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What is the vortex "transport entropy"?[1] ANDREI SERGEEV, SUNY at Buffalo, MICHAEL REIZER, VLADIMIR MITIN, SUNY at Buffalo — Below the superconducting transition the large thermomagnetic effects in the type II superconductors are determined by magnetic vortices. These topological excitations are completely different from particle-hole exctitations in the Fermi liquid and, therefore, the thermomagnetic effects do not require particle-hole asymmetry. Thermomagnetic effects in the vortex state are widely described in terms of the "transport entropy." Despite of intensive theoretical and experimental investigations, this mysterious quantity is still in conflict with either the Onsager principle or the third law of thermodynamics [1]. We resolve this forty years enigma taking into account the magnetization current in the presence of the temperature gradient. Then contributions of superconducting currents of vortices are canceled in the Nernst effect, and, therefore, in agreement with the Onsager relation, both the Nernst and Ettingshausen phenomena originate solely from vortex cores. Finally, the transport entropy turns out to be by a factor of $4ln(\lambda/\xi)$ smaller than that used in literature [1] (λ is the magnetic field penetration depth, ξ is the coherence length. For high-temperature cuprates this factor is $\sim$20.
[1] R.P. Huebener, *Magnetic flux structures in superconductors*, Springer-Verlag, Berlin, (1979).

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