NOW TRY IN ENGLISH CLIL

Thermodynamics

Thermodynamics (from the Greek thermos meaning heat and dynamis meaning power) is a branch of physics that studies the effects of changes in temperature, pressure, and volume on physical systems at the macroscopic scale by analyzing the collective motion of their particles using statistics.

Roughly, heat means «energy in transit» and dynamics relates to «movement»; thus, in essence thermodynamics studies the movement of energy and how energy instills movement. Historically, thermodynamics developed out of the need to increase the efficiency of early steam engines.

The starting point for most thermodynamic considerations are the laws of thermodynamics, which postulate that energy can be exchanged between physical systems as heat or work. They also postulate the existence of a quantity named entropy, which can be defined for any system. In thermodynamics, interactions between large ensembles of objects are studied and categorized. Central to this are the concepts of system and surroundings (ambiente). A system is composed of particles, whose average (media) motions define its properties, which in turn are related to one another through equations of state. Properties can be combined to express internal energy and thermodynamic potentials are useful for determining conditions for equilibrium and spontaneous processes.

With these tools, thermodynamics describes how systems respond to changes in their surroundings. This can be applied to a wide variety of topics in science and engineering, such as engines, phase transitions, chemical reactions, transport phenomena, and even black holes. The results of thermodynamics are essential for other fields of physics and for chemistry, chemical engineering, cell biology, biomedical engineering, and materials science.

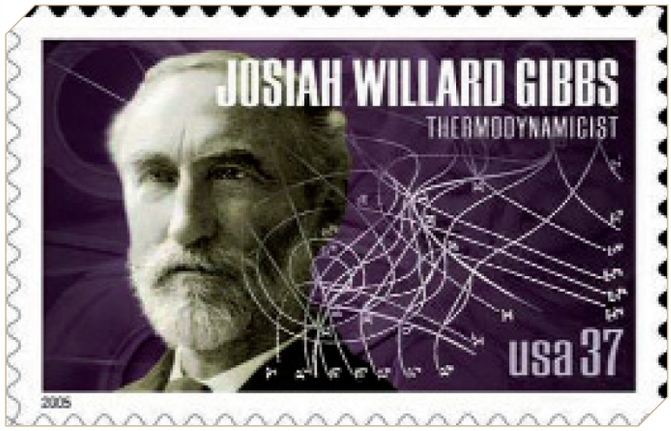
History

A short history of thermodynamics begins with the British physicist and chemist Robert Boyle. In 1656, in coordination with English scientist Robert Hooke, invented the air pump. Using this pump, Boyle and Hooke noticed the pressure-temperature-volume correlation. In time, the ideal gas law was formulated.

Later designs implemented a steam release valve to keep the machine from exploding. By watching the valve rhythmically move up and down, Papin conceived of the idea of a piston and cylinder engine. In 1697, based on Papin's designs, engineer Thomas Savery built the first engine. These early engines being crude and inefficient attracted the attention of the leading scientists of the time. One such scientist was Sadi Carnot, the «father of thermodynamics», who in 1824 published «**Reflections on the Motive Power of Fire**», a discourse on heat, power, and engine efficiency. This marks the start of thermodynamics as a modern science.

(Adapted from Wikipedia)

Josiah Willard Gibb's biography



Josiah Wilard Gibbd raffigurato in un francobollo commemorativo del 2005, negli USA.

Gibbs was born in New Haven, Connecticut, February 11, 1839. Gibbs attended the Hopkins School and Yale College, graduating in 1858 very high in his class and receiving prizes in mathematics and Latin. Gibbs obtained the first Ph.D. degree in engineering in the USA, 1863. He then tutored in Yale College: two years in Latin and a year in what was then called natural philosophy. In 1866 he went to Europe to study, spending one year each at Paris, Berlin, and Heidelberg, where he was influenced by the luminaries Kirchhoff and Helmholtz. Germany was then the leading nation in chemistry, thermodynamics, and theoretical natural science in general. These three years account for nearly all of his life spent outside of New Haven. Gibbs was the founder of Chemical Thermodynamics.

In 1869 he returned to Yale and was appointed Professor of Mathematical Physics in 1871.

Gibbs then turned to the development and presentation of his theory of thermodynamics. In 1873, Gibbs published a paper on the geometric representation of thermodynamic quantities. This paper inspired Maxwell to make (with his own hands) a plaster cast illustrating Gibbs' construct which he then sent to Gibbs. Yale proudly owns it to this day.

Information about the names and careers of Gibbs's Yale students is not readily available. He strongly influenced the education of the economist Irving Fisher. Gibbs died in New Haven, April 28, 1903.

(Adapted from Wikipedia)

Thermodynamics quantity

Pressione	Pressure	P
Energia interna	Internal energy	U
Temperatura	Temperature	T
Entropia	Entropy	S
Energia libera di Helmholtz	Helmholtz free energy	$\Delta A = \Delta U - T\Delta S$
Entalpia	Enthalpy	$\Delta H = \Delta U + P\Delta V$
Energia libera di Gibbs	Gibbs free energy	$\Delta G = \Delta H - T\Delta S$

Activities

Match the words in table A with the English equivalent in table B. Use a dictionary if needed.

Table A

A	Calore
B	Lavoro
C	Calorimetro
D	Cinetica
E	Reagente
F	Prodotto
G	Esotermico
H	Endotermico
I	Catalisi
J	Catalizzatore
K	Equilibrio
L	Concentrazione
M	Molarità
N	Molalità
O	Normalità
P	Percentuale
Q	Costante
R	Pressione
S	Volume
T	Temperatura

Table B

1	Ratio
2	Product
3	Molality
4	Kinetics
5	Pressure
6	Endothermic
7	Molarity
8	Calorimeter
9	Temperature
10	Catalyst
11	Equilibrium
12	Heat
13	Constant
14	Exothermic
15	Normality
16	Reactant
17	Volume
18	Catalysis
19	Concentration
20	Work

Keys

Match the words in table A with the English equivalent in table B. Use a dictionary if needed.

Table A	Table B
A	12
B	20
C	8
D	4
E	16
F	2
G	14
H	6
I	18
J	10
K	11
L	19
M	7
N	3
O	15
P	1
Q	13
R	5
S	17
T	9