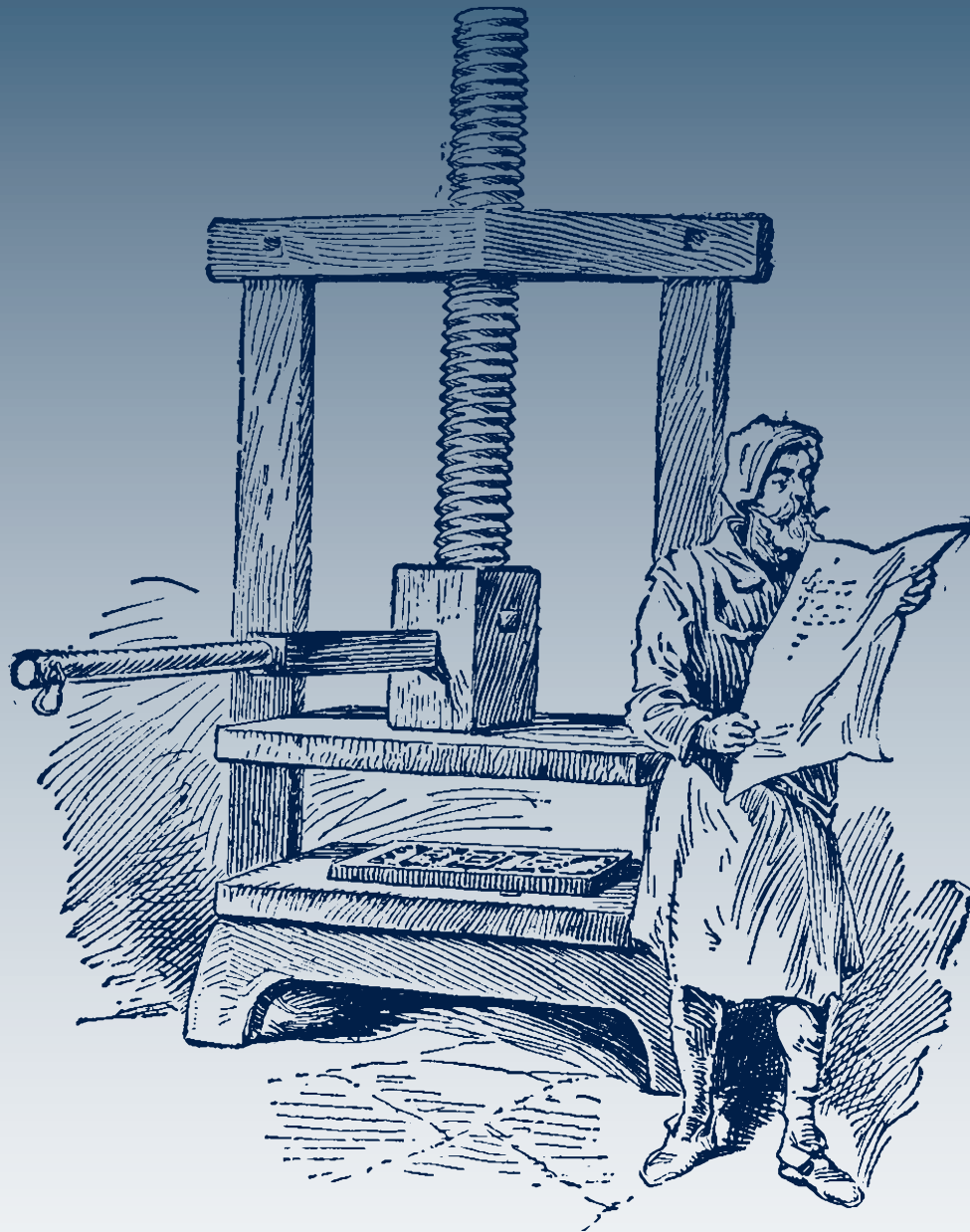


Patterns of Change in Technology

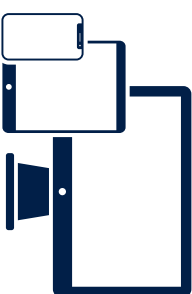
3.11 EXPLORE the contribution of technological developments and innovation to historical change.



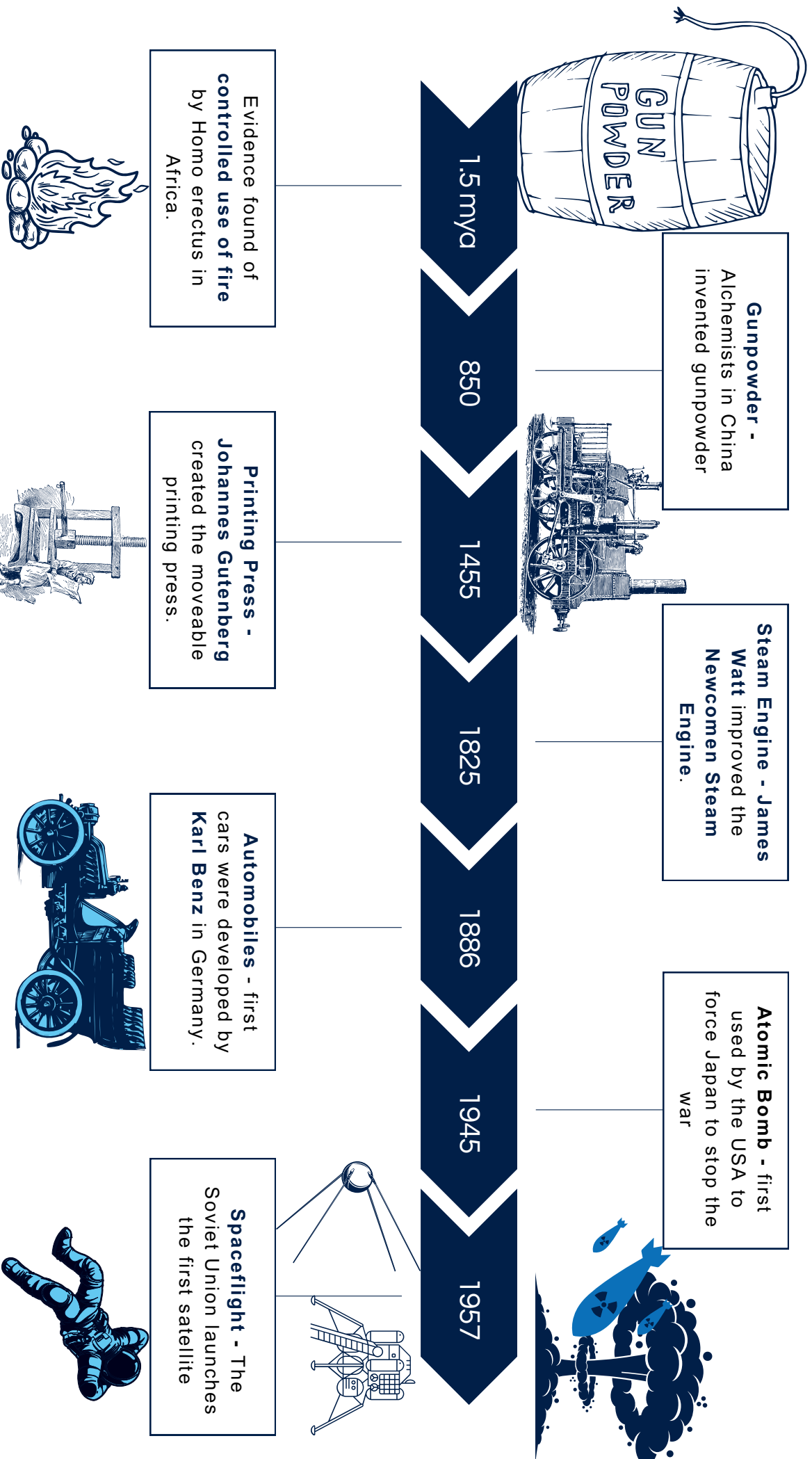
- 33.1 Timeline
- 33.2 Cornell Notes
- 33.3 Keywords
- 33.4 Knowledge Organiser
- 33.5 Questions

This chapter will examine the ways in which technological advances have transformed human society, from the first controlled use of fire to the digital age.

Patterns of Change in Technology



3.11 EXPLORE the contribution of technological developments and innovation to historical change.



Patterns of Change: Technology

Headings	Notes
<p>WHAT IS TECHNOLOGY?</p>	<ul style="list-style-type: none"> • Technology refers to tools, devices, or methods used to carry out specific tasks. • Innovation involves the introduction of new ideas, methods, or products that bring significant changes to society. • Throughout history, developments in technology have been among the primary drivers of change, influencing daily life, social structures, and global history.
<p>TECHNOLOGY IN ANCIENT TIMES</p> <p>AGRICULTURAL INNOVATION</p>	<ul style="list-style-type: none"> • Agricultural technology was essential in securing a stable and nutritious food supply, starting with farming, which allowed the growth of human populations and the formation of settlements. • The Mesolithic Period marked a time when humans were hunter-gatherers, relying on hunting and gathering plants, with a nomadic lifestyle that shifted with seasons or food availability. • The Neolithic farmers introduced early cultivation practices, growing crops and domesticating animals for dairy and meat, transforming diets and contributing to community stability. • With a secure food supply, communities expanded into towns and cities. Food surplus allowed people to specialize in other roles, including metalworking, carpentry, and religious practices. • Technological advances in metalworking, like the creation of iron ploughs, allowed for deeper soil cultivation, boosting agricultural productivity. • Water supply systems were established to provide cities with drinking water and to irrigate fields, keeping soil fertile and supporting agricultural expansion.
<p>MANUFACTURING AND INDUSTRY</p>	<ul style="list-style-type: none"> • Early human manufacturing involved creating essential objects like tools, weapons, pots, homes, and clothes from materials such as stone and wood. • During the Bronze Age in Ireland, the introduction of bronze (a combination of copper and tin) enabled the production of stronger, more easily shaped tools and weapons, advancing both industry and society. • Copper was mined locally (e.g., at Mount Gabriel in Co. Cork), while tin was imported from places like Cornwall in Britain.
Keywords	Summary
<p>Technology Copper</p> <p>Innovation Mount Gabriel</p> <p>Agricultural technology</p> <p>Farming Tin</p> <p>Mesolithic Period</p> <p>Hunter-gatherers</p> <p>Neolithic farmers</p> <p>Metalworking Cornwall</p> <p>Bronze Age</p> <p>Alloy</p>	

Patterns of Change: Technology

Headings	Notes
MANUFACTURING AND INDUSTRY	<ul style="list-style-type: none"> • Smelting was a key process in metalworking, involving the heating and melting of metals to separate them from ore, which allowed for the casting of metals into specific shapes using moulds. • Metalworkers, or smiths, specialized in producing tools such as sickles (for harvesting crops), axes, ploughs, and weapons like knives, swords, shields, and spears. Despite these advancements, farming remained the primary occupation.
MILITARY TECHNOLOGY	<ul style="list-style-type: none"> • Throughout human history, conflict has necessitated the development of weapons and armour for protection and offense. • Early warriors used swords, daggers, and spears for close combat, along with armour and shields to defend against enemy attacks. • For long-range attacks, weapons such as throwing spears, bows and arrows, and crossbows were developed, initially crafted from stone and wood and later incorporating metals for enhanced durability. • As populations began to settle in fortified areas, siege weapons emerged to breach defensive walls; the Romans, in particular, created advanced machines like catapults to hurl projectiles (e.g., stones or metal balls) at fortified positions. • Roman dominance across the Mediterranean was largely due to their military innovations, battlefield tactics, and use of iron weapons, which allowed them to conquer and maintain vast territories for centuries.
IMPACT AND CONTRIBUTION OF ANCIENT TIMES	<ul style="list-style-type: none"> • Technological innovations during ancient times significantly shaped human society and development. • Agricultural advancements such as crop cultivation and animal domestication created a reliable food supply, enabling the formation of stable, settled communities and the rise of early civilisations. • Developments in metalworking allowed the production of tools and weapons, which supported daily life, farming, and defence, and facilitated the expansion of communities. • Military innovations like siege engines and battlefield tactics were instrumental in the growth of empires, especially for the Romans, whose military prowess enabled them to control vast territories.
Keywords	Summary
<p>Smelting</p> <p>Metalworkers</p> <p>Smiths</p> <p>Warriors</p> <p>Siege Weapons</p> <p>Romans</p> <p>Celts</p>	

Patterns of Change: Technology

Headings	Notes
<p>IMPACT AND CONTRIBUTION OF ANCIENT TIMES</p>	<ul style="list-style-type: none"> • Ancient technology laid foundational principles for city planning, agriculture, and defence, influencing later civilisations and establishing structures that persist today.
<p>TECHNOLOGY IN THE MIDDLE AGES</p> <p>AGRICULTURAL INNOVATION</p>	<ul style="list-style-type: none"> • The feudal manor system organised land into large fields and shaped medieval farming practices. • The open field system divided land for crops into three large fields, each further split into long strips of land allocated to different families. <ul style="list-style-type: none"> • Field One: planted with wheat for making bread. • Field Two: planted with oats (for porridge) and barley (for beer). • Field Three: left fallow (unused) to allow the soil to regain nutrients. • Commons land was designated for animal grazing, a fourth large field used by all for communal livestock. • Despite these innovations, the system was inefficient as one-third of the land remained unused each year.
<p>MANUFACTURING AND INDUSTRY</p>	<ul style="list-style-type: none"> • Blast furnaces were introduced in medieval Europe, hundreds of years after their invention in China, showcasing how technological advances spread and evolved independently. • These furnaces produced molten iron, which could be poured into moulds to create cast iron tools and weapons, significantly improving the quality and strength of iron products. • Prior to this, iron tools and weapons were individually hammered into shape. The use of blast furnaces made high-quality iron implements more widely available.
<p>MILITARY TECHNOLOGY</p>	<ul style="list-style-type: none"> • Knights in medieval Europe used weapons and armour similar to those of Roman legionaries — swords, plate armour, and large shields. • Steel production techniques arrived in Europe from China, and although steel was harder and more durable than iron, it was costly, so only the wealthiest knights could afford steel weapons and armour. • Advances in military technology, including steel weaponry and improved armour, transformed combat tactics and were crucial in medieval warfare.
Keywords	Summary
<p>Feudal manor</p> <p>Open field system</p> <p>Commons</p> <p>Blast furnaces</p> <p>Roman legionaries</p> <p>Steel</p>	

Patterns of Change: Technology

Headings	Notes
<p>IMPACT AND CONTRIBUTION OF THE MIDDLE AGES</p>	<ul style="list-style-type: none"> • Medieval agricultural practices, such as crop rotation, helped improve land productivity, supporting population growth and the development of feudal society. • The use of blast furnaces advanced metalworking, leading to stronger, more durable tools and weapons, which were crucial for both farming and warfare. • Military technology like steel weaponry and armour transformed combat, strengthening knights' role in warfare and castle defence. • Collectively, these technological advancements helped Europe transition from isolated communities to more interconnected societies with improved infrastructure, trade networks, and a stronger feudal system. • The innovations of the Middle Ages laid the groundwork for urban growth, the spread of trade, and the political and economic foundation that shaped Europe into the Renaissance period.
<p>TECHNOLOGY IN THE RENAISSANCE</p> <p>AGRICULTURAL INNOVATION</p>	<ul style="list-style-type: none"> • The Renaissance introduced more efficient crop rotation methods that improved soil fertility and allowed for higher crop yields without leaving land fallow. • Farmers began planting clover and legumes, which helped replenish nitrogen in the soil, a key nutrient for plant growth. • New plough designs—such as the heavy, wheeled plough—enabled deeper, more effective cultivation, especially useful for northern Europe's heavy soils. • Trade and exploration brought new crops to Europe via the Columbian Exchange: <ul style="list-style-type: none"> • Maize, potatoes, and tomatoes from the Americas became staples in European diets. • Potatoes, with high nutritional value, helped increase population growth due to their adaptability in various climates.
<p>COMMUNICATION TECHNOLOGY</p>	<ul style="list-style-type: none"> • Prior to the 1400s, books were painstakingly handwritten, which made them costly and rare, limiting access to written knowledge. • Johannes Gutenberg invented the movable type printing press, allowing for quicker, cheaper production of books. His first printed work was the Gutenberg Bible. • The printing press made books accessible to more people, fostering literacy and encouraging the spread of new ideas. This weakened the Catholic Church's control over knowledge, as more people could read and disseminate ideas outside of church doctrine.
Keywords	Summary
<p>Medieval Agricultural Practices</p> <p>Blast Furnaces</p> <p>Crop Rotation</p> <p>New Plough Designs</p> <p>Columbian Exchange</p> <p>Johannes Gutenberg</p> <p>Printing Press</p> <p>Gutenberg Bible</p>	

Patterns of Change: Technology

Headings	Notes
COMMUNICATION TECHNOLOGY	<ul style="list-style-type: none"> Books began to be published in the vernacular (local languages) rather than in Latin, which helped spread Renaissance ideas across Europe.
NAVIGATIONAL TECHNOLOGY	<ul style="list-style-type: none"> Before the Age of Exploration, sailors stayed close to shore, but new technologies made oceanic navigation possible. Cartographers (mapmakers) began using portolan charts from Constantinople, which mapped coastlines, harbours, currents, tides, and depths more accurately. Key navigational tools included: <ul style="list-style-type: none"> Quadrant and astrolabe for determining latitude by measuring the positions of the sun and stars. Compass, which used magnetism to indicate north and aid in direction-finding. Log and line to measure a ship's speed in knots. Line and lead weight to gauge water depth. These advancements allowed European sailors to undertake longer, safer voyages, enabling exploration and conquest.
MILITARY TECHNOLOGY	<ul style="list-style-type: none"> The invention of gunpowder originated from an accidental discovery by Chinese doctors, who mixed sulphur and saltpetre seeking to extend life. Gunpowder changed the nature of warfare; cannons became standard siege weapons, able to destroy fortified city walls and transform naval battles. Handheld firearms evolved over time, making battles more deadly and contributing to the success of European conquests, as in the case of the Spanish conquest of the Aztecs and Incas.
IMPACT AND CONTRIBUTION OF THE RENAISSANCE	<ul style="list-style-type: none"> Renaissance agricultural innovations led to increased food production and population growth, setting the stage for further advancements in the Agricultural Revolution. Printing technology revolutionised communication, making books affordable, increasing literacy, and promoting the spread of new ideas, thus weakening the Catholic Church's control over information.
Keywords	Summary
<p>Vernacular</p> <p>Renaissance</p> <p>Age of Exploration</p> <p>Cartographers</p> <p>Quadrant</p> <p>Astrolabe</p> <p>Compass</p> <p>Gunpowder</p> <p>Aztecs</p> <p>Incas</p>	

Patterns of Change: Technology

Headings	Notes
<p>IMPACT AND CONTRIBUTION OF THE RENAISSANCE</p>	<ul style="list-style-type: none"> Advances in navigational technology enabled European explorers to reach new continents, laying the foundation for global trade networks, conquest, and the colonisation of the Americas. The invention of gunpowder and firearms shifted the balance of military power, allowing European states to expand through conquest and colonisation. The technological progress of the Renaissance spurred scientific inquiry, exploration, and cultural shifts, contributing to the transformations of the Enlightenment and Age of Exploration.
<p>TECHNOLOGY IN INDUSTRIAL SOCIETY</p> <p>AGRICULTURAL INNOVATION</p>	<ul style="list-style-type: none"> The Norfolk system developed by Charles Townshend involved a four-crop rotation: wheat, turnips, oats/barley, and clover/grass, which restored nutrients to the soil and increased food production. Enclosure transformed farming by consolidating individual strips into large farms, fenced for efficiency, ending the open-field system. Selective breeding by Robert Bakewell involved reserving the largest animals for breeding, leading to bigger and healthier livestock and increased meat availability. Jethro Tull's seed drill allowed for efficient planting by sowing seeds at the correct depth in straight rows. Cyrus McCormick's mechanical reaper mechanised crop harvesting, making it faster and less labor-intensive.
<p>MANUFACTURING AND INDUSTRY</p>	<ul style="list-style-type: none"> The Industrial Revolution began in Britain, driven by innovations such as the steam engine. Thomas Newcomen's steam engines were initially used to pump water from mines, with later improvements by James Watt, including a flywheel that allowed rotary motion, making it versatile for powering other machines. Steam power was applied to textile machinery like Crompton's spinning mule and Cartwright's power loom, which accelerated cloth production and drove the growth of factories.
Keywords	Summary
<p>Navigational Technology</p> <p>Gunpowder</p> <p>Norfolk System</p> <p>Enclosure</p> <p>Selective Breeding</p> <p>Seed Drill</p> <p>Mechanical Reaper</p> <p>Steam Engine</p> <p>Spinning Mule</p> <p>Power Loom</p>	

Patterns of Change: Technology

Headings	Notes
<p>COMMUNICATION TECHNOLOGY</p>	<ul style="list-style-type: none"> • Friedrich Koenig's steam-powered printing press in 1812 could print 1,100 sheets per hour, boosting mass media as newspapers could now be widely produced and distributed. • This cross-innovation, where steam power enhanced printing, allowed for quicker dissemination of information to the public.
<p>NAVIGATIONAL TECHNOLOGY</p>	<ul style="list-style-type: none"> • Steam engines also transformed transportation, initiating the Railway Age. • Richard Trevithick built the first steam-powered locomotive, and George Stephenson's Rocket operated on the Liverpool-Manchester line, marking the rise of passenger railways.
<p>IMPACT AND CONTRIBUTION OF THE INDUSTRIAL</p>	<ul style="list-style-type: none"> • Agricultural innovations like crop rotation, selective breeding, and mechanisation supported a rapidly growing population and enabled urban migration. • The steam engine powered factories, leading to mass production in industries such as textiles and contributing to the growth of industrialised cities. • Developments in communication, such as the steam-powered printing press, fostered mass media, enabling faster information dissemination to a wider audience. • The railway system transformed transportation, making it easier to move goods and people, facilitating trade, and connecting distant areas economically and culturally. • The Industrial Revolution marked a shift from agrarian to industrial societies, creating modern urban centres, spurring economic growth, and laying the groundwork for the capitalist economy.
<p>TECHNOLOGY IN MODERN TIMES</p>	<ul style="list-style-type: none"> • A rapid increase in global population necessitated advancements in agricultural technology to feed more people.
<p>AGRICULTURAL INNOVATION</p>	<ul style="list-style-type: none"> • The internal combustion engine replaced animals for farm work, leading to mechanised farming with tractors and combine harvesters, which freed land previously used to sustain working animals. • Artificial fertilizers developed in the early 20th century replenished soil nutrients, eliminating the need for crop rotation and enabling multiple crop yields per year. • The introduction of pesticides began with the development of synthetic insecticides in the 1920s, increasing crop protection and yield:
Keywords	Summary
<p>Friedrich Koenig's Richard Trevithick George Stephenson's Steam Engine Railway Agricultural Technology Internal Combustion Engine Artificial Fertilizers Pesticides</p>	

Patterns of Change: Technology

Headings	Notes
AGRICULTURAL INNOVATION	<ul style="list-style-type: none"> • Insecticides combat pests, fungicides prevent plant diseases, and herbicides control weeds. • These advancements contributed to the Green Revolution, which spread these methods globally, reducing famine risks. • Mechanisation and higher food production led to urbanisation, with populations moving to cities as farm labour requirements declined.
MANUFACTURING AND INDUSTRY	<ul style="list-style-type: none"> • Although steam engines had driven 19th-century machines, they were large, labour-intensive, and prone to breakdowns. The internal combustion engine resolved these issues with its compact, efficient design. • Karl Benz developed the first automobiles in Germany in 1886, while Henry Ford in the USA introduced mass production via the assembly line, allowing large-scale, affordable car manufacturing. • Assembly line production meant workers remained in place while parts were brought to them, a system soon adopted in other industries worldwide. • Electricity became widely available in the 20th century, transforming daily life: <ul style="list-style-type: none"> • Lightbulbs invented by Thomas Edison and Nikola Tesla replaced candles and lamps, making lighting safer and cheaper. • Power plants supplied electricity for homes and businesses, enabling 24-hour factory operations and powering various new appliances. • Larger vehicles powered by internal combustion engines (e.g., tractors and tanks) enabled advances in agriculture, transport, and military technology.
MILITARY TECHNOLOGY	<ul style="list-style-type: none"> • World War I introduced new military technology such as: <ul style="list-style-type: none"> • Aeroplanes for reconnaissance, aerial combat, and bombing. • U-boats (German submarines) used for naval warfare, sinking military and civilian ships. • Tanks invented by the British to break the trench warfare stalemate. • Chemical weapons like chlorine gas and phosgene, which caused mass casualties and long-term injuries. • Shell shock, now known as PTSD, affected soldiers exposed to intense, prolonged combat.
Keywords	Summary
Insecticides Power plants fungicides tractors herbicides Aeroplanes Karl Benz Tanks Henry Ford Chemical weapons Assembly line Electricity PTSD Thomas Edison Nikola Tesla	

Patterns of Change: Technology

Headings	Notes
MILITARY TECHNOLOGY	<ul style="list-style-type: none"> • World War II advancements included: <ul style="list-style-type: none"> • Improved submarines and torpedoes, ASDIC (sonar), and radar for oceanic warfare. • Aircraft carriers as mobile airbases, allowing planes to refuel mid-sea. • Enhanced weaponry with Tiger tanks and machine guns like the German MG 42, firing 1,200 rounds per minute. • Jet fighters like the Messerschmitt ME 262, a German invention, and long-range rockets (e.g., the V1 and V2). • The Atomic Bomb: The US developed atomic bombs during the Manhattan Project, leading to devastating bombings of Hiroshima and Nagasaki in 1945, causing mass civilian casualties and long-term radiation effects.
IMPACT AND CONTRIBUTION OF MILITARY	<ul style="list-style-type: none"> • World War technology advancements meant battles could shift quickly, as in Blitzkrieg tactics, with new weapons causing unprecedented destruction. • Civilian casualties increased, with WWII seeing approximately 38-55 million civilian deaths. • Atomic bomb invention introduced a new era of warfare with nuclear deterrence, profoundly shaping Cold War politics.
COMMUNICATION TECHNOLOGY	<ul style="list-style-type: none"> • The 19th and 20th centuries saw significant advances in telecommunications (electric-based communication systems), transforming how information was shared globally. • Telegraph: Invented in 1831, it enabled instant text-based communication over long distances through wired signals. • Telephone: Developed by Alexander Graham Bell in 1876, allowing real-time verbal communication via voice waves transmitted electronically. • Radio: Pioneered by Guglielmo Marconi in the 1890s, it became a household staple by the 1920s, providing news, weather, music, and entertainment. • Television: Emerging in the 1920s, television became the leading source of entertainment and information after WWII, with over 90% of American homes owning a TV by the mid-1950s. • Television shaped culture by broadcasting significant events (e.g., moon landing, social movements) directly into homes, helping drive social awareness and change. • Mobile phones emerged from satellite communication advances, allowing wireless verbal communication, followed by the internet in the 1980s, providing vast access to info and media.
Keywords	Summary
<p>Asdic Radar</p> <p>Aircraft Carriers</p> <p>Tiger Tanks Machine Guns</p> <p>Jet Fighters Rockets</p> <p>Atomic Bomb Blitzkrieg</p> <p>Telegraph Telephone</p> <p>Radio Television</p> <p>Mobile Phone Internet</p>	

Patterns of Change: Technology

<i>Headings</i>	<i>Notes</i>
NAVIGATIONAL TECHNOLOGY	<ul style="list-style-type: none">• The Space Race during the Cold War era led to groundbreaking technological innovations as the US and Soviet Union competed in scientific exploration and military technology.• Sputnik: Launched by the Soviet Union in 1957, the first artificial satellite, sparking US fears of a missile gap.• Explorer: In 1958, the US successfully launched its first satellite, restoring national confidence.• The Moon Landing: US President John F. Kennedy set the goal to land on the moon, achieved by NASA's Apollo 11 mission in 1969.• Neil Armstrong and Buzz Aldrin became the first humans to walk on the moon, watched by over 500 million people globally, marking a US victory in the space race and symbolising technological prowess.• Space race technology spurred innovations in satellites, communication, and computing, influencing both military and civilian life.
IMPACT AND CONTRIBUTION OF MODERN TIMES	<ul style="list-style-type: none">• Agricultural innovations such as mechanisation and chemical usage met the food demands of a rapidly growing global population, contributing to urban migration and reducing the risk of famine.• Manufacturing advancements through the internal combustion engine and mass production expanded consumer goods availability, making technology accessible to the broader public and transforming everyday life.• Military technologies introduced in the world wars redefined global power structures and led to devastating impacts on civilian and military populations, with the atomic bomb setting a new precedent for potential destruction.• Communication breakthroughs from radio and television to the internet enabled real-time global connection, reshaping media, culture, and social dynamics.• Space race achievements accelerated technological progress in navigation, computing, and satellite technology, continuing to influence modern innovation and geopolitical competition.
<i>Keywords</i>	<i>Summary</i>
Space Race Sputnik Missile gap Explorer The Moon Landing NASA Apollo 11 Neil Armstrong Buzz Aldrin	

Patterns of Change: Technology

<i>Keywords</i>	<i>Definitions</i>
Arms Race	<ul style="list-style-type: none">• A race between the USA and the USSR (Soviet Russia) and their allies to compete for superiority in military arms, often referred to during the Cold War.
Cold War	<ul style="list-style-type: none">• Period of hostility between the USA and its allies and the Soviet Union and its allies that lasted from the end of World War II to the collapse of Communism in the early 1990s.
Historical Change	<ul style="list-style-type: none">• Changes that happen in history; how differences occur in history through causes and effects (consequences).
Industrial Revolution	<ul style="list-style-type: none">• Rapid industrial growth or change that began in the middle of the 18th Century and brought about the factory system and the growth of cities.
Innovation	<ul style="list-style-type: none">• Any new idea, method or product that brings about change.
Navigation	<ul style="list-style-type: none">• Directing or guiding a ship from one place to another
Nuclear War	<ul style="list-style-type: none">• A war fought with atomic and hydrogen (nuclear) bombs
Standardisation	<ul style="list-style-type: none">• Developing the same basic features e.g. in the English language
Technological Developments	<ul style="list-style-type: none">• The practical use or application of methods and machines to produce goods and services in mass production.
Technology	<ul style="list-style-type: none">• The tools, devices or means to carry out tasks.

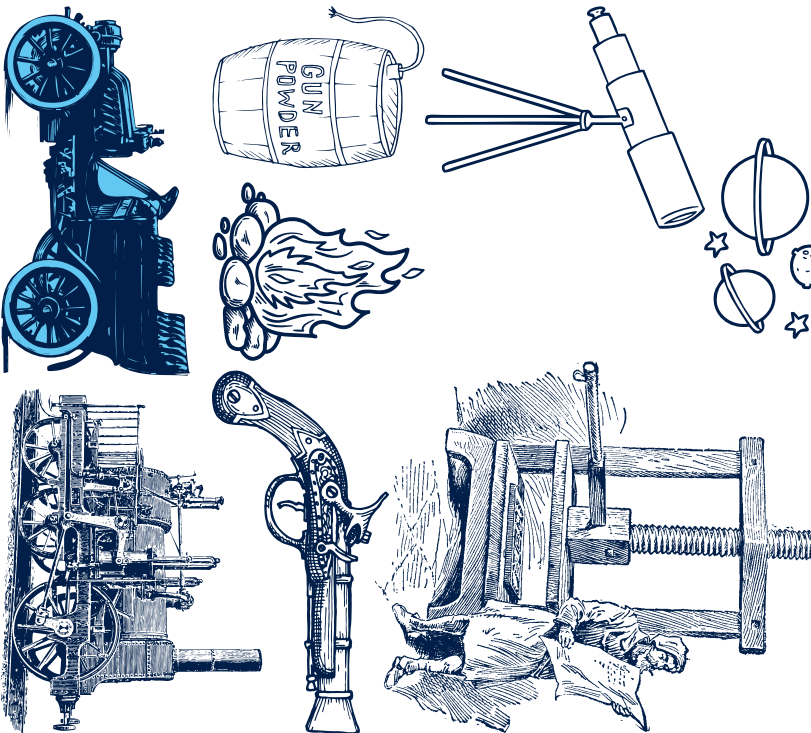


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3.11 EXPLORE the contribution of technological developments and innovation to historical change.

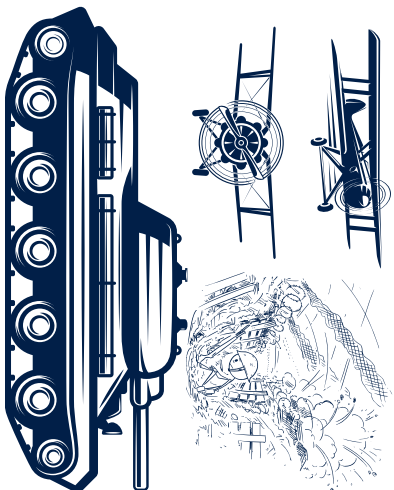
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Technological developments have played a significant role in shaping human history. From the first controlled use of fire and the invention of gunpowder to the present day, advancements in technology have revolutionized the way we live, work, and communicate. The Renaissance saw significant advancements in art, literature, philosophy, and science, including the development of the printing press and navigation techniques. The Industrial Revolution brought about mass production and significant social and economic changes, while the World Wars spurred the development of new military technologies and raised ethical questions about their use. The Space Race led to advancements in space technology and demonstrated the power of science and technology to the world. In modern times, technology continues to rapidly evolve, with innovations in areas such as mobile devices, artificial intelligence, renewable energy, and e-commerce. While these advancements bring many benefits, they also raise concerns about privacy, security, job displacement, and their impact on society and the environment. As we continue to develop and adopt new technologies, it is important to consider their potential benefits and risks, and to work towards a more equitable and sustainable future.

The World Wars

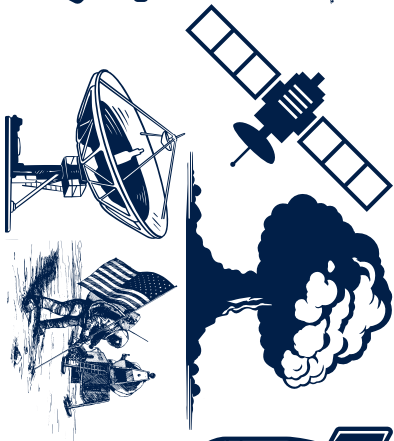
The two World Wars had a profound impact on technological developments. During World War I, advancements in communication and transportation technologies were made, including the development of radios, telegraphs, and the use of airplanes for warfare. The use of chemical warfare also led to the development of gas masks and other protective gear. World War II saw even more technological advancements, including the use of nuclear weapons, the development of radar and sonar, and the use of jet engines in airplanes. The war also spurred the development of computers, which were used to crack enemy codes and assist in other military operations. The technologies developed during these wars had a lasting impact on society and paved the way for further scientific advancements in the post-war era. These advancements in military technology also raised ethical and moral questions about the use of technology in warfare and its impact on civilian populations.



The Renaissance was a period of great cultural, artistic, and scientific flourishing that began in Italy during the 14th century and spread throughout Europe. It was characterized by a renewed interest in classical learning, humanism, and individualism. This led to significant advancements in fields such as art, literature, philosophy, and science. Technological developments during this time included the printing press, which allowed for the widespread dissemination of knowledge, and the use of perspective in painting, which revolutionized the way art was created and viewed. The Renaissance also saw significant advancements in navigation and exploration, which paved the way for European expansion and colonization in the following centuries. These developments challenged the traditional authority of the church and aristocracy and gave rise to new ideas about individual freedom and the potential of human achievement.

The Space Race

The Space Race was a competition between the United States and the Soviet Union to be the first to explore outer space. It began in the late 1950s and continued until the early 1970s. The Space Race led to significant advancements in space technology, including the development of rockets, satellites, and space capsules. It also spurred advancements in computing, as NASA used computers to aid in space exploration. The Space Race had a profound impact on society, as it demonstrated the power and potential of science and technology to the world. It also led to the development of new industries, such as satellite communications and remote sensing. The Space Race fueled Cold War tensions and raised questions about the role of technology in the arms race between the United States and the Soviet Union.



The Industrial Revolution was a period of rapid industrialization that began in Britain during the late 18th century and spread throughout the world. It was characterized by the introduction of new machinery, steam power, and mass production techniques, which transformed the way goods were produced and consumed. The Industrial Revolution brought about significant social and economic changes, including the growth of urbanization and the rise of the middle class. It also led to the development of new transportation systems, such as the steam engine and railway, which greatly facilitated trade and communication. The Industrial Revolution marked the beginning of modern capitalism and paved the way for further technological advancements in the 19th and 20th centuries. The mass production of goods led to a significant increase in global trade and the emergence of consumer culture, while the working conditions in factories raised questions about the rights of workers and the impact of industrialization on society and the environment.

Modern Day

In the modern day, technological advancements have continued at an unprecedented pace. The development of the internet and mobile devices has transformed the way people communicate and access information. Social media has allowed for the widespread sharing of ideas and facilitated the growth of online communities. Advancements in robotics and artificial intelligence have the potential to revolutionize many industries, from manufacturing to healthcare. Renewable energy technologies, such as solar and wind power, have the potential to address climate change and reduce our dependence on fossil fuels. The rise of e-commerce has transformed the way people shop, while advances in transportation have made global travel faster and more accessible. The increasing use of big data and machine learning has led to new insights and innovations in fields such as healthcare, finance, and education. The rapid pace of technological change has also led to concerns about job displacement and the potential impact on society and the economy.



Patterns of Change in Technology

Doodle Revision Page or Sketch Notes
Include heading(s), short notes, keywords, timelines,
images (maps, drawings, diagrams) as needed

TECHNOLOGY IN ANCIENT TIMES

- **Agricultural Innovation:** The shift from hunter-gatherers to farmers during the **Neolithic period** marked the beginning of settled communities. **Domestication of animals** and cultivation of crops provided a stable food supply, allowing populations to grow and towns to form.
- **Metalworking:** The **Bronze Age** introduced metal tools and weapons, improving farming and **military technology**. Bronze, made by **smelting copper and tin**, enabled stronger tools like **ploughs**, and weapons such as **swords and spears**.
- **Military Technology:** Early warfare involved close combat weapons like **swords and shields**. To attack fortified cities, ancient armies developed **siege weapons** such as **catapults**.

TECHNOLOGY IN THE MIDDLE AGES

- **Agriculture:** The **three-field system** of crop rotation allowed medieval farmers to rotate crops while leaving one field fallow to recover nutrients, improving crop yields.
- **Manufacturing:** The invention of **blast furnaces** produced higher-quality iron, which could be cast into tools and weapons, advancing technology in agriculture and warfare.
- **Military Technology:** The Middle Ages saw the use of **steel** in weapons and armour, making them stronger and more durable. **Knights** used swords, lances, and steel plate armour in battle.

TECHNOLOGY DURING THE RENAISSANCE

- **Gunpowder:** Invented in **China** in the 800s and introduced to Europe by the 1300s, gunpowder revolutionised warfare. **Cannons** and **handheld guns** made traditional city walls and fortresses obsolete.
- **Printing Press (1455):** Invented by **Johannes Gutenberg**, the **movable type printing press** revolutionised communication by making books cheaper and easier to produce. This innovation helped spread new ideas, such as those of the **Renaissance** and **Reformation**.
- **Navigation Technology:** The **astrolabe**, **compass**, and improved **maps** allowed European sailors to navigate across oceans, leading to the **Age of Exploration** and European conquest of the Americas.

TECHNOLOGY IN INDUSTRIAL SOCIETY

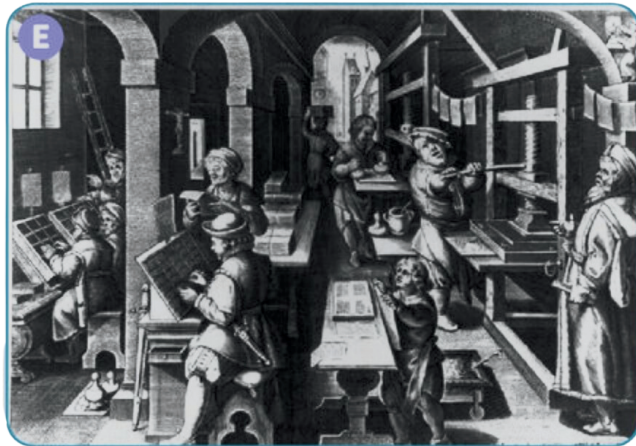
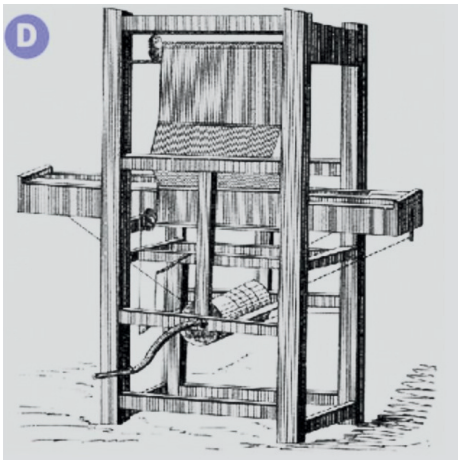
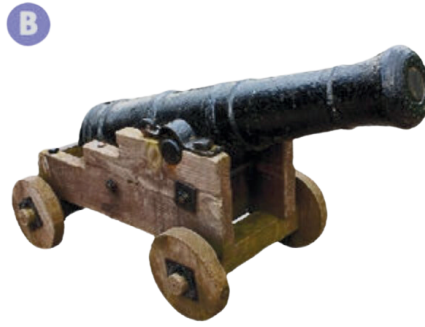
- **Agricultural Revolution:** Innovations like **crop rotation** (Norfolk system), **selective breeding**, and the **seed drill** improved food production. The **mechanical reaper** made harvesting faster and more efficient.
- **Steam Engine:** **James Watt's** improvements to the steam engine allowed it to power factories and transportation, including **trains** and **steamships**, driving the **Industrial Revolution**.
- **Manufacturing:** Factories using **steam-powered machines** increased the production of textiles and other goods, leading to the growth of cities and the expansion of industries.

TECHNOLOGY IN THE 20TH CENTURY

- **Internal Combustion Engine:** The invention of the **internal combustion engine** powered **automobiles**, **tractors**, and **electricity generation**, transforming transportation and industry.
- **World Wars and Technological Innovation:**
 - **World War I:** Introduced **tanks**, **airplanes**, and **chemical weapons** like **chlorine gas**.
 - **World War II:** Featured advancements in **radar**, **submarines**, and **machine guns**. The invention of the **atomic bomb** in 1945 marked a significant leap in military technology.
- **Telecommunications:** The development of the **telegraph**, **telephone**, **radio**, and **television** revolutionised communication, connecting people across vast distances and spreading information quickly.
- **Space Race:** The **US** and **Soviet Union** competed to achieve technological superiority in space. The **moon landing (1969)**, carried out by NASA's **Apollo 11**, symbolised the peak of this competition and advanced **satellite** and **computer technology**.

Ch. 33 - Patterns of Change (Technology)

Below are five of our most significant technological innovations. Examine them and answer the questions that follow.



- For three of the five technological innovations shown above, identify the contribution it made to human history.
- Based on your study, name one other technological innovation not shown above and explain how it impacted on human history.
- Explain how technological innovations have contributed to our study of the past.
- Identify a period of history that saw significant technological innovation and write an account of how technology impacted on that period.
- From your study, identify one pattern of change in technological innovation. Write an account of how that pattern of change impacted on at least two different periods in history. (You must select different periods from those discussed in the previous question).

Question 4

Answer the questions below which deal with the contribution of technological developments and innovation to historical change.

- (a) Name a technological development or innovation you studied as part of your Junior Cycle History course.

- (b) Give the date or time period during which this technological development or innovation occurred.

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- (c) In what area of life did this development or innovation bring about change? (e.g. agriculture, industry, transport, etc.)

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- (d) Give details about the technological development or innovation that you studied.

(e) Do you think this development or innovation in technology made people's lives better or worse? Tick (✓) **one** of the following.

Better

Worse

Explain your opinion.

Question 3

Answer the following questions which deal with technological advances in the 14th, 15th, 16th and 17th centuries.

(a) Number the events in the box below so that they are in the correct chronological order.

The earliest known European drawing of a cannon appeared in a manuscript by Walter de Milemete dated 1326.	
Johannes Gutenberg used a printing press to print an edition of the Bible in 1455; this Bible is the first complete surviving book printed in Europe.	
The Mercator projection map is a cylindrical map first created by Flemish geographer and cartographer Gerardus Mercator in 1569. It became the standard map for navigation.	
The compass came into use for navigation in the Mediterranean region in the late 1200s.	
The earliest existing record of a telescope is from a 1608 patent submitted to the government in the Netherlands by Middelburg spectacle maker Hans Lipperhey for a refracting telescope.	

(b) Explain the term 'chronology'.

(c) In what century did the compass come into use?



(d) Select **one** of the events from question (a) and identify **two** consequences of this technological advancement in history.

(e) Technological development has contributed to significant historical change. Select **one** example you have studied, other than those mentioned in (a) above, and explain why you think it is historically significant. You can choose any period in history to write about.

Technological development:
It is historically significant because:

