Heat

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Energy that is in transit, but unassociated with matter, and that results from a temperature difference between the source from which the energy is coming and the sink toward which the energy is going. For the purposes of thermodynamics, it is convenient to define all energy while in transit as either heat or work. Energy is not called heat before it starts to flow or after it has ceased to flow. A hot object does contain energy, but calling this energy heat as it resides in the hot object can lead to widespread confusion. *See also:* ENERGY; INTERNAL ENERGY.

Heat flow is a result of a potential difference between the source and sink which is called temperature. Work is energy in transit as a result of a difference in any other potential such as height. Work may be thought of as that which can be completely used for lifting weights. Heat differs from work, the other type of energy in transit, in that its conversion to work is limited by the fundamental second law of thermodynamics, or Carnot efficiency. This natural law is that the fraction of the heat Q convertible to work is determined by the relation $dW = Q(dT/T)$ for processes where the source and sink are differentially different in temperature, or by the relation $dW = dQ(T_1 - T_2)/T_1$ where the source (at T_1) and the sink (at T_2) differ by a finite temperature interval. *See also:* WORK.

For the above relations to be valid, temperature must be expressed on a thermodynamic temperature scale. Conversely, any temperature scale for which the above relations are valid, irrespective of the substance or material under investigation, is a thermodynamic temperature scale. The perfect gas law defines a scale in which the temperature is proportional to the thermodynamic temperature. In order to make the two scales be identical, the triple point of water (temperature and pressure at which ice, water, and vapor are in equilibrium) is defined to be at 273.16 kelvins on both the ideal-gas and the thermodynamic scales. *See also:* TEMPERATURE; THERMODYNAMIC PRINCIPLES.

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