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Transport theory in condensed matter physics-metamaterial is phase transition

In 1966, W S Gan first introduced transport theory to statistical mechanics and condensed matter physics. In the past, transport theory has been associated only with kinetic theory and neutrons transport theory in nuclear reactor research. It is also at about the same time in 1966 that solid state physics changed name to condensed matter physics to reflect the role of phase transition. Transport theory has now become the most important theory in statistical mechanics. It is the foundation of theoretical design of materials. Transport theory describes the transport properties of different phases of matter and so is closely related to phase transition. The 2016, Nobel physics award to topological phase transition enhanced the status of phase transition as it is a breakthrough to a whole new world of new materials or new phases of matter. In this paper use of the power of phase transition to explain turbulence and sonoluminescence will be given. An Ising model of turbulence will be proposed which will provide a rigorous theory to describe the region around the critical point or critical temperature of second order phase transition. The weakness of the Landau-Ginzburg theory of second order phase transition is that it is a phenomenology and meanfield theory and is unable to explain the region around the critical temperature.

Biography

Woon Siong Gan obtained his PhD in Feb 1969, from the physics department of Imperial College London. He is the first to introduce transport theory to statistical mechanics and condensed matter physics in 1966. The title of his PhD thesis is Transport Theory in Magnetoacoustics. In the past, transport theory has been used only in kinetic theory and neutrons transport theory. He is also the first to introduce symmetry properties to acoustic fields in 2007 which has been demonstrated by the successful fabrication of acoustic metamaterials. He has published the book *Acoustical Imaging: Techniques and Applications for Engineers* by John Wiley and Sons in 2012 and several other papers. He is also the Founder and current President of the Society of Acoustics(Singapore) and the Founding Director of Acoustical Technologies Singapore Pte Ltd, a technologies company with expertise in acoustical imaging.

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