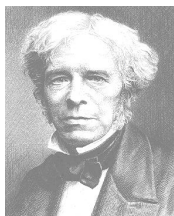


Michael Faraday



Outline

- Introduction
- Early life
- Research work
- Later years
- Influence
- Conclusion

Introduction

- One of the most marvelous scientists in the 19th century
- Rose from obscure origin
- Diligent and intelligent
- Became not only a great chemist, but also a renowned physicist
- Most influential breakthroughs were in electromagnetism

Early Life

- Born in Newington, England in 1791
- One of the four children in a working class family
- Only some basic education from a church school
- Had been apprenticed to a London bookbinder since 14
- Took the opportunity to read some of the books

Early Life (continued)

- Developed an interest in science
- Saved money to buy some apparatus for his first experiment
- Began to attend some lectures on science
- Decided to quit trade and pursue science at the end of his apprenticeship

Big Change

- Wrote to Sir Humphry Davy
 - Chemist at the Royal Institution
- Begged for a job and sent along with a bound volume of notes, which he had taken at Davy's lectures
- Impressed by the boy's zeal, Davy made Faraday his laboratory assistant in 1813



Big change (continued)

- Since then (21 year-old), drank in knowledge from Davy
- Finished his second apprenticeship in 1820
- Great accomplishment for a man who was almost completely self-educated originally

Early Research

- Mainly with chemical problems
- In 1820, produced C_2Cl_4 and C_2Cl_6
- In 1823, discovered a method of liquefying chlorine and other gases
- In 1825, successfully isolated a new compound, benzene

Influence

- Knowledge of electricity before Faraday
 - Static electricity (1600)
 - Leyden Jar (1746)
 - Voltaic Pile - DC (1800)
 - Early research on electrolysis (1806)
 - Nobody knew the incredible power that electricity could provide

Significant Breakthroughs in Electricity and Magnetics

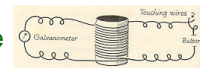
- Three important inventions
 - Motor (1821)
 - Transformer (1831)
 - Generator (1831)
- How could he make it?
 - Books, Lectures & Experiments
 - Inspiration + Originality

Invention of Motor

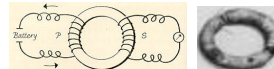
- Oersted discovered the deflection of a magnet upon an electric current flowed (1820)
- Inspired by Wollaston's idea of producing a reciprocal effect
- Successfully constructed a model in which a wire would rotate around a magnet (1821)

His Research on Current Induction

→ The first scheme

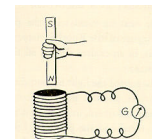
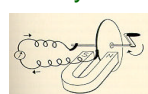


→ The second scheme (Transformer)



→ The third scheme (magnetic force line)

→ Disk dynamo



Other Contributions

- Stated law of electrolysis, linked chemistry and electricity (1833)
- Explained phenomenon of capacitance (1835)
- Discovered the Magnetization of light (1845)
 - Believed that magnetism and light are two forms of electromagnetic radiation
 - Was supported by Maxwell ten years later
 - Indirect result: the invention of radio

Later life

- Was given many honors, including:
 - An offer to become the president of the British Royal Society
 - An award of knighthood
 - However, a humble scientist as he was, he turned down those offers
- The declining mental powers in 1855
 - Ceased researching
 - Continued as a lecturer for another six years
- Died on August 26, 1867

Faraday's breakthroughs propelled our society to a new level of knowledge

- We use motor in thousands of applications: disk drive, video machine, fan, pump, washing machine, refrigerator, air conditioner...
- We need generator to produce electricity
- We need transformer for long-range electricity delivery and in some devices
- Those inventions compose the frame of our electric world

What if a Worldwide Blackout?

Passengers. would. be. trapped. in. the. subway. and. elevator
Doctors. would. have. troubles. to. operate. surgeries
Airports. would. not. be. able. to. regulate. the. airlines
Our. cities. would. fall. into. darkness. at. night
ALL. the. communications. would. be. interrupted.
no radio, no TV, no telephone, and no Internet
Manufactories. would. have. to. stop. production
Modern. farms. have. to. regress. to. the. state. of. using. plow

Conclusions

- A world without electricity is almost inconceivable to the modern mind
- The use of electricity completely permeates the modern world
- It is largely due to Faraday's ingenious creations

Michael Faraday Was

- A pioneering scientist and magnificent thinker
When his work led him to a field that he did not know much about, or even nobody knew much about, he made it his business to learn
- A man of character and integrity
He did not like to vaunt his fruitful breakthroughs, which greatly change our world
- Worth to be imitated by our students