

2018 NEC C&C Prize Ceremony

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■ **SINCE 1985**, THE NEC Computers and Communications (NEC C&C) Foundation has presented its annual C&C Prizes to recognized distinguished persons who made outstanding contributions to research and development and/or pioneering work in the fields of semiconductors, computers, and/or telecommunications and in their integrated technologies (C&C). 2018 C&C Prize Ceremony was held on November 28 at All Nippon Airways Intercontinental Tokyo in Akasaka, Tokyo. The NEC C&C Foundation presented the annual C&C Prize to H. Nishimori and C. W. Tang (Figure 1). The citations read as follows.

- *Hidetoshi Nishimori*: For contribution to quantum annealing and to research into random spin systems which underlie fundamental mechanism enabling the development of quantum annealing machines.
- *Ching W. Tang*: For discovery and pioneering development of thin-film organic light-emitting devices leading to the progress of organic electronics industry.

K. Yano, the president of the NEC C&C Foundation, opened the ceremony and delivered welcome speech. The Chairman of the award committee T. Aoyama recognized the 2018 C&C Prize recipients and Yano presented the prize to the two

recipients. Then, the recipients H. Nishimori and C. W. Tan delivered acceptance speeches.

H. Nishimori is a professor at the Tokyo Institute of Technology and the Tohoku University. He received the Ph.D. degree from the University of Tokyo and he did his postdoctoral research at Carnegie-Mellon University and Rutgers University.

He was the first to propose the quantum annealing computation model that operates under the natural laws of physics to enable high speed resolution of hard and complex problems such as combinatorial optimization. The basic theory of quantum annealing was developed in the field of statistical mechanics. Prof. Nishimori spent many years conducting research on the phenomena of random spin systems, which is typical spatially nonuniform system that is regarded as a central problem in statistical mechanics. Through this research, he showed that there is a special area in a phase diagram, called “Nishimoi line,” where an exact solution can be obtained. This discovery has been of monumental importance to statistical mechanics and Prof. Nishimori’s remarkable contribution has been paramount to outcomes such as error correction code in information theory which leverages the properties of random spin systems and the Nishimori line.

His findings also gave rise to a quantum annealing model that he jointly proposed with his student, T. Kadowaki, in 1998.¹ Though his research on mathematical model of magnetic

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Figure 1. Prof. H. Nishimori (left), President of NEC C&C Foundation K. Yano, and Prof. C. W. Tan. (Courtesy of the NEC C&C Foundation.)

bodies, in which he studied random interactions of particles with surrounding particles that had only two allowed orientations (up and down), he discovered that optimization problems consisting of systems that search for the lowest energy configuration is a standard format of combinatorial optimization.

D-Wave Systems based in Canada developed the prototype of the quantum annealing machine, “Orion” and demonstrated it at the Computer History Museum in Mountain View, California, in 2007. They built the world first commercially available machine D-Wave One in 2011. They also adopted Quantum Flux Parametron (QFP) for the purpose to amplify signals from the quantum bit. QFP was invented by Eiichi Goto² of University of Tokyo in 1986.

C. W. Tan is a professor emeritus at the University of Rochester and a professor at the Hong Kong University of Science and Technology. His extensive research on organic electronics, especially organic light-emitting diodes (OLEDs), culminated in his discovery of a highly luminous and efficient layered thin film structure with separated in his discovery of a highly luminous and efficient layered thin-film structure with separated functions, has remained one of the most important technological contributions in today’s display industry.

Today, interface technologies are the backbone of information and communications society. Flat

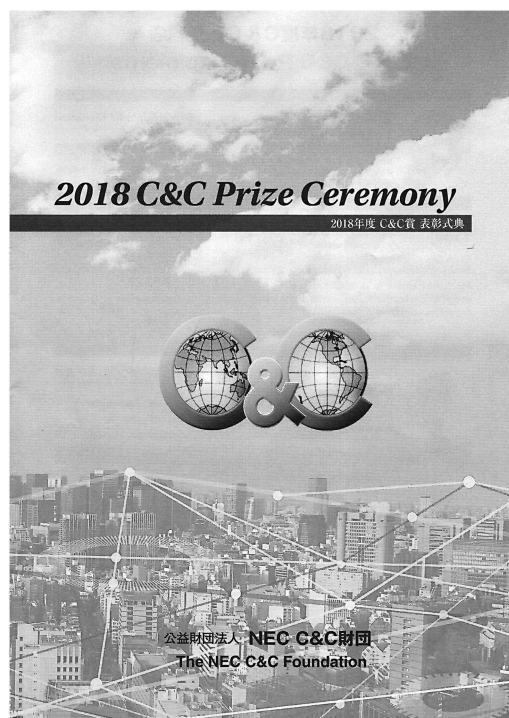


Figure 2. 2018 C&C Prize Ceremony, the NEC C&C Foundation, November 2018.

panel displays (FPDs) in particular play a vital role as general interfaces as well as in compact information devices like smartphones that support everyone within the reach of the mobile internet. While liquid crystal displays (LCDs), which work on the principle of organic electroluminescence, are becoming more and more popular. OLEDs are characterized by their thin, shape-free, flexible, and surface-emitting design, and their low-voltage characteristics that are ideal for portable devices. They outperform LCDs in providing high-contrast images, high-speed response, and wide viewing angles. OLEDs have already acquired a substantial share of the compact information device market and have begun to be used in TVs and other large devices and display devices. These and other aspects have made OLEDs crucial elements in various information devices and display devices. Besides outstanding image quality and design, OLEDs feature low power consumption, enabling compact devices that connect people and have minimal impact on the environment.

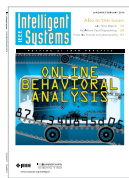
Prof. Tang concluded his talk by thanking three wise women; his grandmother, his mother and his wife.

The C&C Prizes are awarded to no more than two groups annually. Each recipient is given a certificate, a plaque, and a cash award (10 000 000 yen for each group).

REFERENCES

1. T. Kadowaki and H. Nishimori, "Quantum annealing in the transverse Ising model," *Phys. Rev. E*, vol. 41, no. 20, pp. 5355–5363, Nov. 1998. <http://www.stat.phys.titech.ac.jp/~nishimori/papers/98PRE5355.pdf>
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