HUMANITIES INSTITUTE

NORTH AMERICAN INNOVATION

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Overview North American innovations have contributed a great deal to the economic and industrial development of the nation, and to its place on the world stage, as a partner, aggregator, popularizer, and leader in many different fields and specialties. Innovation has been a key to survival, and also important in improving standards of living, and also in striving to open doors of opportunity and the realization of the "American Dream."

ANCIENT PERIOD

PreHistory

Clovis culture (18,000 – 8,000 BC): We now know that the waves of people who came across the Bering Strait land bridge during the last Ice Age made their way to all parts of North America came in two distinct pulses. Radiocarbon dated artifacts show that the first group arrived 20,000 years ago, and the Clovis group arrived at around 13,000 years ago. Both groups developed unique spear points made of chert, obsidian daggers and arrow points, bone wrenches, ivory spear bases, and chert cleavers. They formed new techniques for hunting that made it possible to form groups and kill mammoths, bison, and deer. Turtles were, however, the "go-to" food and were used for meat, and their shells for bowls.

Classical

Southwest Pueblo (1200 BCE – 1300 AC): The Pueblo Indians were known for their innovations in communal living. They created elaborate cliff dwellings which were subdivided by purpose. They also developed methods of farming that utilized irrigation and crop rotation to successfully grow enough maize, beans, squash, and gourds to last more than a season.

Eastern Woodlands (1000 BCE – 1000 AD): The Abenaki, Iriquois, and other Eastern Woodlands peoples developed a system of agriculture that incorporated fertilization (using fishbones and compost). They created a farming system that allowed them to grow crops in grid patterns that circled the longhouses where they lived. There were outlying storehouses that were also used as guard posts.

Mississippian (800 – 1500 AD): The Mississippian peoples whose largest settlement was in Cahokia (modern-day Saint Louis area), lived along the Mississippi River and its tributaries. Its governmental center was in Spiro, Oklahoma, where there were complexes of large "mounds" (complexly engineered earthen pyramids), along with a water system. Their civil engineering innovations were impressive, with pyramids, large earthworks, drainage systems, irrigation, and retaining walls. They also developed boats capable of transporting cargo in extensive trade voyages along rivers.

Colonial (Early Modern)

Inventions: Colonial America was a place where gentlemen farmers and entrepreneurs were motivated to develop inventions to improve productivity and quality of life. They often shared ideas with contacts in England.

Atmospheric steam engine (1712): Thomas Newcomen was the first to develop the atmospheric steam engine, which was the first practical steam engine. It was modified in the American colonies and used in iron-mongering.

Flying Shuttle (1733): John Kay's flying shuttle was developed in England for spinning. It was also implemented in the American colonies in areas that produced flax for linen, wool, and cotton.

Improved steam engine (1769): James Watt improved the steam engine in England, which was exported to the American Colonies where it was used primarily as a steam pump. The piston pump was used in milling and also to move paddles in the first experiments with paddleboats.

Benjamin Franklin: A tireless innovator, Franklin developed the lightning rod, bifocals, and Franklin stove, many of which became fixtures in American homes and lives.

Robert Fulton: In the 1790s, Robert Fulton developed the steamboat (a steam engine powered paddleboat) which he used on the Hudson River. His goal was to show how cargo boats could move from New York City to Albany, allowing the transport of raw materials, equipment, and finished goods.

Agricultural Inventions: Eli Whitney, born in Massachusetts, is credited for changing the face of American industry by inventing the cotton gin and turning cotton into a profitable crop, and making it possible to support a thriving textile industry in New England.

Banking Innovations / Money: Alexander Hamilton, one of the "Founding Financiers," helped develop the Bank of North America and the Bank of New York (1794). They were limited in scope, and were used primarily as savings banks. Loans and insurance companies were not affiliated with banks. Loans were often made by the land owners, or by "monied" individuals.

Nineteenth Century

Raw Materials (Plantation, Mining, Fur, etc.): Economic progress was made possible in the plantation-dominated South, the gold and mining dominated West, and the factory-dominated Northeast thanks to steam-powered farm equipment (tractors, threshers); steam-powered combustion engines, mining (mills, amalgamation chemical processes for gold, coal mining

Industrial Revolution / Manufacturing: The new American nation went through two episodes of Industrial Revolution. The first included canal systems and steam engines. Tom Thumb was the first to develop steam-powered locomotive. Benjamin Wright designed canals including the Erie Canal which connected the Hudson River (at Albany, NY) with the Great Lakes. The first wave also included steel processes (Bessemer) that allowed the production of steel for railroads. The second Industrial Revolution set the stage for improved communications, illumination (longer work days), factories of all kinds, and transportation. Americans inventions (or significant innovations on existing inventions) included the electromagnet, telegraph, electric light, Bessemer process for steel, sewing machine, typewriter, internal combustion engine, photograph, moving pictures, steam turbine, machine gun, AC motor and transformer, and the automobile.

Innovative Social Arrangements/ Utopian Settlements: Innovative social arrangements flourished in the United States, particularly in the western, more unsettled parts of the country. Early Utopian communities included the celibate Shakers who developed new herbal medicines and a distinctive type of furniture, the Mormons who established a complex society in Utah where they focused on agriculture and trade. The Oneida Community, established by John Humphrey Noyes in Putney, Vermont, practiced a complex (and scandalous) kind of open marriage. The expanded and found economic success by developing high-quality silverware and embroidered silks. The overall economic system was socialistic. They eventually fell apart as a community (but lived on as a silverware business) due to sexual jealousy.

Inventions in Wars (1812, 1848, Indian Wars, Civil War, More Indian Wars, 1898): There were numerous inventions that accompanies the various wars. The Ironside ship and submarine were developed and improved during the wars of 1812 and the Civil War. The Gatling Gun was developed and implemented with savage efficacy in the Civil War. Navigation and communication innovations took place in the war with Mexico in 1848 and also in the fort system in the Indian wars.

Medicinal Innovations: American medical innovations were in tandem with European innovations. They included improving immunizations, and beginning to recognized the need to sterilize equipment and to wear clean (rather than blood-encrusted) clothing. Clara Barton adopted Florence Nightingale's nursing practices and established the American Red Cross and a system of standardized nursing practices. Medicines, especially those containing opium, flourished.

Twentieth Century

Second Industrial Revolution: The Second Industrial Revolution started at the turn of the century, and resulted in dramatic breakthroughs in communication, transportation, and public works. The inventions included forged steel, automobiles, telegraph, telephone, waterworks, public sewer systems, trams, gas and electricity in homes.

Third Industrial Revolution: The Third Industrial Revolution had to do with computers, petrochemicals (plastics, nylon, etc.), airplanes, and space-age innovations. It started in the 1950s, with dramatic breakthroughs in plastics, in computing, and also in the development of materials and processes that allowed additional automation, television and radio broadcasting, space travel, air travel, satellite communication, and more.

Fourth Industrial Revolution: In the 1980s and 1990s, the development of the World Wide Web and the Internet led to dramatic change in what way people communicate, obtain information, and also monitor people and processes. It was accompanied by the development of computing power, which allowed the development of artificial intelligence and "smart" systems. The change in communication led to the dramatic transformation and automation of many professions and jobs, such as journalist, middle manager, secretaries, typists, clerks, commercial artists, and more.

World War I Technologies: The American inventions that were used in World War I were quite diverse. They ranged from the use of airplanes and a system of air traffic control, to on-the-ground innovations. The more mundane included the development of cotton cellulose, which was used for medical purposes (wadding). Cotton cellulose was later developed into sanitary napkins for women, and later, paper tissues. Paper tea bags were developed by an American.

Factory Technologies and Management: The early 20th century saw the Americans develop a new kind of "scientific" management for making factories both efficient and keeping employees optimally happy (an implementation of Jeremy Bentham's "felicific calculus). It was called "industrial hygiene" and was adopted with great success in all kinds of factories and workplaces. The focus was on mass production, elimination of waste, and equitable treatment of workers. It was first used by Ford in the assembly-line manufacture of the Model T. Frederick Taylor was effectively articulated the concepts, and it was used as a foundation for later engineering endeavors, including industrial engineering and management.

Rise of Labor Unions and Trade: Due in large part to the exploitive, dangerous, and inefficient use of labor in mines, factories, ships, docks, and other areas, and the need for specialization, labor unions formed in order to fight the oligopolies that wished to minimize labor costs. The trade unions arose as a political choice in the early part of the century, when countries resolved the problem by not allowing private ownership at all, and elected socialism or communism. The U.S. upheld private ownership (either by individuals or corporations), and at the same time implemented protections through the use of labor laws and unions (who had strength through labor laws). The unions truly transformed American labor and resulted in a high standard of living for union members. However, with the advent of labor-saving technology, and the pressure of unions to continue to add benefits, many unions found themselves to be unsustainable. The trend in the late 20th century was to rely on governmental protections of labor and not collective bargaining.

Cultural Innovations: This article has focused on industrial innovations, but it is worth mentioning that in the 20th century there was significant crossover, and the cultural innovations sparked new developments and dement for better communication, computing, and production techniques. Some of the examples are in the entertainment industry: music (jazz, rock, hip-hop, classical music); film industry (the "talkies" of the 20s, and then those with extreme special effects, starting with color, and ending with animation and 3D images); travel and tourism (the theme parks, such as Walt Disney World, and festivals such as Woodstock, Altamont (a negative impact), and Coachella (electronic music).

<u>Discussion/Questions</u>

1. When Columbus and the other Europeans arrived in the Americas, they did not find a barren wasteland devoid of organization or civilization, although at times it was convenient to depict American indigenous peoples in a negative light. Instead, they found elaborate cities with complex engineering, and systems of agriculture that allowed stable communities to emerge. Describe some of the agricultural and engineering innovations of the peoples in America before the Europeans.

2. The colonial settlers used innovations to make their production of raw materials for England to be more efficient. In the Northeast, the need to process the furs, skins, hides, and other materials led to innovations. In the South, the plantations needed improved technology in order to make their operational sustainable. Discuss 4 or 5 of the innovations during Colonial America.

3. The 19th Century was a time of westward expansion and also industrial revolution, with the rapid development of canals, railroads, and methods of communication. List the different innovations that contributed to the Westward Expansion and describe to costs and benefits of each.

4. The 20th century has seen numerous generations of innovation, some so profound that they are called revolutions. Explain the kinds of innovations that occurred during the Second, Third, and Fourth Industrial Revolutions, and provide a few examples of the way they changed everyday life for the average American, and how they opened opportunities for those seeking a better life (or a more interesting one) from countries experiencing crisis or ongoing instability.

Readings

Bey, Lee. (2016). Lost cities #8: mystery of Cahokia – why did North America's largest city vanish? The Guardian. August 17, 2016. https://www.theguardian.com/cities/2016/aug/17/lost-cities-8-mystery-ahokia-illinois-mississippians-native-americans-vanish

Hughes, Thomas P. (2004) American Genesis: A Century of Invention and Technoloigcal Enthusiams, 1870 – 1970. 2nd Ed. Chicago: University of Chicago Press.

Pacey, Arnold. (1991) Technology in World Civilization: A Thousand-Year History. Boston: MIT Press.

Seppa, Nathan. (1997). "Metropolitan Life on the Mississippi" Anciant Cahokia. The Washington Post. March 12, 1997. http://www.washingtonpost.com/wp-srv/national/daily/march/12/cahokia.htm

Stearns, Peter. (2012) The Industrial Revolution in World History. 4th ed. London: Taylor & Francis.

Taylor, Mitch. (2011) Ford Model T – How to Start & How to Drive: https://youtu.be/QxfHMtgg2d8

Wisconsin Historical Society. Mississippian Culture and Azatlan. https://www.wisconsinhistory.org/turningpoints/tp-003/ Great site with original documents and primary sources.