

Lecture 4: Enlightenment Chemistry and Physics

1. Introduction

- Complex legacies of French Revolution
- The nature of matter and light

2. Background

- Aristotelian chemistry: earth, air, fire, water
- Early modern alchemists: mercury, sulfur, salt
- Boyle's studies of combustion and alchemy
- Mining, metallurgy, and chemistry
- George Stahl, phlogiston theory

3. Pneumatic chemistry

- Joseph Black, fixed air (CO_2)
- Henry Cavendish, inflammable air (H_2)
- Joseph Priestley, vital air (O_2)
- Air and water are complex materials

4. Lavoisier and the Chemical Revolution

- Instruments and experiments
- Combustion: metals increase in weight
- Recognition of role of oxygen
- Parallels of combustion and respiration
- Lavoisier's new chemical terminology
- Tax farming and execution

5. Science and French Revolution

- Guillotine: humanitarian science
- École polytechnique
- Metric system
- Laplace: Napoleonic patronage and influence
- Laplacian physics: expanding Newtonian physics

6. Wave Theory of Light

- Traditional theories of light
- Newton's prisms and corpuscular theory
- Thomas Young, interference patterns
- Augustin Fresnel, diffraction
- First major break from Newtonian physics

Further Reading:

- Trevor Levere, *Transforming Matter: A History of Chemistry from Alchemy to the Buckyball*, 2001.

Names and Dates:

George Stahl (c. 1660-1734)

Phlogiston

Joseph Black (1728-1799)

Joseph Priestley (1733-1804)

Henry Cavendish (1731-1810)

Antoine Laurent Lavoisier (1743-1794), *Elements of Chemistry*, 1785

Pierre-Simon Laplace (1749-1827)

French Revolution

Ecole Polytechnique, 1794

Institut de France, 1795

Thomas Young (1773-1829)

Double-slit experiments

Augustin Fresnel (1788-1827)