MAX PLANCK INSTITUTE FOR THE PHYSICS OF COMPLEX SYSTEMS

Laudatio

In recognition of his original contributions to computational
many-body and statistical physics

Prof. Dr. Werner Krauth

has been awarded the
Martin Gutzwiller Fellowship 2018/2019
of the Max Planck Institute for the Physics of Complex Systems.

Werner Krauth is an unusually creative and versatile computational physicist. He has contributed to many fields, mainly to classical and quantum many-body physics, but ranging much more broadly all the way to high-energy physics. His trademark is the invention of new computational schemes which combine physical intuition and algorithmic originality. This frequently puts him in a position to ask new questions, or resolve long-standing open issues. His central scientific achievements are thus highly varied.

A characteristic instance of this is his work on "Absence of thermodynamic phase transition in a model glass former" (2000). There, by devising a new Monte Carlo algorithm, he answered the question of whether the glass transition is a purely dynamical phenomenon, or whether it goes along with a 'proper' thermodynamic transition. In a field where many questions remain open and controversial for notoriously long periods of time, this is a remarkable achievement indeed. Other outstanding contributions include his work on dynamical mean-field theory when the method was in its very infancy; and his identification of an unexpected type of two-step melting in two-dimensions in the context of Kosterlitz-Thouless physics.

Many of Werner Krauth's current interests are grouped around working towards a new paradigm for Monte Carlo simulations. His recent work on so-called "Beyond-Metropolis" algorithms considers schemes that violate detailed, yet satisfy global balance; the system energy need not be computed at each step, providing a fresh perspective for long-range interactions.

Werner Krauth's originality has led him to follow his own intellectual trajectory; whenever this trajectory intersects with fashions in the respective fields – sometimes concurrent, but often much later – one appreciates the vision and depth of his contributions.

Werner Krauth has also been an educational innovator, inspiring many budding physicists over the years. His enthusiasm for teaching is infectious, and the clarity of his exposition exemplary. He has a signature pedagogical style, explaining physics and computation via simple algorithms. His book on "Statistical Mechanics: Algorithms and Computations" (2006) is a unique exposition this style. In addition, he has designed a widely recognised Massive Open Online Course (MOOC), which has achieved a tremendous reach, with tens of thousands of registered students.

Overall, Werner Krauth is a source of sparkling ideas, an engaging personality, and a role model for what it means to be a scientist with an independent mind. He seems to have boundless energy, which he is committed to fully harnessing in the pursuit of whatever project he undertakes.