Temperature below Zero Kelvin

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Abstract

Thermal activity is caused in a temperature differential. We use different relative temperature scales to measure the thermal state of matter. We make use different zero settings of different temperature scales basing upon different isothermal state corresponding to change of state of matter on the surface of the earth such as the melting point of water as zero degree Celsius and 0° F as the temperature at which a brine made of 50% salt and 50% ice melts. The melting temperature of water or the melting temperature of brine can vary in space and on other celestial bodies due to differences in atmospheric pressure. The Kelvin scale, a thermodynamic temperature scale, came into existence when William Thomson (later Lord Kelvin) proposed an absolute temperature scale based on the Carnot-cycle. This scale, which starts at absolute zero (0 K, equivalent to -273.15°C), provides a more fundamental and scientifically useful way to measure temperature. In absolute (Kelvin) scale, temperature below 0 (K) is not feasible as it is the lowest temperature. The absolute temperature is not arbitrary but supported by the thermodynamic phenomenon. The extra-nuclear space structure of the sun goes on decreasing outwardly reaching a value close to -273°C or 0 (K) at its boundary as revealed from the temperatures of planets. Any experiment carried out in the solar system is essentially within a confined system with a fixed boundary temperature of 0 (K). The Kelvin temperature becomes a parameter in thermodynamic laws. If the boundary temperature of the extra-nuclear space structure of another star is minus 100 K then the thermodynamic absolute temperature for the other star would be (K+100). Assuming the drop-in temperature of the extra-nuclear space structure of the galaxy has the similar trend as that of the sun, the boundary temperature of extra-nuclear space structure of stars located towards the boundary of the galaxy would be lower than that of the sun i.e. lower than 0 (K). Thus, the so-called absolute temperature is only another relative temperature. The paper discusses all aspects of so-called absolute temperature.

Key Words: *Thermal activity, Absolute temperature, Relative temperature,Temperature differential, Zero Kelvin, Extra-nuclear space.*

Discussion

Temperature refers to thermal state of matter. We are able to know the thermal state of a body because the hot body emits photons at higher energy levels which is a function of the energy state of the body. The energy level of a photon is a function of photonic charge potential (non-electric charge potential) which in turn is a function of mass-space structure of the photon [1]. Photons are particles of matter in the micro-micro domain having mass in photonic mass units & charge in photonic charge units and they have rest existence in solid, liquid, gas and space as space matter particles [2]. Like the extra nuclear space structure of the celestial body in macro scale atomic particles in micro scale the light particles and field forming particles (photons) have extra nuclear space structure in micro-micro domain scale. If the mass-space ratio of a photon at rest is the same as that of the matter in its surrounding, then the charge state of the photon is zero. But the zero charge of a photon becomes charge active with different photonic charge potential relative to the charge state of the new local condition [3]. Thus, the mass-space structures of photons in local equilibrium (at rest) are different at different locations in the structure of the universe. In the new atomic model, the energy levels of photons (space matter particles) in the extra-nuclear space structure of atoms, decreases towards the boundary [4]. We also know the temperature of the extra-nuclear space structure of the sun decreases towards the boundary of the solar system which is revealed from the temperature profile of planets of the Sun. It is natural to think that a similar phenomenon occurs in the like manner, the temperature of the extra-nuclear space structure of a galaxy to go in decreasing order towards the boundary of the galactic system. The temperature gradient of the extra nuclear space structure of the galaxy can be visualized from the temperature of stars located at different distances from the nucleus. A star with it's in the extra nuclear space structure and orbiting within the space fluid of the galaxy attains the surrounding temperature of the space fluid at the boundary of extra nuclear space structure of the star. For all thermodynamics processes within the solar system, the boundary temperature of the extra-nuclear space structure of the sun is an active parameter. We notice the temperature at the boundary of solar extra-nuclear space structure approaches zero K. Thus, it is no wonder if we find the temperature below zero K at the boundary of the galaxy.

The thermodynamic events, in an earthly environment, reveal that there is a definite correlation among pressure, volume and temperature. The temperature factor in the said correlation is neither Celsius nor Fahrenheit but refers to the temperature $T=(t^{o}C+273)$ where the temperature (T) is the absolute temperature in Kelvin. We again find that the thermal energy radiation is directly proportional to T^4. We then established theoretically that the value of zero Kelvin as the absolute zero temperature of the universe. Obviously, no temperature below absolute zero is feasible. We have also seen how difficult it is to approach a temperature close to absolute zero.

All measurements are done relative to some reference standard. We make use different zero settings of temperature scales based on different isothermal states corresponding to change of state of matter on the surface of the earth such as the melting point of water as zero degree Celsius and 0° F as the temperature at which a brine made of 50% salt and 50% ice melts. We measure the pressure in terms of atmospheric pressure at the surface of the earth. We measure the dynamic parameter (time) of a system with reference to the rotational dynamics of the earth. All these relative measurements are earth based because these references are easily accessible to the inhabitants of the earth. Since any relative scale can be used to evaluate/characterize the property of a system for study of dynamics of systems, we have taken the best consistent reference values pertaining to the surface of the earth.

The motivation for any dynamics comes only from a differential property, such as differential pressure, differential temperature, differential electric potential etc. The differential property remains unchanged if the reference zeros are taken differently in two different relative scales. Thus, the differential temperature in the Kelvin scale is the same as that in the Celsius scale.

If all dynamics are concerned with some differential property why the same is not reflected in the thermodynamic laws of gas (Charles' Law and Steffan-Boltzmann law). In fact, they are obeying the differential temperature and the same can be identified with proper analysis. Examining the extra-nuclear space structure of the sun, we notice both pressure and temperature are decreasing towards the boundary of the solar system. However, the temperature fluctuation does occur within the range of solar corona due to thermal celestial charge polarization in the Sun's extra nuclear space structure (solar atmosphere) similar to that occurring in earth's atmosphere in its closer range [5] [6]. We notice different celestial bodies are at different temperatures. Beyond the solar corona the temperature in the extra-nuclear space structure of the sun goes on decreasing outwardly with the lowest temperature prevailing at its boundary. The temperature of planets is an indication of the phenomenon of outwardly decreasing temperature of the extra-nuclear structure of the sun. Fig.1 shows the schematic temperature profile of the extra-nuclear space structure of the galaxy and the sun within it. In the new concept all centrally organized mass-space structures have space-density gradients, space content per unit volume [7]. Space being a physical entity, there is no difficulty in accepting variations in space content per unit volume [7] Further, space always contains space matter particles where the size and number density of space matter particles is function of space density [4]. Again, temperature is a function of mass-space structure. Thus, the lowest temperature in the solar system prevails only at the boundary of the extra-nuclear space structure of the sun. This boundary temperature is approaching zero Kelvin as seen from the decreasing temperatures of planets. There is no reason why the temperature profile of the extra-nuclear space structure of a galaxy would not follow the same trend. The stars are located at different distances from the nucleus of the galaxy and have different temperatures. In view of the above one can expect the temperature at the boundary of the extra-nuclear space structure of the Milky-way galaxy to have the lowest temperature. The sun is located at 2/3rd the radius of the Milky-way galaxy. The temperature at the boundary of the sun's extra-nuclear space structure has the same value as that prevailing in the extra nuclear space structure of the galaxy at the sun's location. If the temperature at the boundary of the sun's extra-nuclear space structure is -273^{o}C (zero K), then the temperature of the boundary of the galaxy would be lower than zero Kelvin (–K). This suggests the Kelvin temperature does not refer to absolute temperature. Hence, the Kelvin temperature scale is relative like the Celsius and Fahrenheit scale but with lower value of reference zero.

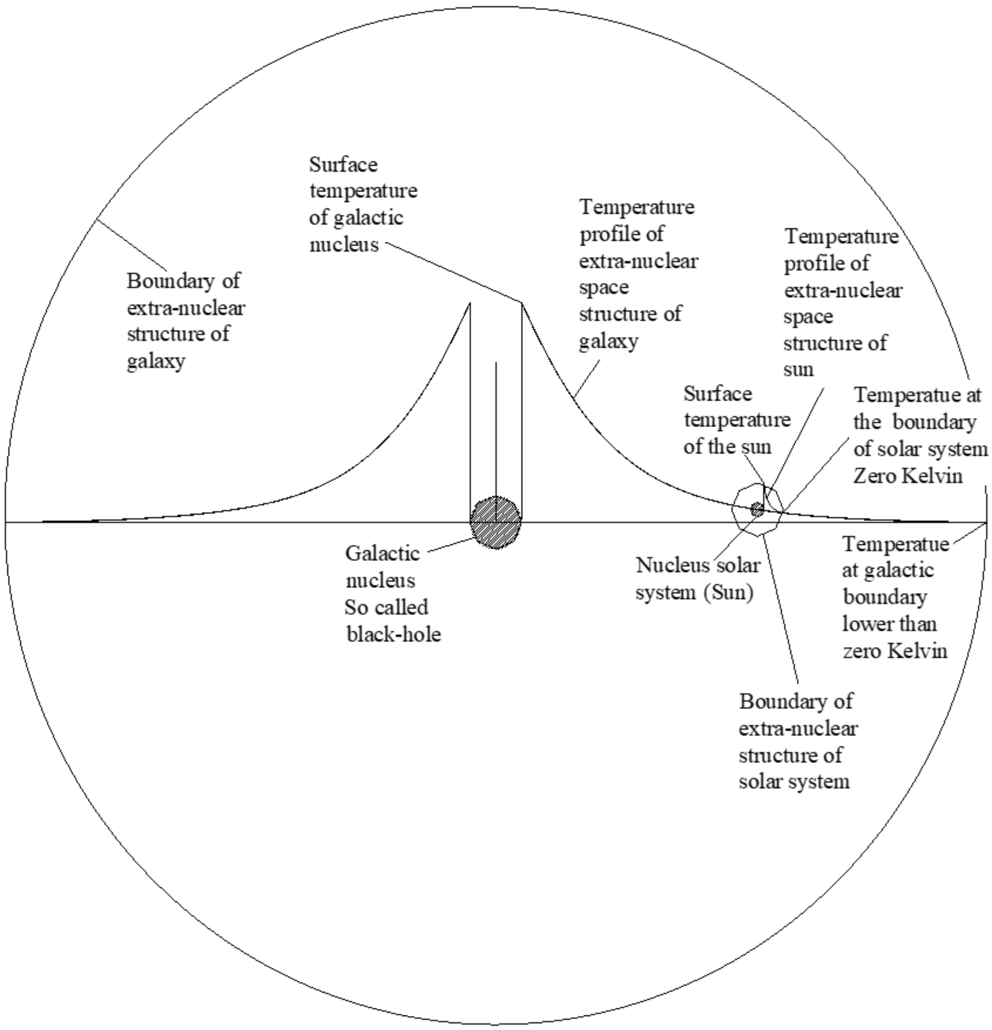

Fig.1 schematic view of temperature profiles in a galaxy

The thermal radiation is proportional to the 4^{th} power of absolute temperature. Thermal radiation, being a dynamic activity, the motivation for radiation should have been functionally related to a differential temperature rather than the absolute temperature. We may now examine the sun's radiation towards the interstellar medium. Assume the zero Kelvin temperature at the boundary of the extra-nuclear structure of the sun is a relative zero which has another assumed absolute value τ. Thus the temperature difference between the sun and the boundary of the extra-nuclear space structure of the sun is given by:

$\Delta t = T - 0 = T$ (in Kelvin scale)

where, T is the temperature of the sun in Kelvin scale.

Also $\Delta t = (T + \tau) - (\tau) = T$

where $(T+\tau)$ is the temperature of the sun and τ is the temperature at the boundary of the extra-nuclear structure in the new absolute temperature scale.

The thermodynamics and radiation from matter within the solar system actually uses a differential temperature between the sun and the extra-nuclear space structure of the sun. Thus, the true significance of the so-called absolute temperature T relates only to a differential temperature $\{(T+\tau) - (\tau)\}$. The temperature differential value of the solar system has to be modified while working out the radiation and thermodynamics in another star system having different orbital radius. Thus, the so-called absolute zero temperature in Kelvin scale refers to zero in a relative temperature scale.

Conclusion

The so-called absolute zero temperature (zero K) refers only to another reference zero at a lower value for a different relative scale. Hence, temperature below zero Kelvin is feasible. The author has shown that the temperature at the boundary of the extra nuclear space structure of the galaxy is lower than zero Kelvin. Again, the temperature at the boundary of the universe may be further lower. The reference zero temperature in different relative scales has different absolute values to which we have no access.

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