

Philosophy of Engineering

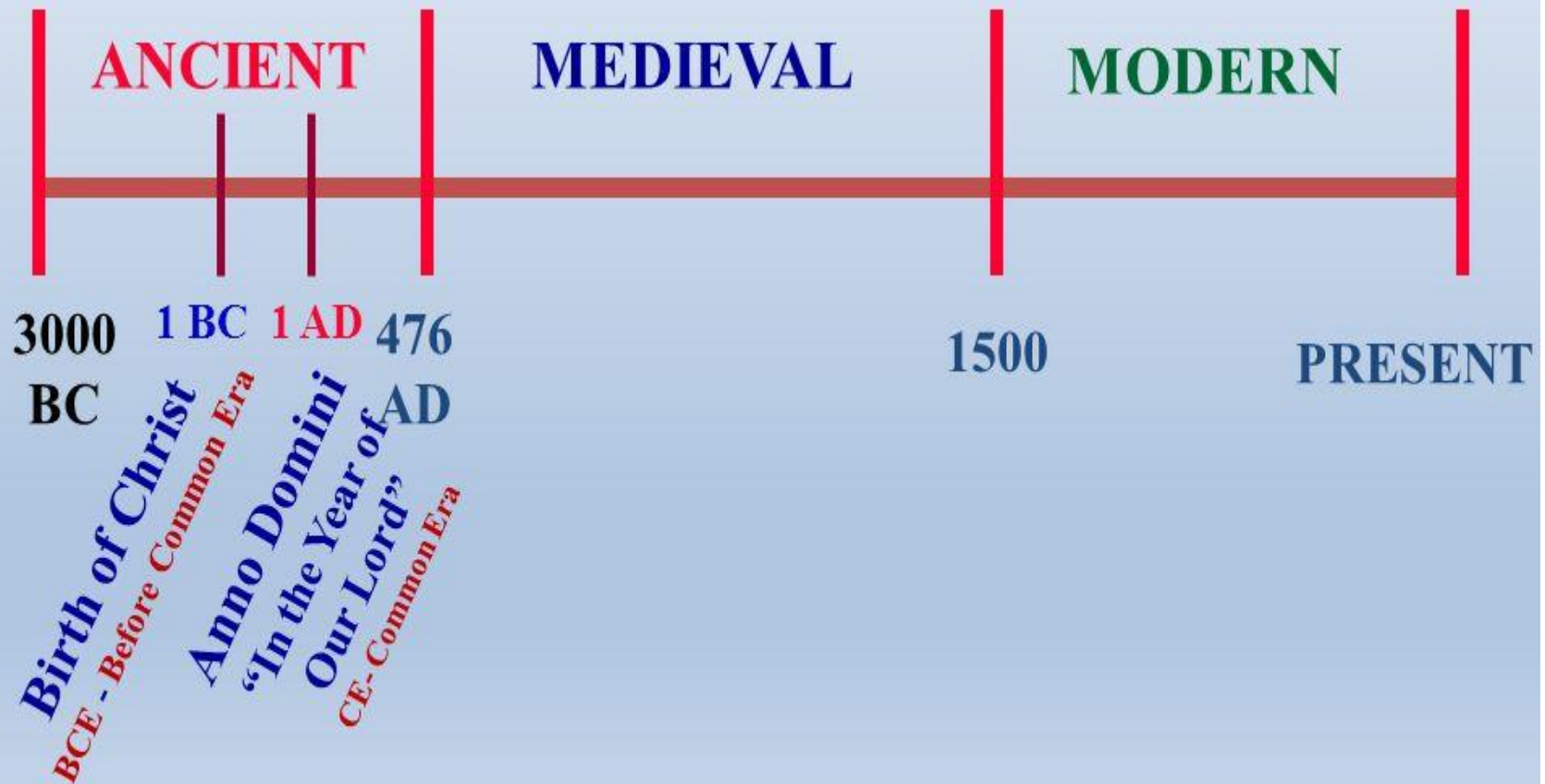


UNIT-I

Dr.A.Arunkumar
AP/Physics

HOW WE DIVIDE HISTORY

HISTORIC PERIOD



The Beginnings of Engineering: 6000 - 3000 B.C.

Early Achievement Progression in this Era

- People discovered methods of producing fire
- People discovered how to use rocks as tools
- People learn how to shape soft metals into tools
- Mixing different kinds of metals could make better tools

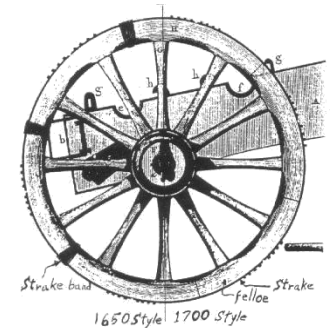


The Beginning of Engineering:

6000 - 3000 B.C.

Major Engineering Projects or Inventions

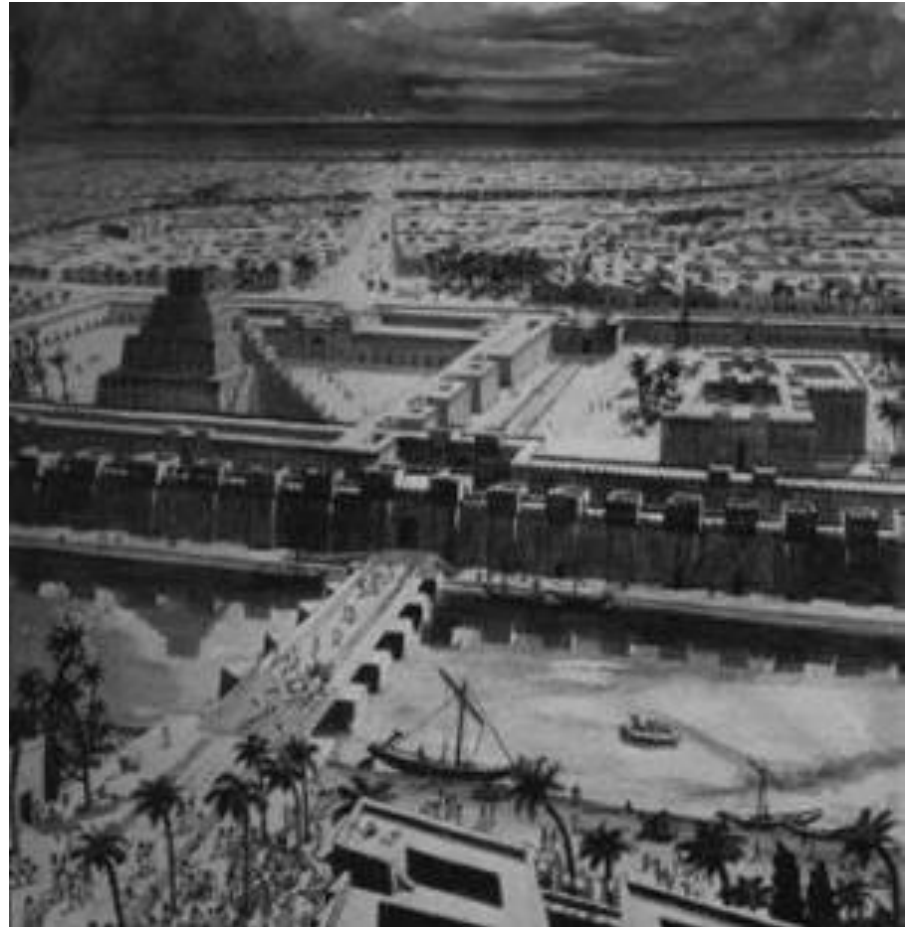
- Irrigation systems to promote crop growth
- Animal-, water-, and wind-driven machines
- The wheel and axle
- Plow & Yoke



Engineering in Early Civilizations: 3000 - 600 B.C.

- Babylonian engineers:

- Primitive arches used in moving water (hydraulics)
- Bridges were built with stone piers carrying wooden stringers



Engineering in Early Civilizations: 3000 - 600 B.C.

■ Egyptian Engineers

Pyramid Age - 2900 B.C and lasts 1000 years

2,300,000 building stones (2.5 tons each) used to build the Great Pyramid of Cheops, aka Khufu

Outstanding examples of engineering skills in land measurement and building layout - transit and level

Irrigation systems

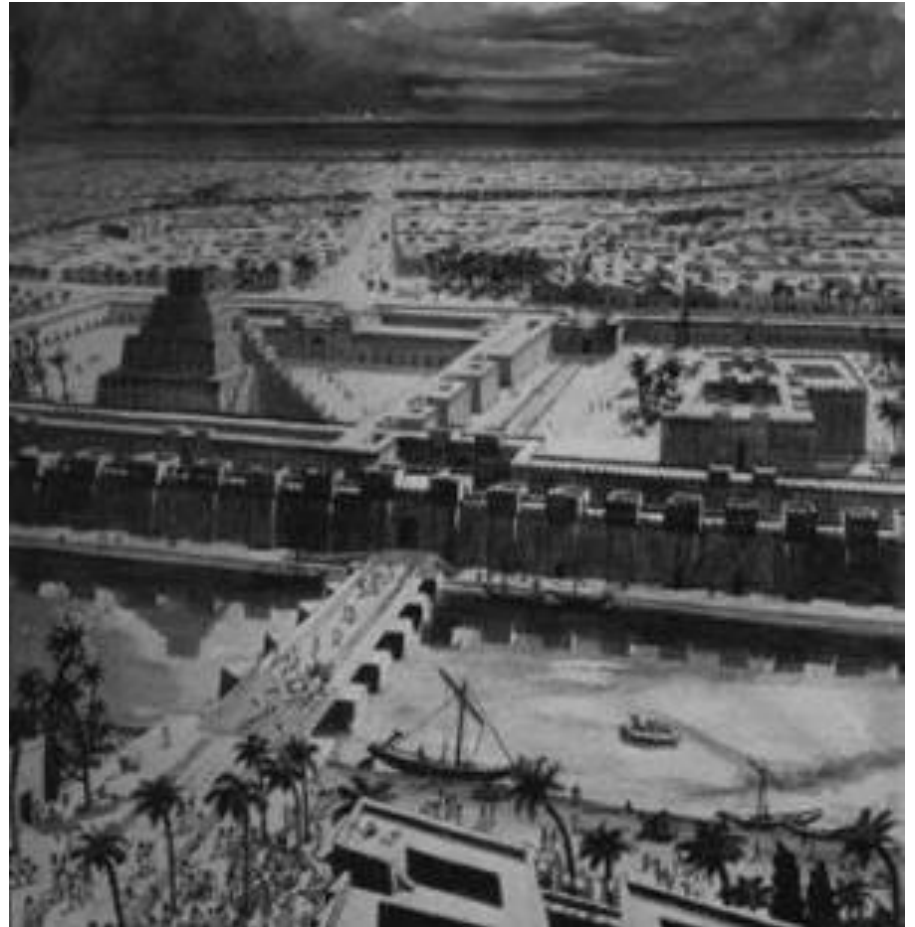


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Traveling Through the Ages

- I 200 B.C. – A.D. I
 - Quality of wrought iron an (iron alloy with a very low carbon content) is improved
 - Swords are mass produced
 - Siege towers are perfected
 - Greeks develop manufacturing
 - Archimedes introduces mathematics in Greece
 - Concrete is used for arched bridges, roads and aqueducts in Rome.

Traveling Through the Ages:A.D. 1-1000

- Chinese further develop the study of mathematics
- Gunpowder is perfected
- Abacus calculating machine introduced to Europe from the Orient
- Cotton and silk manufactured



Traveling Through the Ages: 1000-1400

- Silk and glass industries continue to grow
- Chimneys first appeared in European buildings
- Locks for canals were developed in Italy
- Spinning wheels developed to twist fiber into thread
- Leonardo Fibonacci, a medieval mathematician, writes the first Western text on algebra



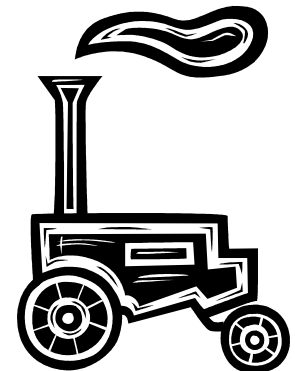
Traveling Through the Ages: 1400-1700

- First toilet is invented in England
- Galileo constructs a series of telescopes, with which he observes the rotation about the sun
- Engineers organized as a separate unit in the French army
- Isaac Newton constructs first reflecting telescopes
- Boyle's Gas Law, stating pressure varies inversely with volume, is first introduced.



Traveling Through the Ages: 1700-1800

- Industrial Revolution begins in Europe
- James Watt patents his first steam engine
- Society of Engineers, a professional engineering society, is formed in London
- First building made completely of cast iron built in England
- First mechanical loom created



Traveling Through the Ages: 1800-1875

- First railroad locomotive is designed and manufactured
- Italy's Volta developed the first battery
- Single wire telegraph line is developed
- Reinforced concrete is first used
- First synthetic plastic material is created
- First oil well drilled in Pennsylvania
- Typewriter is perfected
- There were 70 engineering schools in the US
- Compressed-air refrigeration plant built in Paris

Traveling Through the Ages: 1875-1925



- Telephone is patented in the US by Alexander Graham Bell
- Thomas Edison invents the light bulb and the phonograph
- Automobile introduced by Karl Benz
- Wright brothers complete first sustained flight
- Ford develops first diesel engines in tractors
- First commercial flight between Paris and London begins

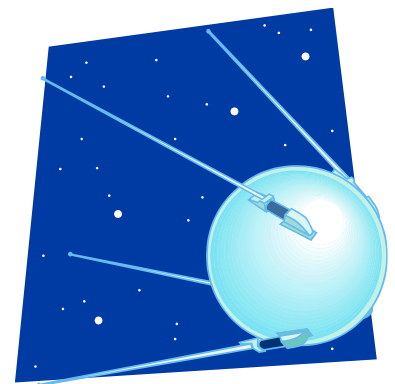
Traveling Through the Ages: 1925-1950

- John Logie Baird invents a primitive form of television
- First atomic bomb is used
- The transistor is invented



Traveling Through the Ages: 1950-1975

- Computers first introduced into the market, and are common by 1960
- Sputnik I, the first artificial satellite, put into space by USSR
- First communication satellite—Telstar—is put into space
- The U.S. completes the first ever moon landing



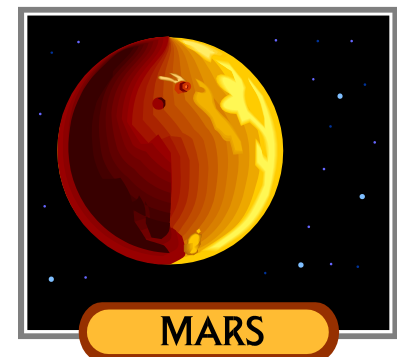
Traveling Through the Ages: 1975-1990

- The supersonic flight between Europe and the U.S.
- Columbia space shuttle space travel
- First artificial heart is successfully implanted



Traveling Through the Ages: 1990-2000

- Robots travel on Mars
- The “Channel Tunnel ” between England and France is finished
- GPS is used to predict and report weather conditions, as well as many other consumer applications

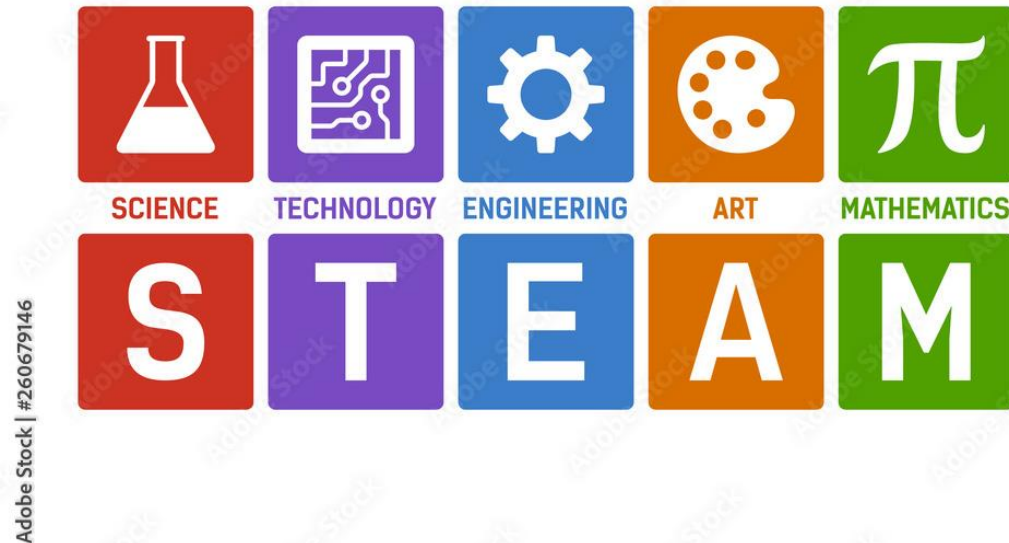




In Summary...

Every new innovation
builds on ideas of
previous innovations!

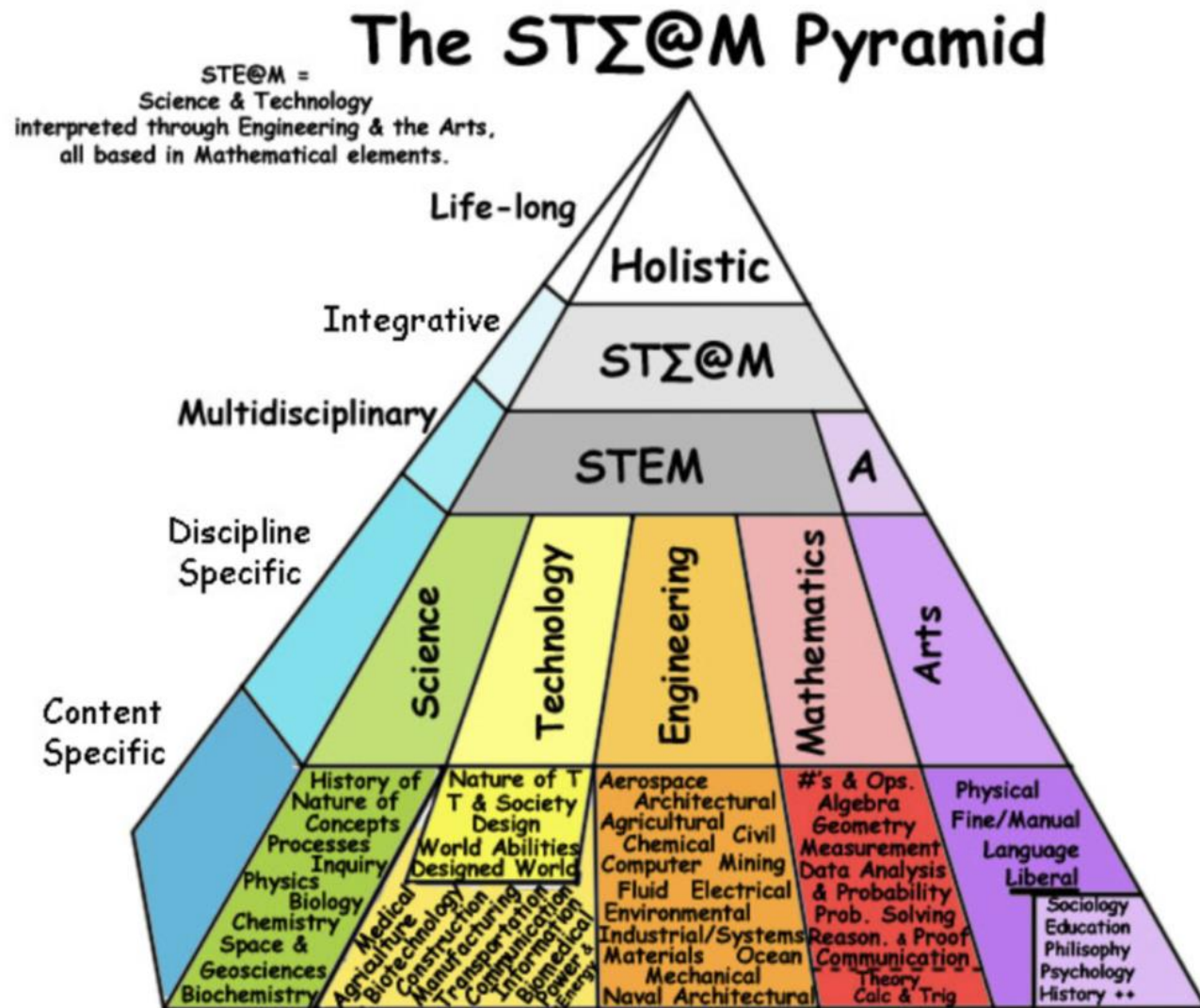
STEAM



STEM stands for Science, Technology, Engineering and Math. The initial STEM education pushed for advancements in technology, yet something started to become more apparent.

We can have lots of bots, but you can't code creativity or program imagination

STEAM pyramid



STEAM pyramid

- Science: problem selection, experimentation (using the Scientific Method)
- Technology: researching (using online libraries, web searches), communication (blogging, videoconferencing, emailing)
- Engineering: building or improving a design/model
- Art: writing, communications, poetry, video presentations, creating models
- Mathematics: collecting data, analyzing data outcomes, performing geometry problems



STEAM Education Outreach

- The STEAM framework and research help educators, businesses, research facilities, and society use similar processes by which to help keep the curriculum relevant in the digital age.
- STEAM Education helps organize a shared bank of lesson plans co-created by contributors from over 30 countries and all 50 states to try and address the commons of global education for adaptation to regional goals and interests.



Relation between Arts, Mathematics, Science, Technology and Engineering

- Functions of Art
 - **Non-motivated functions**
 - **Motivated functions**

Non-motivated functions

- **Basic human instinct for harmony, balance, rhythm.**

Art at this level is not an action or an object, but an internal appreciation of balance and harmony (beauty), and therefore an aspect of being human beyond utility.

- **Experience of the mysterious.**

Art provides a way to experience one's self in relation to the universe. This experience may often come unmotivated, as one appreciates art, music or poetry.

- **Expression of the imagination.**

Art provides a means to express the imagination in non-grammatical ways that are not tied to the formality of spoken or written language. Unlike words, which come in sequences and each of which have a definite meaning, art provides a range of forms, symbols and ideas with meanings that are malleable.

- **Rituals and symbolic functions.**

In many cultures, art is used in rituals, performances and dances as a decoration or symbol. While these often have no specific utilitarian (motivated) purpose, anthropologists know that they often serve a purpose at the level of meaning within a particular culture. This meaning is not furnished by any one individual, but is often the result of many generations of change, and of a cosmological relationship within the culture.

Motivated functions

- **Communication.**
- **Art as entertainment**
- **Art as a "free zone"**
- **Art for social causes.**
- **Art for psychological and healing purposes.**
- **Art as a fitness indicator.**

Science, engineering, and technology

- Science is systematic knowledge of the physical or material world gained through observation and experimentation.
- Engineering is the goal-oriented process of designing and making tools and systems to exploit natural phenomena for practical human means, often (but not always) using results and techniques from science.
- Technology is often a consequence of science and engineering, although technology as a human activity precedes the two fields.

Desired Attributes of an Engineer

- 1. Teamwork
- 2. Continuous learning
- 3. Creativity
- 4. Problem solving
- 5. Analytical ability
- 6. Communication skills
- 7. Logical thinking
- 8. Attention to detail
- 9. Mathematical ability
- 10. Leadership