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50th anniversary of the transport theory in condensed matter physics

In 1966, Woon Siong Gan coined/invented the name transport theory in condensed matter physics. Transport theory was previously used only in neutron transport theory for reactors design. Transport theory has come a long way. It is today the key foundation of theoretical design of materials. In 1971, the international journal Transport Theory & Statistical Physics was launched by Taylor & Francis. Transport theory is the theory of transport properties. Transport theories have singularity behaviour at the point of phase transition. Hence transport properties can lead to the invention of new materials. This is known as the transport theory approach to phase transition. This is a new approach proposed by me after the Landau and Ginzburg's phenomenology theory of spontaneous symmetry breaking to phase transition. Transport theory also played a role in the founding of the field of condensed matter physics. Because of its contribution to phase transition. Transport theory can be classified into classical transport theory and quantum transport theory. Transport theory also has an important status in statistical physics, in classical statistical mechanics and quantum statistical mechanics. Due to its various important developments throughout the years, it is meaningful to celebrate its 50th anniversary this year.

Biography

Woon Siong Gan obtained PhD at the age of 24. He obtained BSc in physics in 1965, DIC in acoustics & vibration science in 1967 and PhD in acoustics in 1969, from the Imperial College London. His PhD thesis pioneered the statistical mechanics approach to ultrasound propagation in semiconductors. The usual approach is electron-phonon interaction of many body theories. It is also the first to introduce the concept of topological phase transition. The thesis title Transport Theory in Magnetoacoustics pioneered the introduction of transport theory to condensed matter physics. Transport theory is today the key foundation of theoretical design of materials. Hence his thesis also played a role in the founding of the field of condensed matter physics. He also recently discovered the singularity behavior of transport properties and resonance is singularity. In 2007 he pioneered the introduction of gauge invariance to acoustic field equations. Acoustic metamaterial is an outcome of gauge transformations. He is currently working on the application of gauge invariance to nonlinear acoustics such as multiple scattering, inverse scattering, and interactions. He has published the book Acoustical Imaging: Techniques & Applications by John Wiley & Sons in 2012, the book New Acoustics, based on Metamaterials by Springer in 2018 and several papers on acoustical imaging and gauge invariance in acoustics. He is a Fellow of the Institute of Acoustics, UK, a Fellow of the Engineering & Technology Institute, UK, a Fellow of the Institution of Engineers, Singapore, a Fellow of the Southern African Acoustics Institute, a Senior Member of IEEE, a Senior Member of the American Institute of Ultrasound in Medicine, and a Member of the Acoustical Society of America.

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