Article on Temperature and Temperature Scales

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It can easily be demonstrated as follows: When two objects of the same material are placed together, the object with higher temperature cools while the cooler object gets warmer until a point is reached after which no more changes occurs.

THERMAL EQUILIBRIUM

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Therefore, now we can say that Temperature is that quantity which is same for both the system when they are in thermal equilibrium.

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This law can be restated as follows:

If there are three or more than three systems which when taken together are in thermal contact and in thermal equilibrium as well, then any of the two system taken together are in equilibrium with one another.

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In 1641, the first sealed thermometer that used liquid rather than air as the thermometric medium was developed for Ferdinand II, Grand Duke of Tuscany. His thermometer used a sealed alcohol-in-glass device, with 50 "degree" marks on its stem but no "fixed point" was used to zero the scale. These were referred to as "spirit" thermometers.

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It was in 1724 that Gabriel Fahrenheit, an instrument maker of Däanzig and Amsterdam, used mercury as the thermometric liquid. Mercury's thermal expansion is large and fairly uniform, it does not stick to the glass, and it remains a liquid over a wide range of temperatures. Its silvery appearance makes it easy to read.

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On this scale, Fahrenheit measured the boiling point of water to be 212. Later he adjusted the freezing point of water to 32 so that the interval between the boiling and freezing points of water could be represented by the more rational number 180.

Temperatures measured on this scale are designated as degrees Fahrenheit (°F). In 1745, Carolus Linnaeus of Upsula, Sweden, described a scale in which the freezing point of water was zero, and the boiling point 100, making it a centigrade (one hundred steps) scale each step was called "degree". Anders Celsius (1701-1744) used the reverse scale in which 100 represented the freezing point and zero the boiling point of water, still, of course, with 100 degrees between the two fixed points.

In 1948 use of the Centigrade scale was dropped in favor of a new scale using degrees Celsius (° C). The Celsius scale is defined by the following two items that will be discussed later in this essay:

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On the Celsius scale the boiling point of water at standard atmospheric pressure is 99.975 C in contrast to the 100 degrees defined by the Centigrade scale.

To convert from Celsius to Fahrenheit: multiply by 1.8 and add 32. $°F = 1.8°C + 32$ $°K = °C + 273$.

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In a constant volume gas thermometer a large bulb B of gas, hydrogen for example, under a set pressure connects with a mercury-filled "manometer" by means of a tube of very small volume. (The Bulb B is the temperature-sensing portion and should contain almost all of the hydrogen). Raising or lowering the mercury reservoir R may adjust the level of mercury at C. The pressure of the hydrogen gas, which is the "x" variable in the linear relation with temperature, is the difference between the levels D and C plus the pressure above D. P.

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This temperature is called the thermodynamic temperature and is now accepted as the fundamental measure of temperature. Note that there is a naturally defined zero on this scale - it is the point at which the pressure of an ideal gas is zero, making the temperature also zero. With this as one point on the scale, only one other fixed point need be defined.

In 1933, the International Committee of Weights and Measures adopted this fixed point as the triple point of water, the temperature at which water, ice, and water vapor coexist in equilibrium); its value is set as 273.16. The unit of temperature on this scale is called the Kelvin, after Lord Kelvin (William Thompson), 1824-1907, and its symbol is K (no degree symbol used).

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TEMPSENS
INSTRUMENTS

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EQUALIBIRIUM STATE	t_{90}/K	$t_{90}/°C$
Triple point of hydrogen	13.8033	-259.3467
Boiling point of hydrogen at pressure of 33321.3Pa	17.035	-256.115
Boiling point of hydrogen at pressure of 101292Pa	20.27	-252.88
Triple point of neon	24.5561	-248.5939
Triple point of oxygen	54.3584	-218.7916
Triple point of argon	83.8058	-189.3442
Triple point of mercury	234.3156	-38.8344
Triple point of water	273.16	0.01
Melting point of gallium	302.9146	29.7646
Freezing point of indium	429.7485	156.5985
Freezing point of tin	505.078	231.928
Freezing point of zinc	692.677	419.527
Freezing point of aluminium	933.473	660.323
Freezing point of silver	1234.93	961.78
Freezing point of gold	1337.33	1064.18
Freezing point of copper	1357.77	1084.62