

## UNIT 29 FAMOUS SCIENTISTS

### THOMAS EDISON

He was an American. He was the inventor of the light bulb, the phonograph and the motion picture camera that lead to motion movies.

### LOUIS PASTEUR

He was born in France. He was the first to develop the germ theory that disease is caused by microorganisms like bacteria and virus entering the body. He was the first to develop immunization and vaccination techniques, that introducing a weak form of bacteria into the body would help the body produce defenses to kill the germ and become resistant to it. He produced the first vaccine for rabies. He also produced vaccines for small pox and anthrax.

He talked about the **Germ Theory** and that sterilization techniques prevent bacteria from entering the body and causing infection. He is considered one of the **founders of Modern Microbiology**. He developed the process of pasteurization and vaccines for rabies, anthrax.

### RACHEL CARSON

She was born in Pennsylvania, America, She was very interested in nature and writing. She became a marine biologist with the US fish and wild life service and wrote many books and articles. She documented in detail the effect of harmful pesticides, especially DDT, and their harmful effect and danger to the environment, marine life and wild life. This caused the government to review its pesticide policy and ban the use of DDT.

### EDWARD JENNER

He was an English doctor who pioneered vaccination. He discovered that inoculation with cowpox gave immunity to small pox. It was a huge medical breakthrough and saved many lives. This lead to vaccinations for small pox and in 1980, the WHO (World Health Organization) declared that small pox, a deadly disease previously, had been eradicated from the world.

## **GALILEO GALILEI**

He was born in Italy. He did a lot of work in astronomy and natural motion. Though he did not actually invent the telescope (Hans Lippershey did); he made many improvements to it. He is considered the inventor of the modern telescope which helped him study planets and discover that the Earth was not the center of the Universe as has previously been thought. He discovered that the planets revolved around the Sun. He faced an inquisition by the church for this and was called a heretic.

He also did experiments by dropping objects from the leaning Tower of Pisa and showed that the speed of a falling object is not proportional to its weight. He climbed to the top of the leaning tower and dropped a heavy weight and a light weight at the same time, and found that they reached the ground at the same time.

He also discovered the law of pendulum which helped in the development of clocks. He invented the thermometer and military compass.

**ISAAC NEWTON** - He was born in England. He is the one of the most influential scientists that ever lived and his achievements in mathematics, optics and physics laid the foundation for modern science. He invented the reflecting telescope.

Newton described universal gravitation; that every massive particle in the universe attracts every other massive particle with a force directly proportional to their masses, and inversely proportional to the square of the distance between them. He saw an apple fall from a tree to the ground and thought that there might be a connection between gravity and the way the Moon circled the Earth instead of flying into space. He was the first to explain and try to measure gravity.

He developed a theory of color, based on the observation that a prism splits white light into many colors of the visible spectrum.

He developed the Newton's three laws of motion.

1. **Newton's first law:** An object that isn't being pushed or pulled by a force either stays still or keeps moving in a straight line at constant speed. i.e. if you let go of a moving shopping cart, it keeps going in a straight line until it crashes into something.
2. **Newton's second law:** Forces make things accelerate. The bigger the force and the lighter the object, the greater the acceleration i.e. it is much easier to make a light weight racing bike speed up, than a ten-ton truck.
3. **Newton's third law:** Every action has an equal and opposite reaction i.e. when a rocket pushes burning gas out of its engine, the gas pushes back on the rocket and lifts it into space. Newton realized that forces (which he called actions) always happen in pairs.

## **MICHAEL FARADAY**

Michael Faraday was an English chemist and physicist. He is known for his experiments in electricity and magnetism. His major discoveries include electromagnetic induction, diamagnetism and electrolysis. The unit of capacitance called the **farad** is named in his honor.

In chemistry, Faraday studied chlorine and discovered two new compounds of chlorine and carbon. He invented an early form of the **Bunsen burner** used in laboratories. He discovered **benzene** which is used as an industrial solvent.

He described the **Faraday's laws of electrolysis**. (electrolysis is a method of using direct current DC to drive a chemical reaction that otherwise would not happen). This is important in the separation of elements from ores.

He discovered the principle of **electromagnetic induction**; that a magnetic field should be able to produce an electric current. (the production of electric current across a conductor moving through a magnetic field). This led to the development of generators, motors, dynamo and transformers. He is considered the inventor of the electric motor.

He also discovered **diamagnetism** (the property of an object to create a magnetic field in repulsion to an externally applied magnetic field). He discovered the **Faraday effect**, that an intense magnetic field can rotate the plane of polarized light. This was the first experiment that showed that light and electromagnetism are related.

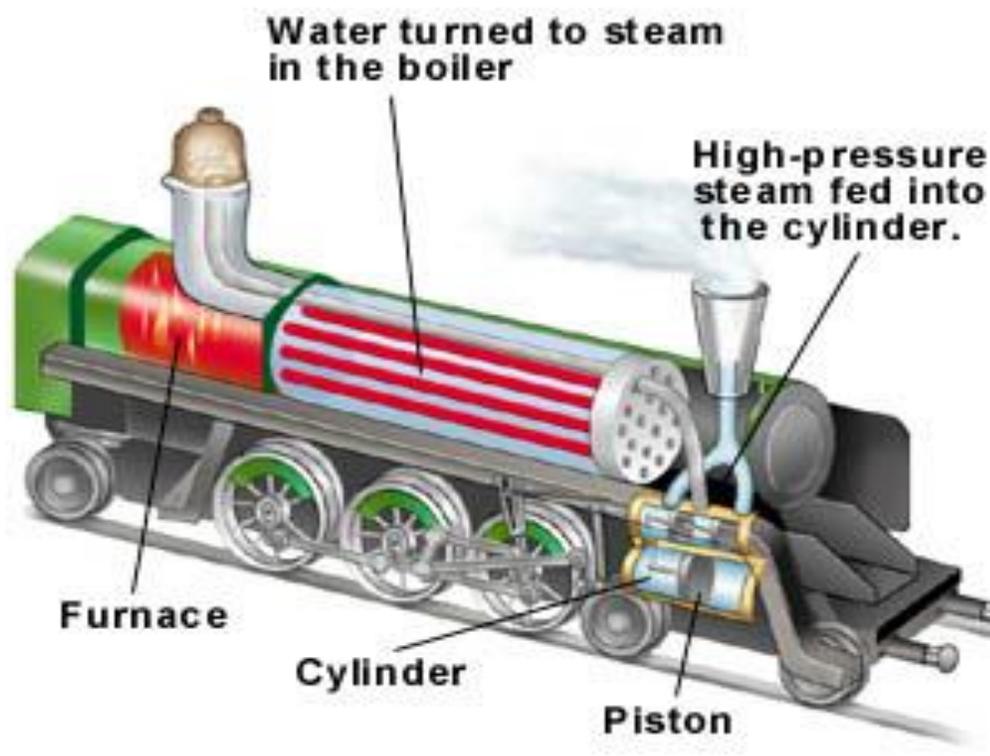
Michael Faraday made discoveries that made generating and using electricity much easier. He invented the electric motor that is used in most cars, fans, washing machines, hair dryers.

## JAMES WATT

James Watt was a Scottish inventor and engineer. **He is known for his improvements in steam engine technology and is the inventor of the modern steam engine.** A steam engine is an engine that uses the heat energy of steam under pressure, to generate power. Steam engines powered all early locomotives, steam boats and factories.

He was given a model of the Newcomen steam engine for repairs and began studying the history of the steam engine and the properties of steam. He realized that the design wasted a lot of energy. He designed a separate condensing chamber for the steam engine that prevented enormous losses of steam. This avoided waste of energy and improved the power, efficiency, and cost effectiveness of steam engines. Eventually he adapted the engine to produce rotary motion, and this increased its use to beyond, just pumping water. He also invented the rotary engine, the double action engine and the steam indicator, which records the steam pressure inside the engine.

A unit of measurement of electrical and mechanical power, called the **Watt** has been named in his honor. James Watt's improvement to the steam engine converted it to a machine that became the work horse of the Industrial Revolution. It made new types of industries possible and brought great social change, as people in villages moved to cities, to work in factories. It transformed the world from an agricultural society to an industrial one.



## ALEXANDER GRAHAM BELL

He was an inventor who invented the **telephone**. He also developed the **acoustic telegraph** (a machine that transmitted multiple telegraph messages at the same time, over a single telegraph wire, by using different audio frequencies or channels for each message). He also invented the **metal detector**.

He explained the principle of **hydrofoils** (it is a wing like structure that lifts the boat out of water during forward movement and reduces drag on it) **and hydroplanes**. (a hydroplane is a fast motor boat where the weight and speed of the boat is supported by the lift of the water)

## THE WRIGHT BROTHERS

The Wright Brothers Wilbur and Orville Wright flew the first plane with a pilot aboard in 1903 in Kitty Hawk, North Carolina. It was a historic achievement that marked the start of the aerial age and would define the 20th century.

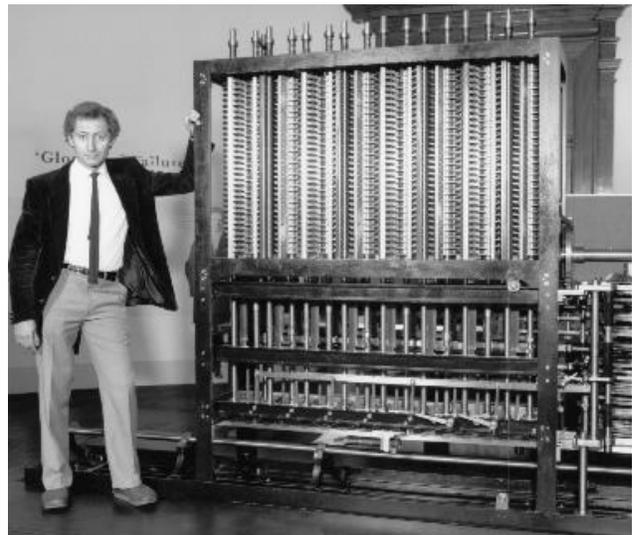
## GUGLIELMO MARCONI

He was an Italian inventor. He is considered the inventor of the **radio** and is known as the father of **long distance radio transmission**. He developed a radio telegraph system which used radio waves to transmit telegraph messages without connecting wires.

He also developed **Marconi's law**. This law is the relation between height of antennas (a device that converts electrical waves to radio waves), and maximum signaling distance. This law states that the maximum good signaling distance varies directly as the square of the height of the transmitting antenna. He was awarded the Nobel Prize in Physics in 1909.

## CHARLES BABBAGE

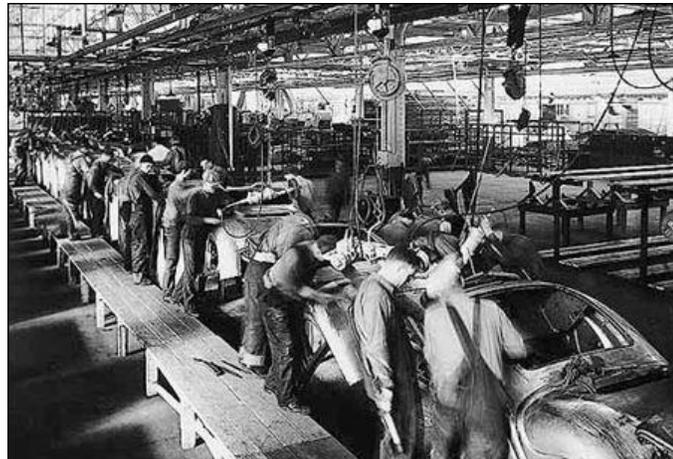
He was an English mathematician and engineer. He is the one who originated the concept of a programmable computer and is considered a "father of the computer"



## HENRY FORD

He was an American and the founder of the Ford Motor Company. He changed the way car manufacturing was done. He introduced the assembly line system for manufacturing cars. This began the Motor age and the car shifted from being a luxury item, to a method of essential transportation for the ordinary man.

Using a constantly moving assembly line, and division of labor, there was a huge gain in production of cars. More cars were made in less time. Workers remained in one place, adding one part to a car as it moved past them on a moving assembly line belt. Parts were delivered to the workers in a carefully timed way, to keep the assembly line moving efficiently. The introduction of the moving assembly line revolutionized car production by reducing the time required to produce a car. Cars became more readily available and cheaper to buy. This changed society. As more Americans owned cars, there was a growth of suburbs and a national highway system developed. A huge factory was built in Michigan and all the steps of car production, from refining the raw materials, to final assembly of the car, took place there, characterizing Henry Ford's idea of mass production. **He is responsible for the development of the assembly line technique of mass production.**



## **ENRICO FERMI**

He was an American physicist and is regarded as one of the leading scientists of the 20<sup>th</sup> century. He developed the **first nuclear reactor** Chicago Pile-1 and has been called the “father of the atomic bomb”. He was a great expert on neutrons and bombarded most of the elements in the periodic table with them, with the discovery of new radioactive particles.

He worked on **nuclear fission** (the splitting of the atom). He found that splitting the nucleus of the atom, released neutrons and an enormous amount of energy. He worked on emission of neutrons and the **first controlled nuclear chain reaction**. These principles were used to construct an atom bomb. He was a leader for the development of nuclear energy and the atomic bomb.

He is known for his contributions to nuclear and particle physics, and the development of the quantum theory. The 100<sup>th</sup> element of the periodic table Fermium is named after him.

## **BARBARA McCLINTOCK (1902-1992)**

She was an American scientist and one of the world’s most famous cytogeneticists. She pioneered the field of cytogenetics, a mix of cytology (cells) and genetics (genes and chromosomes). She did studies on maize and corn, and was able to identify maize chromosomes. She studies chromosomes and how they could change during reproduction of maize plants.

She linked regions of the chromosomes with physical traits. She demonstrated the areas of the chromosome that are important in the conservation of genetic information. She discovered transposition and jumping genes (that DNA can change its position in a cell) and showed how genes are responsible for turning physical characteristics on or off. For this, she got the Nobel Prize in 1983.

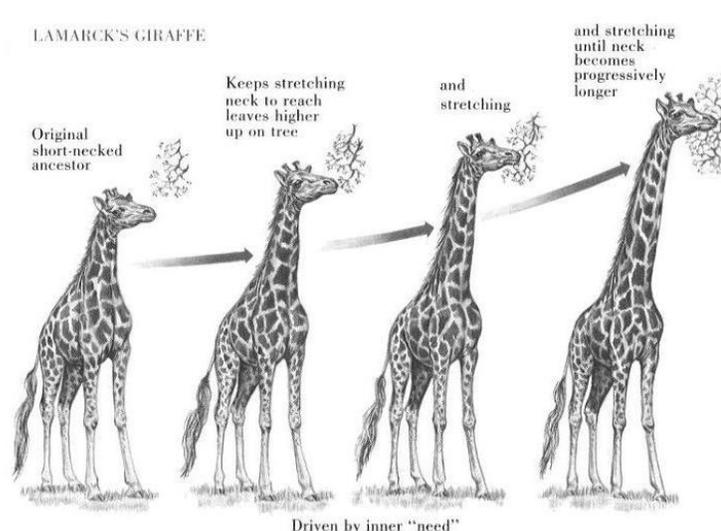
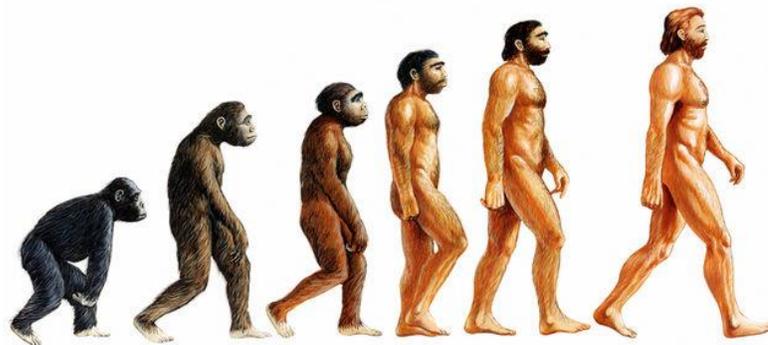
Barbara McClintock faced bias and her work was ignored because she was a woman working in sciences. She gained recognition for her work later and was honored and well respected. She serves as a role model for girls

## CHARLES DARWIN

Charles Darwin was an English naturalist. He laid the foundations of the theory of evolution and transformed the way we think about the natural world. During his time, people believed that God had created the world in 7 days as described by the Bible. However on a 5 year scientific voyage on the HMS Beagle, he read how fossils were evidence of animals and plants that had lived millions of years ago. The breakthrough in his ideas came in the Galapagos Islands near South America.

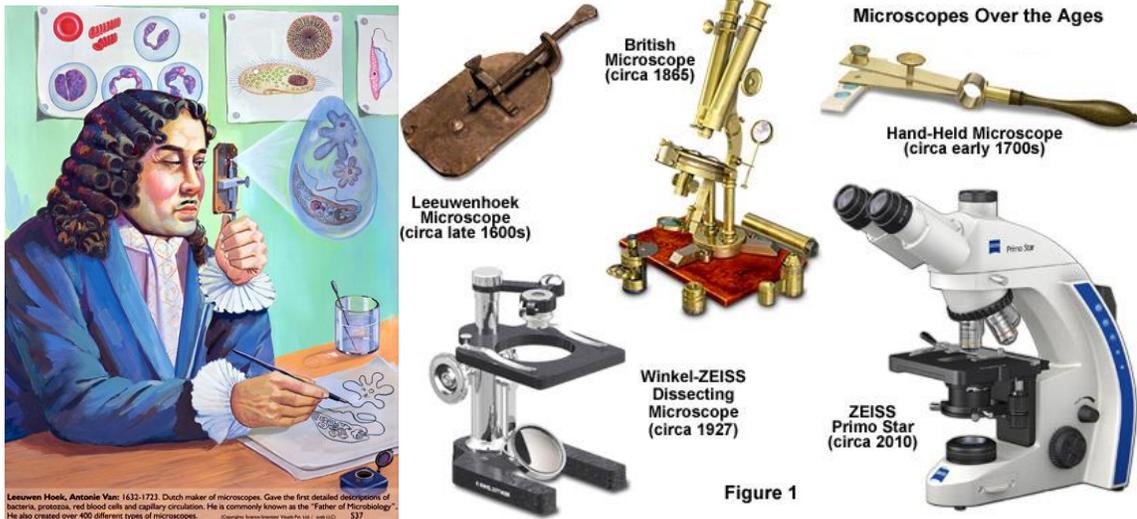
Based on his observations during his voyage, he described a **theory of evolution occurring by the process of natural selection**. He said that all species of life have descended over time, from common ancestors. The animals (or plants) that are best suited to the environment survive and reproduce. They pass on characteristics to their offspring in the form of little changes that help them adapt and survive. Gradually the species changes over time and new ones develop. Natural selection eliminates inferior species over time, since they cannot adapt. According to this theory, man had descended from animals (apes). The pathway of evolution from amoeba to man has been a slow and gradual one.

In 1859, he published "On the Origin of Species by Means of Natural Selection". The book was very controversial and widely attacked by the church. However, now in the modern world, his theory about evolution is widely accepted.



## ANTON VAN LEEUWENHOEK

He was from Holland and is considered the father of microscopy because of the advances he made in microscope design and use. He worked in a drapery store where magnifying glasses were used to inspect the quality of the cloth. He experimented and made lenses with curvatures that gave great magnification. With these lenses, he built microscopes and used them to examine bacteria, red blood cells, yeast, water samples and more. He made discoveries of single celled organisms and things that had never been viewed before. He is considered a father of microbiology and the inventor of the microscope.



## GEORGE WASHINGTON CARVER

He was a black American and a very famous name in American history. From a very early age, he was interested in plants and earned a degree in agriculture. America's economy was heavily dependent on agriculture and years of growing cotton and tobacco, had depleted the soil. Carver taught

- The practice of rotating crops to ensure that soil didn't wear out it's nutrient potential
- He directed the planting of peas, which took nitrogen from air and transferred it to soil, creating nitrate rich soil that was perfect for planting cotton and more.
- He did the same with peanuts, which were good at enriching the soil.

Peanut crop grew quickly and could be overwhelming; peanuts did not have much use. Carver did research and developed 300 products that used the peanut, like ink, shampoo, cosmetics, dyes, paints, plastics, paper, soap. He is the inventor of peanut butter. He then moved on to the sweet potato that grew in abundance and developed many products using the sweet potato, like flour, starch and artificial rubber. He worked on soya beans and pecans too. His imagination for using foods to make non food items made his name famous.

## **JANE GOODALL**

Jane Goodall was an English primatologist (a person who studies primates, which is a group of animals that includes human beings, apes, monkeys and others). It was felt that studies of the primate species which is most closely related to humans- chimpanzees, gorillas, orangutans- would shed light on human's ancestors.

She is considered to be the world's foremost expert on chimpanzees and is known for her 45 year study of wild chimpanzees in a national park in Africa. She studied animals in the wild, patient observations over long periods of time, both in social groups and individual animals. Her studies changed how chimpanzees (a kind of ape) are understood, but also how studies of many other animals are carried out.

She found that chimpanzees like humans, could use tools (wood sticks to dig termites out of the ground) and exhibited behavior like hugs, tickling, aggression, similar to human beings.

She used her knowledge to set limits on laboratory chimpanzees used to study diseases and tried to improve the conditions under which they were kept. She has received many honors for her environmental and humanitarian work.



## **JONAS SALK AND ALBERT SABIN**

Jonas Salk was an American medical researcher and virologist. He is known for his discovery and development of the first polio vaccine. Polio was an epidemic disease that killed many people and left many crippled or paralyzed. The vaccine that he developed was approved for public use in 1955 and reduced polio by 90%. Later the Albert Sabin oral polio virus (OPV) reduced the incidence even more. In 1963, Jonas Salk opened the Salk Institute for Biological Studies which is one of the world's most prestigious research facilities studying AIDS, Alzheimers disease, Parkinson's disease, and plant biology.