INTRODUCING THE LIEB-YNGVASON ENTROPY-DEFINITION INTO UNDERGRADUATE ENGINEERING THERMODYNAMICS EDUCATION: A CASE STUDY AT ILMENAU UNIVERSITY OF TECHNOLOGY

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ABSTRACT

Entropy is the most important and at the same time the most difficult-to-understand term of thermodynamics. Many students are discontent with its classical definition $dS = \delta Q/T$ since it is based on "temperature" and "heat" which both cannot be accurately defined without entropy. The physicists Elliott Lieb and Jakob Yngvason have recently developed a formulation of thermodynamics [1] which is free of these problems and defines entropy in a mathematically rigorous way in terms of adiabatic accessibility. Whereas the Lieb-Yngvason entropy-definition is readily accessible to scientists and engineers with previous knowledge and working experience in engineering thermodynamics, the question whether this accurate definition can be used in undergraduate engineering thermodynanics education for mechanical engineers was an open question until recently. Ths present communication describes a series of lectures and course material [2] aimed at introducing the Lieb-Yngvason entropy-definition into second-year engineering thermodynamics courses for mechanical engineers at Ilmenau University of Technology (Germany). The lecture will share the experience accumulated since 2007 with more than 2000 undergraduate students and indicate some ways in which the Lieb-Yngvason theory can help making undergraduate engineering thermodynamics eduation more mathematically rigorous.

REFERENCES

[1] E. Lieb, J. Yngvason, The physics and mathematics of the second law of thermodynamics, *Phys. Rep.*, vol. 310 (1999) pp. 1-96
[2] A. Thess, The entropy principle: thermodynamics for the unsatisfied, Springer Verlag Berlin Heidelberg (2011)