

# Heat Happens: Thermodynamics in Daily Life

## 04-GS-ING-001

**Johannes Kiefer**

Technische Thermodynamik  
Universität Bremen  
e-mail: [jkiefer@uni-bremen.de](mailto:jkiefer@uni-bremen.de)

**Heike Glade**

Technische Thermodynamik  
Universität Bremen  
e-mail: [heike.glade@uni-bremen.de](mailto:heike.glade@uni-bremen.de)



# History of Thermodynamics

## 17<sup>th</sup> Century

- **Sir Isaac Newton (1643-1727, England; law of cooling)**
- **Robert Boyle (1627-1692, Ireland/England; ideal gas)**
- **Edme Mariotte (~1620-1684, France, ideal gas)**
- **Guillaume Amontons (1663-1705, France; ideal gas, hypothesis abs. zero)**



# History of Thermodynamics

## 18<sup>th</sup> Century

- **Joseph Louis Gay-Lussac (1778-1850, France; ideal gas, electrolysis)**
- **Jacques Charles (1746-1823, France; ideal gas)**
- **Joseph Black (1728-1799, France/Scotland; latent heat)**
- **Benjamin Thomson (Count Rumford, 1753-1814, USA/UK, heat, 1<sup>st</sup> law)**
- **Jean Baptiste Joseph Fourier (1768-1830; France, heat conduction)**
- **James Watt (1736-1819, Scotland; steam engine)**



# History of Thermodynamics

## 19<sup>th</sup> Century

- **Amadeo Avogadro (1776-1856, Italy; ideal gas, specific heat)**
- **Sadi Carnot (1796-1832, France; heat engine)**
- **Rudolph Clausius (1822-1888, Germany, entropy, 2<sup>nd</sup> law)**
- **Henri Victor Regnault (1810-1878, France, gas laws)**
- **James Clerk Maxwell (1831-1879, Scotland, Maxwell equations, kinetic gas theory)**
- **Ludwig Boltzmann (1844-1906, Austria; statistical thermodynamics)**
- **Lames Prescott Joule (1818-1889, England; heat effects, engines)**
- **Josef Stefan (1835-1893, Austria; radiative heat transfer)**
- **William John Macquorn Rankine (1820-1872, Scotland; energy, theory of steam engine)**



# History of Thermodynamics

## 19<sup>th</sup> Century

- **William Thomson (Lord Kelvin, 1824-1907, Ireland/Scotland, heat, temperature)**
- **James Thomson (1822-1892, Ireland/Scotland, pressure dependence freezing point)**
- **Rudolph Diesel (1858-1913, Germany; diesel engine)**
- **August Otto (1832-1891), Germany; Otto engine)**
- **Robert Stirling (1790-1878; Scotland; Stirling engine)**
- **Carl von Linde (1842-1934; Germany; refrigeration, gas liquification)**
- **Jacob Perkins (1766-1849; USA/England, heat pump)**



# History of Thermodynamics

## 20<sup>th</sup> Century

- **Max Planck (1858-1947, Germany; radiative heat transfer)**



# System & state

## Types of system

- **Closed system**
- **Open system**
- **Isolated system**
- **Adiabatic system**



# State Functions & Energy

- **Volume**
- **Mass / Number of moles**
- **Temperature**
- **Pressure**
  
- **Kinetic Energy**
- **Potential Energy**
- **Internal Energy**
- **Heat**
- **Work**