

Giovanni Jona-Lasinio has made seminal contributions to many areas of statistical mechanics. We describe here only some of his many contributions.

*The study of critical phenomena in field theory and statistical mechanics.*

Giovanni Jona-Lasinio (together with Carlo Di Castro), were the first ones to show that renormalization group could be used to understand the critical behavior near second phase transitions. The renormalization group the basis of the techniques later developed by Kenneth Wilson for the theory of phase transitions, which earned him the Nobel Prize in 1982. Wilson himself gave ample credit to Di Castro and Jona-Lasinio, recognizing them as pioneers.

In the same field Jona-Lasinio has later played an important role with the introduction of probabilistic techniques, e.g. emphasizing the relation between the generalized central limit theorem and the renormalization group.

*Non-equilibrium statistical mechanics*

Giovanni Jona-Lasinio and his younger collaborators have developed a thermodynamic theory for the fluctuations based on general principles. This approach generalizes the theory of Onsager in an off-equilibrium setting. A remarkable feature of the theory is that the non-equilibrium fluctuations are predicted to have long range space correlations: at the same time the theory is very general and nevertheless applicable to rederive some of the very few exact results without need of the original elaborate computations.

Giovanni Jona Lasinio has played an important role in using ideas coming from statistical mechanics ideas in other contexts. He has given very important contribution to high energy physics, often using his knowledge coming from statistical mechanics, thus contributing to the diffusion of concepts coming from statistical mechanics in quantum field theory. This can be seen from the title paper 1), where spontaneously symmetry breaking was introduced in particle physics (this paper played a great role for assigning the 2008 Nobel prize to Nambu).