Department of Physics
The Chinese University of Hong Kong

Symposium
in Honour of the 90th Birthday of
Professor Yang Chen Ning

Saturday, 15 September 2012

Time : 3:00 pm to 6:00 pm

Venue : L1, Science Centre, The Chinese University of Hong Kong, Shatin, New Territories

Programme:

Time	Speaker	Title
3:00 pm – 3:05 pm	Xia Keqing (CUHK)	Opening
3:05 pm – 3:35 pm	Jason Tin Lun Ho (Ohio State)	Prof CN Yang and Modern Cold Atom Research
3:35 pm – 4:05 pm	Chu Ming Chung (CUHK)	Neutrino Oscillations — Still Crazy After All These Years
4:05 pm – 4:35 pm	Liu Renbao (CUHK)	Probing Lee–Yang Zeros and Time-domain Phase Transitions
4:35 pm – 4:50 pm	Tea break	
4:50 pm – 5:20 pm	Ge Molin (Nankai)	Yang–Baxter Equation and Quantum Information
5:20 pm – 5:40 pm	Chen Fong Ching (CUHK)	CN Yang Archive
5:40 pm – 6:00 pm	Yang Chen Ning	Remarks

Enquiries: 3943 6339

Abstracts

Prof CN Yang and Modern Cold Atom Research

Jason Tin Lun Ho, The Ohio State University

I shall discuss the profound contributions of Professor C.N. Yang in the area of quantum gases: his seminal contributions to the field which preceded the discovery of Bose-Einstein condensation by several decades, the inspiration he gave to new generations of physicists in this field, and his important role in developing cold atom research in Asia. I shall also discuss the recent success in cold atom research in CUHK, which is a timely gift to Professor Yang in this joyous celebration.

Neutrino Oscillations — Still Crazy After All These Years

Chu Ming Chung, The Chinese University of Hong Kong

The discovery of neutrino oscillation – a neutrino travelling in space transforms from one type to another – has profound impacts on particle physics, astrophysics and cosmology. It is a clear manifestation of the phase of the particle wave function, the importance of which has been emphasized by Prof. C. N. Yang for over half a century. The Daya Bay Reactor Neutrino Oscillation Experiment aims to measure a key neutrino oscillation parameter, θ_{13}, to an unprecedented precision of better than 3 degrees, which is critical to the design of future experimental measurement of CP violation in the leptonic sector, the basis of a possible explanation of why matter dominates anti-matter in the universe. This work can also be viewed as an extension of the seminal proposal by Lee and Yang that Parity is violated in weak interaction. I will present an overview of neutrino oscillations and a progress report of the Daya Bay experiment, particularly on our recent observation of electron-antineutrino disappearance, which leads to the world's first determination of the value of θ_{13}.

Probing Lee-Yang Zeros and Time-domain Phase Transitions

Liu Renbao, The Chinese University of Hong Kong

Sixty years ago, C. N. Yang and T. D. Lee laid the foundation for the modern phase transition theory by proving the Lee-Yang theorem. The theorem relates the phase transitions to the analytic properties of partition functions in the complex plane of external field or fugacity. The theorem states that the partition function of a ferromagnetic Ising model will be zero and therefore the free energy be non-analytic at complex values of the fugacity which are distributed along a unit circle in the complex plane. Above the phase transition temperature, the Lee-Yang zeros form an open arch with the two ends being the singularity points called Lee-Yang edge singularities. The Lee-Yang zeros and edge singularities have not been regarded observable since they occur only at complex field or temperature which are not physical. In the light of Wick rotation in which time and inverse temperature are treated as imaginary continuation of each other, we recently discovered that the coherence of a probe spin coupled to an Ising model, as a function of time, presents zeros in one-to-one correspondence to the Lee-Yang zeros. In the thermodynamic limit, the probe spin coherence will become constantly zero for time between the two edge singularities, which manifests itself as a phenomenon of time-domain phase transitions. Progresses have been made in experimental observation of Lee-Yang zeros for the first time in history. These findings allude to a profound link between time and temperature, the two most fundamental quantities of nature, and establish time as a new dimension for phase transitions.

Yang–Baxter Equation and Quantum Information

Ge Molin, Nankai University

将两种类型辫子算符（类型-I，置换及推广与类型-II，Bell 态及纠缠态）作用在拓扑基上，得到辫子群的 2 维、3 维表示的具体形式。进而获得相应杨-Baxter 方程的解，指出对类型-I，它满足 Galileo 叠加，而对类型-II，（例如任意子）为 Lorentz 叠加，结果可推广至 N 维，就是 Wigner D 函数。指出上述两种类型与 D 函数的 L_1-Norm 的极值相联系。最后，对 SU（N）指出纠缠态是 Yangian 的自然表示，并讨论 Yangian 的可能实现。

通过以上讨论，可以体验到，杨振宁先生 40 多年前的基本思想，仍然有旺盛的生命力，导致新的进展。