Learning and understanding thermodynamics: a struggle against obviousness

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Abstract The foundation thermodynamics rests upon is so solid that it would be ridiculous and fruitless to scrutinize it trying to find nonexistent mistakes and inconsistencies. It is hopeless to come across something important, which was overlooked by the architects of this discipline. In other words, one is not supposed to be critical while reading Gibbs' works; instead, one must merely be sufficiently clever and attentive to understand their contents. The same degree of a critical indifference is hardly warranted when one deals not with the classical thermodynamics per se, but with computational thermodynamics and its applications.

In the lecture, three very dissimilar problems are analyzed.

1. We shall start with the calculation of the maximum temperature of adiabatic combustion.
2. Then we shall try to answer the question "What exactly does pressure do to the molar Gibbs energies?"
3. Finally, we shall discuss the compound energy formalism and realize that a universally adopted method to specify the reference frame is not unique.

Since these three topics are completely unrelated, one may develop an uneasy feeling that they were randomly chosen and then start wondering what justifies considering them one by one during the lecture. Although the problems in hand are not connected, their unlikeness in itself will help us to realize that in computational thermodynamics there are many areas in which the inertia of thinking may lead to a shallow understanding and wrong conclusions.

During the last five minutes of the lecture, the participants will be informed about the Department of Materials Science and Engineering of McMaster University, and about opportunities of graduate studies over there.