On the Ability of Matter in the Aggregate to Increase Specific Heat near the Absolute Zero of Temperature: a Comment on Arxiv:1010.0259

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Abstract

Arxiv:1010.0259, now withdrawn, presents analysis to show that on approach to the absolute zero of temperature, the specific heat of matter in the aggregate, such as ultrathin wires that do not enter the state of superconductivity, increases. There is good reason to expect that this is true, which we will show in the present paper, which moves us to urge that Arxiv:1010.0259 be restored.

The author of Arxiv:1010.0259 has withdrawn the paper due to an error in equation (13).[1] In spite of the error, the essential thesis of the paper is not compromised. The essential thesis is that the specific heat of matter in the aggregate near absolute zero increases. The author says that mesoscopic systems, such as ultrathin wires, refuse to relinquish their residual heat. The more the temperature is lowered, the more matter resists being cooled.

It seems that there is a conservation law at work here. It seems that there are two energies we need to consider: the exterior energy, or the energy in the space in which matter resides, and the energy internal to matter. As the exterior energy is reduced, the interior energy increases. That means the absolute zero of temperature can never be achieved in aggregate matter because we have a self-defeating system. It suggests that matter in the aggregate mutually supports itself.

We will write a simple equation on the basis of what we have just said. If E_i is the system's internal energy, and E_e is the energy in the space of the system, we have

$$E_i + E_e = k \tag{1}$$

where k is the constant. This equation would apply only very near to absolute zero, and the value of k would have to be determined experimentally for each type of material not entering the superconducting state. As to why E_i should increase, we shall only speculate at this point that perhaps aggregate matter absorbs photons. Photons are plentiful and readily available, so they seem to be an excellent source for a heat bath for mesoscopic systems. [2]

The author of Arxiv:1010.0259 writes his paper on the basis of fermions. We shall look at one of those with structure. According to reference [3], the internal entropy of a fermion is

$$S = k_B \ln\left[1 - \sqrt{1 - v^2/c^2}\,\right] \tag{2}$$

which produces an internal entropy of $-\infty$ when the fermion is at rest. This certainly coincides with what the author of Arxiv:1010.0259 found. If the internal energy of each fermion is increasing, is it any wonder that the specific heat of the fermionic system is going up near zero Kelvin?

References

1. Anghel, Dragoş-Victor. "Divergent specific heat at zero Kelvins: breakdown of the Third law of thermodynamics", Arxiv:1010.0259.
2. Ragazas, Constantinos. "The Temperature of Radiation", Vixra:1001.0035.
3. Carroll, Robert L. The Eternity Equation, J.R. Rowell Printing Company, Charleston, South Carolina, 1976, p. 109-114, 168-170.