The origin of Complexity: Local Activity and the Third Law of Thermodynamics

by Prof Leon Chua

About the Talk
The first two laws of thermodynamics cannot be used to explain numerous complex phenomena that had puzzled many luminaries, including Boltzmann, Schrodinger, Prigogine, Eigen, Gellman, Turing, Smale, etc. This 2-hour lecture introduces the new “principle of local activity” which resolves the above conundrum by providing a mathematical foundation for the current hot albeit disarrayed research area dubbed “complexity”. The principle of local activity asserts that “complexity is impossible without local activity”. This mathematically rigorous, yet simple and constructive theory can be applied by anyone with a basic background in ordinary differential equation and linear algebra. The concept of local activity and its pearl, called the “edge of chaos”, provides the essential tool for explaining and predicting all sorts of hitherto unresolved complex phenomena from both natural and social sciences. The secret behind the principle of local activity is that it implies a non-monotonically increasing “entropy function”, thereby providing the missing complement of the second law of thermodynamics.

About the Speaker
Prof Leon Chua received his MS and PhD degrees from Massachusetts Institute of Technology and the University of Illinois at Urbana-Champaign. Since 1970, he has been with the University of California, Berkeley, where he is currently a Professor of Electrical Engineering and Computer Sciences. Prof Chua is a permanent Distinguished Professor and an Honorary Fellow of the Institute for Advanced Study at the Technische Universität München.

He was the first recipient of the IEEE Gustav Robert Kirchhoff Award in 2005 and was awarded the IEEE Neural Networks Pioneer Award in 2000. Elected an IEEE Fellow in 1974, he has received many international prizes, including the IEEE Browder J. Thompson Memorial Prize, the IEEE W.R.G. Baker Prize, the Frederick Emmons Award, the M.E. Van Valkenburg Award (twice), and the 2005 Francqui Award from Belgium.

He has been awarded seven USA patents and 14 Honorary doctorates from universities in Europe and Japan.

He was elected a foreign member of the European Academy of Sciences and the Hungarian Academy of Sciences. In 2010, he was awarded a John Guggenheim Fellow and The Leverhulme Trust Visiting Professorship. In 2011, he was awarded a Distinguished Professorship by Technische Universität München, Germany, and also a Royal Academy of Engineering Distinguished Visiting Fellowship within Imperial College London. In 2013-2015, he was awarded the Marie Curie Fellowship by the European Commission. He is currently a visiting professor at the Imperial College London.

27 May 2014
(Tuesday), 3pm to 5pm
SPMS-LT4 (SPMS-03-09),
21 Nanyang Link,
Singapore 637371

Admission is free.
Please register online at
http://www.ntu.edu.sg/ias/ptreg

For enquiries, please email us at
iasevents@ntu.edu.sg