Yankees and New York Giants. Concessionaires in that era usually sold fans just ice cream and lemonade. One chilly day Stevens noticed that shivering fans weren't buying anything. He sent his salesmen out of the stadium to buy hundreds of "dachshund" sausages and rolls to put them in.



People had been eating long, thin sausages for hundreds of years. A city in Germany, Frankfurt-am-Main, often gets credit for originating and naming this sausage – the "frankfurter." Some hot dog historians, however, think it was invented in the late 1600's by Johann Georghehner, a butcher in Coburg, Germany who later sold them in Frankfurt. People called them "dachshund sausages" after the cute German dog with the long body.

Stevens' sales crew soon was selling the dachshund-in-a-bun combination – convenient for people to eat without a knife or fork – to the fans. Vendors roamed among the shivering fans with sausages in pots of hot water. Stevens told them to shout, "They're red hot. Get your dachshund sausages while they're red hot."

A newspaper cartoonist named Tad Dorgan supposedly took note and drew a cartoon showing dachshund sausages snuggled inside buns. Unable to spell "dachshund," he penned the words "hot dog" on the cartoon. The term then meant something fashionable. And so the term "hot dog" became an American food icon. Maybe.

Dorgan was a very popular cartoonist for the Hearst newspapers, and hundreds of his creations remain. This particular cartoon, however, is not among them. Among other accounts is a story that dachshund sausages became standard fare at baseball games in 1893, when a St. Louis bar owner, Chris Von de Ahe, started selling them at the St. Louis Browns major league baseball stadium.



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### Johnny Appleseed

John Chapman acquired his reputation as Johnny Appleseed while planting apple trees in Ohio, where he spent much of his time, laying the foundation for the modern apple growing industry.

He was born in 1774 in Massachusetts, but spent much of his life traveling throughout Illinois, Indiana, Kentucky, Pennsylvania, and Ohio. He created apple orchards almost everywhere he went, planting seeds and also transplanting seedlings. Even after two centuries many of the trees he planted still bear fruit. He was instrumental in spreading apple planting among the U.S. pioneers, and also to Native Americans.

He was known for "roughing" it - usually choosing to sleep outdoors even when offered a warm bed. Many stories abound, but the consensus says that he dressed humbly in rags and even wore a pot on his head as a hat -- the pot was also used for cooking. He often went barefoot and was generally known as a kind man who wanted to spread the beauty of his favorite fruit and tree throughout his country.

Johnny Appleseed died in 1845, reportedly the only time he had ever been sick.



#### Find out more...

- Harpers Magazine, November 1871 (<http://mason.gmu.edu/~drwillia/apple/>)



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From Aquaculture to Hot Dogs

### Holey American Icon: Life Savers Candy



Clarence Crane, a Cleveland chocolate maker, invented Life Savers candy in 1912. The candy-with-a-hole-in its center became a nationwide hit, and remains popular a century later. Urban legend claims the hole resulted from a horrible accident in the Crane household: His young daughter supposedly choked to death on a piece of candy that blocked her windpipe. Hoping to spare other parents from the same tragedy, Crane put a hole in the new candy so that people who aspirated it would still be able to breathe through the hole. That's a myth, however, and Life Savers' shape had a much different origin.

Crane had been selling handmade chocolate candy in the Cleveland area since 1891. Sales always slowed during the hot summer months, when chocolate melted quickly. So Crane decided to add a hard, non-melting candy to his product line to boost summer sales. Almost every candy shop carried pillow-shaped peppermint candies imported from Europe.

Crane wanted his candy to stand out, and chose the hold-in-the-center shape as a marketing gimmick. The shape inspired their name. The candies looked like mini-life savers, flotation devices used to keep people from drowning. Crane also packed the candies into a distinctive cardboard tube, which sold for 5 cents. For the label, he seized on another marketing ploy. People often bought peppermint candy to hide bad breath, or the odor of alcoholic beverages. So Crane's label showed an old seaman throwing a life preserver to a pretty female swimmer. "For That Stormy Breath," the label declared.

The candy, however, got stale within a week and lost its flavor. Life Savers didn't become a big hit until 1913, when Crane sold rights to the product to two New York businessmen for \$2,900. One, Edward Noble, added the familiar foil wrapper to preserve freshness. Kraft Foods, Inc. makes Life Savers today and sells them around the world.

### Lightning Bolts in Your Mouth

The flavoring in wintergreen Life Savers contains molecules that exhibit triboluminescence. That's the mechanical generation of light, which occurs when certain chemical bonds are broken by mechanical crushing. WintOGreen Lifesavers have such bonds. No other flavor does it, including peppermint. The process occurs in two steps. Breaking crystals of sugar in the candy first produces ultraviolet light. Then wintergreen molecules absorb the ultraviolet, and fluoresce, emitting a flash of visible light. One way to demonstrate triboluminescence is to chew a WintOGreen Lifesaver in a room in front of a mirror that can be made very dark. Try a bathroom or bedroom. Allow about 15 minutes for your eyes to adjust to the dark. With your lips open, chew one Life Saver and watch for the flashes. Each piece should flash many times as the chewing and crushing continues. Caution: Chew carefully to avoid choking, and don't laugh or joke with friends. Young children who do this experiment should have an adult present. Crushing the candy with a hammer in a dark place also works.



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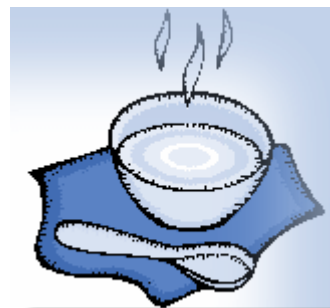


## Agriculture & Food

From Aquaculture to Hot Dogs

### Father of Snap, Crackle & Pop: Ferdinand Schumacher

Ferdinand Schumacher, of Akron, helped found the American breakfast food industry in 1856 when he opened the German Mills American Oatmeal Company. It was one of three companies that combined in 1901 to form the Quaker Oats Company, a diversified global corporation that sells about \$2 billion worth of products each year. Schumacher's oatmeal is still the favorite of 6 out of every 10 people who eat hot breakfast food. They buy more than \$500 million worth of Quaker Oats every year. Modern science has proven Schumacher correct in regarding oatmeal as healthy food.



### Healthy Food

Quaker Oats blazed a new health trail in 1996. It became the first company with the U. S. Food and Drug Administration's permission to claim that its product could reduce the risk of heart disease. Oatmeal packages soon began displaying the notice: "Diets high in oatmeal or oat bran and low in saturated fat and cholesterol may reduce the risk of heart disease."



Eating oats and oat bran reduces the amount of cholesterol in the blood. Millions of people in the United States have high blood cholesterol levels that increase the risk of heart attacks, the nation's No.1 killer. For some people, a bowlful of oatmeal each day lowers blood cholesterol levels almost as much as anti-cholesterol drugs.

### Popularizing a New Food

Oats? People don't eat oats. Horses eat oats. That's what most Americans thought before Ferdinand Schumacher immigrated to Akron in 1851 from Hanover, Germany, and introduced the country to a new people-food. Schumacher opened a grocery on Howard Street, and expected ground oats to sell like hotcakes. They did back home in Germany, and in Ireland, Scotland, and other countries. People knew that oat "porridge" was so nutritious that you could practically live on it. Oats were inexpensive enough for almost everyone to afford a good meal. And they tasted good, too.

Americans, however, wondered why Schumacher was selling horse food. In 1854, Schumacher invented a machine to chop oats into small cubes, which he packed into glass jars and sold. The cubed oats were so popular that, in 1856, he bought an old factory along the canal and installed machinery that processed 20 big wooden barrels of oats a day. That was the start of Schumacher's German Mills American Oatmeal Company. Schumacher discovered a way to make oats cook faster. He pre-cooked whole oat berries, which have a hard outer shell, and then ran them between rollers to produce flakes, or "rolled oats."

Demand for oats in the U.S. increased when the Civil War started, and the Union Army bought tons to feed hungry soldiers. It enabled Schumacher in 1863 to move production to a bigger factory on Mill Street in Akron, which now is the site of Quaker Square, a hotel and entertainment complex. As oats' popularity grew, so did Schumacher's reputation. People called him "The Oatmeal King." His kingdom, however, was only part of the realm that became the Quaker Oats Company.

The [Quaker Oats Company](#) was born in 1901, when several American oat processing pioneers merged:

- The Quaker Mill Company, which Henry Parsons Crowell had established in Ravenna, Ohio. He registered the now-famous "Quaker" trademark, and sold Quaker Oats in two-pound paper packages with directions printed on the back.
- A huge cereal mill operated in Cedar Rapids, Iowa, by John Stuart, his son Robert, and their partner, George Douglas.
- Schumacher's German Mills American Oatmeal Company.

Robert Stuart became the chief executive officer. Generation after generation of the Stuart family ran Quaker Oats until William Smithburg took over in 1979. Quaker operated as an independent company for 100 years. And it diversified, selling many other products in addition to oatmeal. They include ready-to-eat breakfast cereals, snacks, pancake syrups, flavored rice and pasta products, pet foods, and Gatorade sports drink and thirst quencher products. In 1970, Quaker Oats stopped production in Akron and moved its headquarters to Chicago.

In 2001, Quaker merged with PepsiCo, Inc., the Purchase, New York-based food and beverage company, and became a PepsiCo division. The merger produced the world's fourth-largest consumer-goods company.

Schumacher also invented the process for making Quaker Puffed Rice and Puffed Wheat, breakfast cereals introduced in 1913 with the advertising slogan, "Shot from guns." They boosted Quaker sales by 30-fold. He called the process "pneumatic levitation" because it blew "puffed" cereal through kilometers of pipes from one mill to another, giving rise to the expression "shot from guns." The puffing process involves processing wheat or rice in a hot pressure chamber and then suddenly releasing the pressure, so that the grain expands to many times its original size.



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## Agriculture & Food

From Aquaculture to Hot Dogs

### Father of the Modern Tomato

Alexander W. Livingston, a Reynoldsburg, Ohio seedsman, in 1870 developed the first commercially successful variety of tomato. He changed the tomato from an ugly duckling of horticulture (small, ribbed, hard cored, and almost hollow) into the uniform, smooth-skinned, juicy, flavor-packed, meaty beauty that is one of the world's favorite foods. Livingston and his seed company eventually introduced more than 30 varieties of tomatoes. By 1910, half the major varieties of tomatoes grown in the United States were Livingston products, and he won praise from the U. S. Department of Agriculture.



**"With all due credit to the important contributions of other growers, seedsmen, and investigators, it is not out of place to call attention again to the great contribution of the Livingston Seed Co. to tomato improvement. Of about 40 varieties that had attained a distinct status prior to 1910, a third were productions or introductions by the Livingston company. If we add those varieties derived directly from Livingston productions and introductions, it appears that half of the major varieties were due to the abilities of the Livingstons to evaluate and perpetuate superior material in the tomato."**

-- The Yearbook of Agriculture 1937, U. S. Department of Agriculture.

Stone and Globe are among the Livingston varieties grown today. Seed producers still carry heirloom Livingston seeds such as Acme, Beauty, Buckeye State, Dwarf Stone, Golden Queen, and Perfection. Tomatoes grew throughout the world long before Livingston's work. The tomato is native to the Americas, where the ancient Aztecs and Incas grew it more than 1,300 years ago. In the 16th Century, Spanish Conquistadors took seeds back to Europe from Mexico and Central America. People in Spain, Italy, and other Mediterranean countries fell in love with it. The French thought tomatoes had special powers and called them "The Apple of Love." But the British believed tomatoes were poisonous, and the American colonists carried that myth with them to the New World.



Gradually, however, tomato fans emerged, including the Creoles in New Orleans who diced up tomatoes for jambalayas and gumbos. Livingston selected and planted seeds from tomato plants that bore good fruit. Then he gathered seeds from the best of those tomatoes. Gradually, he got tomatoes that were bigger, smoother, and meatier. After 5 years of this careful selection process, Livingston was ready with seed for a tomato he named the Paragon.

Born in 1821 in Reynoldsburg, Livingston eventually moved to Columbus where he started the A.W. Livingston's Sons seed company. Today, life without *Lycopersicon esculentum* would be odd, indeed. Imagine spaghetti with no sauce, pizza with no rich red topping, and salsa would be lost without it.



### Find out more...

*Livingston and the Tomato* by A.W. Livingston (forward by Andrew F. Smith). First published in 1893, this classic is packed with information about the tomato varieties he developed. As a bonus, there are 60 tomato-based recipes, including exotic but delicious items like tomato butter, pie, and custard.

The Victory Seed Company website offers a Seedsman Hall of Fame, with a profile of A.W. Livingston

### Fun Factoids About Tomatoes

- **The Tomato as Movie Star** - Tomatoes are among the few plants that have starred in the movies. The 1977 sci-fi flick "Attack of the Killer Tomatoes" has become a classic of the low-budget so-bad-it's-good genre. The flick features thousands of ordinary tomatoes that morph into savage predators. As if that wasn't enough, the movie was the first of a series that included titles like "Return of the Killer Tomatoes" and the "Killer Tomatoes Strike Back."
- **Top Tomatoes** - The United States tops the world in tomato production, followed by China, Turkey, Italy and India. Florida, California, and Georgia are the top tomato producing states in the U.S., each with more than 200 square miles under cultivation. The average person in the United States eats about 20 pounds of tomatoes each year.
- **Healthy Food** - Tomatoes are rich in lycopene, the pigment that makes them red. Lycopene is an antioxidant similar to beta-carotene, and wards off the damaging effects of oxidants formed naturally in the body. Studies show that people who eat tomatoes and tomato products regularly have a lower risk of cancer and other diseases. Modern Alexander Livingstons are trying to breed high-lycopene tomatoes brimming with the antioxidant.
- **Home Garden Star** - Tomatoes may be the single most popular backyard garden crop, a staple in an estimated 40 million gardens in the United States.
- **Go Ahead, Do the Math** - Alexander Livingston sold 5,000 pounds of seed for his delicious "Beauty" tomato in 1893. How many tomato plants would that grow? Hint: One ounce of seed contains about 340 seeds. Assume a 95 per cent germination rate. Go ahead, do the math.
- **A Grain of Truth** - Like many myths, the old idea that tomatoes are poisonous did have a basis in fact. Tomatoes are members of a plant group, the *Solanaceae* family, which includes poisonous members. Among them are highly toxic plants like henbane, mandrake, and nightshade. Tobacco, potatoes, and peppers are also members of the *Solanaceae* family.

### Find out more...

Livingston Seed Company  
Livingston's Home and Farm



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## Agriculture & Food

From Aquaculture to Hot Dogs

### Baking Up A Revolution: Charles and Maximillian Fleischmann

The Fleischmann brothers invented a process for making cubes of compressed yeast in 1868 in Cincinnati. Their original Compressed Yeast Cake was the first commercially produced yeast. It marked the start of modern home and commercial baking in the United States. Commercial yeast consists of living microorganisms in suspended animation. When mixed with water and flour, they start growing and release carbon dioxide gas that makes dough rise. Yeast also produces chemical compounds that make bread flavorful. Bread without yeast would be flat, hard, and almost tasteless. The new Fleischmann's Yeast made:



- Bread and baked goods with a better flavor and texture than traditional home-brewed "starters." Those were wild yeast cultures that people grew themselves.
- Home baking simpler and more convenient, freeing homemakers from the care-and-feeding of homemade starters.
- Commercial baked products more uniform in quality.
- A hit with consumers, and still is America's top-selling yeast.

During World War II Fleischmann's research laboratories took convenience one-step further, developing Active Dry Yeast™, to ensure that American troops could enjoy home-baked bread. The new product needed no refrigeration, and the yeast went to work quickly right after addition of warm water. In 1984, yeast got another Fleischmann tweak with development of RapidRise™ Yeast, which makes dough rise up to 50% faster than regular active dry yeast. In 1993, Fleischmann's introduced Bread Machine Yeast, specially formulated for those popular machines.



### A Revolution in Baking

Cardboard bread. That's how some people describe bread made without yeast. "Unleavened" bread is flat, dry, and crispy as a cracker. Try matsah, the bread traditionally eaten during the Jewish Passover holiday, to see the world of difference yeast makes. Yeast gives bread, hot dog rolls, pizza crust, cinnamon buns, and other baked goods a lighter texture and a wonderful flavor and aroma. Bakers just open the cupboard and reach for a little packet of dry yeast, add it to the mixing bowl, and the microorganisms come to life and start working almost instantly. Baking good bread wasn't always so easy.



Baking good bread wasn't always so easy. Even after the Civil War, American home and commercial bakers had to grow their own yeast and work hard to keep it alive. Before the Fleischmann Brothers invented commercial yeast, people baked bread like the Egyptians 4,000 years earlier. Each family, or bakery, kept a crock of sourdough or other "starter" or "leavener." They were living cultures of yeast growing slowly in a flour-and- water dough saved from the last batch of bread.

People hoarded and fought over their starters. Pioneer families carried a crock of starter West in covered wagons. They had to tend their microorganisms, and the care and feeding of starter took some work. The crock of starter needed regular feedings of flour and water. On cold nights, someone slept with the crock to keep the yeast warm and alive. If the starter died, you had to borrow some from a friend, or leave a container of flour and water in the open air to catch wild yeast floating by. Before baking day, the starter might get a little extra flour and sugar to make the yeast grow faster. Then a little starter went into the new batch of bread, and a little stayed in the crock for next baking day. It took a long time for the starter to work, and make the bread rise. Baking bread took an entire day.



When Charles and Maximilian Fleischmann arrived in Cincinnati in the 1860s, they discovered another problem with home-kept yeast: It often didn't work very well. American bread seemed to have a dense, heavy texture and unpleasant taste, compared to the light flavorful loaves of "Vienna" bread that the brothers made at home. The immigrants left their home, just outside Budapest, Hungary, for a new life in America. They realized that yeasts were the problem, and saw the need for a uniform product that would perform reliably every time without the fuss of tending microbes. With money from businessman James W. Gaff in 1868, they invented a way to make large amounts of baking yeast, and patented the process.

The process involved growing yeast in tanks of a nutrient solution called "wort." It contained plenty of sugar for the microbes to feed on and multiply. As the number of yeast cells increased, the wort became thick and creamy. Workers then separated the yeast from the wort, and compressed it into cube-like "cakes" that were packaged for sale.

Fleischmann's yeast became a national commercial success after Charles and Max set up a bakery concession at the Philadelphia's Centennial Exposition, a World's Fair held in 1876. About 10 million people visited the fair. Many sampled fresh-baked bread from the Fleischmann's "Vienna Bakery," and learned that they could make the same loaves at home with the Brothers' Compressed Yeast Cake.

### **The Science Behind the Invention** **"The Oldest Organism Cultivated by Humans"**

People have been growing yeast in homemade "starters" to make bread for more than 4,000 years. However, it wasn't until 1857 that the French microbiologist Louis Pasteur discovered that yeast is alive, a microorganism visible only through a microscope. Charles and Max Fleischmann invented a way of growing those microbes, harvesting them, and putting them into suspended animation in little cubes. They also successfully sold the cubes to consumers, making Fleischmann's yeast the most widely used in America.

Yeasts are single-celled organisms called fungi that exist naturally in the soil and air. Scientists have identified more than 700 different species of yeast. *Saccharomyces*

*cerevisiae* is the yeast that the Fleischmann Brothers turned into a commercial product, and the most common kind used in baking. Yeasts also are used to make beer, wine, and other alcoholic beverages. Not all serve humanity. Some cause infections in humans, and others make food spoil.

Yeasts play key roles in fermentation, a process in which complex molecules are broken down into simpler ones. Fermentation is at the heart of a huge industry that produces not just bread, beer, and wine but millions of gallons of ethanol for "gasohol," antibiotics, vitamins, and chemicals used to make many other products. That's because different kinds of microbes can break down, or metabolize, different substances. In doing so, they produce different products that can be harvested and used.



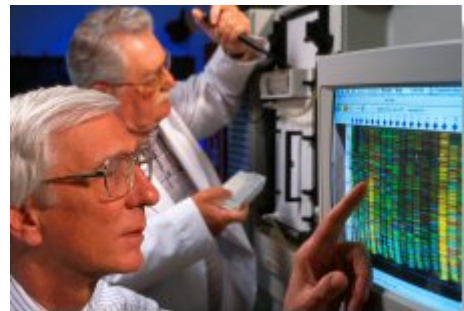
In bread making, *S. cerevisiae* breaks down flour's big starch molecules into sugars. Yeast uses the sugars as its own food to grow, releasing carbon dioxide gas. The tiny bubbles of CO<sub>2</sub> actually inflate bread dough, creating gas pockets that give bread a lighter texture. Those little holes in a slice of bread are gas pockets. Yeast doesn't form much alcohol in the stages of fermentation that occur in bread making. Yeast does a lot more. For instance, it helps produce a host of molecules that give bread a wonderful flavor and aroma. Yeast also helps change the two main protein molecules in wheat flour - gliadin and glutenin - into gluten. Gluten is an elastic substance, consisting of long, thread-like chains, that gives bread a nice chewy texture. Gluten chains also help trap those carbon dioxide bubbles that give baked goods a light, airy texture.

## Back to the Future

### Humble Yeast: A Champion of the Genetics Revolution

When Charles and Max Fleischmann were alive, yeast was a tool for making bread rise, brewing beer, and making wine. Never did they dream that *Saccharomyces cerevisiae*, which they packaged for home and commercial bakers, would become a key tool in genetics research and biotechnology. Scientists use yeast in genetics research because it is easy to grow, simple (with only 6,000 genes compared to perhaps 130,000 in humans) to study, and has many genes similar or identical to those in humans. Evolution led to the appearance of "one-size-fits-all" genes, which do the same job in a wide variety of organisms. About 70% yeast genes are very similar to genes found in humans. Knowledge about how such a gene works in yeast, thus sheds light on how the corresponding gene works in humans.

Although yeast is single-celled, it is a very advanced organism. Like humans, it belongs to a group called "eukaryotes." All eukaryotes share similarities in their cell anatomy, including a distinct nucleus and compartmental structures for carrying out specialized processes. In 1996, scientists deciphered the *S. cerevisiae* genome, the genetic blueprint for yeast used in baking and brewing. They determined the order of all 12,057,500 chemical subunits contained in the yeast's nuclear DNA. Yeast had the largest genome of any organism - or full set of genetic instructions - to decipher at that point. It gave scientists some of their first comprehensive knowledge about how all the genes in a eukaryotic cell function as an integrated system.





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## Agriculture & Food

From Aquaculture to Hot Dogs

### Yellow Dent Corn

James L. Reid developed Yellow Dent Corn, the most popular variety of field corn grown world-wide during much of the 20th Century. Most of today's hybrid corns were derived from Yellow Dent. Dent Corn originally was created by crossing flint and floury corns.



Corn is one of the most important production grains in the United States today. So the development of Yellow Dent Corn -- also known as "field corn" - had remarkable implications for U.S. farmers. Most of the corn grown in the United States today is Yellow Dent. It has a very high Vitamin A content and is perfect for a variety of uses. Yellow dent corn gets its name because of a small 'dent' on both sides of each kernel. It is the corn of choice for many food manufacturers and is used in corn chips and taco shells. Cornmeal is also derived from Yellow Dent Corn, which is used in the baking of cornbread, and other products. Corn starch is turned into fructose which is used as a sweetener in many processed foods and soft drinks.



Yellow Dent Corn differs from the "sweet" corn served as a vegetable in several ways. Sweet corn is full of sugar and softens readily when heated. Sweet corn can even be eaten off the husk in a corn field. But Yellow Dent Corn has a very thick outer skin that does not soften when cooked but must be soaked or ground for processing.

Corn has been a native crop in the Americas for over 7,000 years, and is said to have been brought to Spain by Christopher Columbus.

### Find out more...

- Wyandot Popcorn Museum ([www.wyandotpopcornmus.com](http://www.wyandotpopcornmus.com))