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**Computation of temperature induced phase transitions at high pressure**

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Phase transitions at high pressure and temperature is perhaps one of the most controversial topics in high pressure science. There is a number of theoretical methods developed recently to address this problem. Unfortunately, none of them is fully satisfactory, considering stringent requirements to accuracy of the computed free energies of the involved phases. This, in part, explains the variety of the suggested methods. The experimental data is rather controversial as well, probably because the experiments at extreme conditions are difficult. I will provide overview of the theoretical methods that are applied for the computation and simulation of T-induced phase transitions. Both liquid-solid and solid-solid transitions will be covered. Possible sources of the disagreement between theoretical methods as well as between theory and experiment will be illustrated by examples. Insight from simulations will be used to suggest alternative explanations of experimental data. The optimal, at present, method to compute the transitions will be suggested.