Invention of the Transistor 75 years ago; The Origin of Device Miniaturization towards Super-Intelligent Society.

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184 years ago, in 1838, 'relay' -- the first digital signal amplifier -- provided us with the long-distance telegraph through electric wires. This is the beginning of the information society and 'electrical engineering' era. 116 years ago, in 1906, 'triode vacuum tube' -- the first analog/digital signal amplifier -- brought us 'electronics' that can manipulate the electron movement, as we wish, for use for wireless-telecommunication and machine-control. 75 years ago, in December 1947, the 'transistor' was invented as the first solid-state amplifier for the purpose of device-size reduction in order to realize high-frequency and low-power operation. This is the origin of the device miniaturization for micro/nanoelectronics. The 10 millionths-times device-size reduction in the past 115 years has created billions/trillions-times device-performance increase in the operation speed, energy consumption, weight, and cost, bringing us to super-intelligent society in near future. The tremendous performance increase by the progress of 'micro/nanoelectronics' -- originated by the 'invention of the transistor'-- was a totally new concept and the 3rd technological leap (The 1st and the 2nd leaps were 'electrical engineering' and the 'electronics'). It is obvious that today's intelligent society does not exist without the invention of the transistor. The road to reach the invention of the 'transistor' was an exciting, however, long and hard trail because of the lack of semiconductor physics, high-purity semiconductor materials, and charge-control knowledge at the semiconductor surface, in the period of the 1920's to the 1940's. In this talk, I will start with the story of the transistor invention. Then, I will explain the development of the transistor technologies from the past to the present. Finally, I will predict the limit of the device miniaturization and future direction of the nanoelectronics evolution after reaching its limit.

Biography Hiroshi Iwai is a semiconductor device engineer who contributed to the development of LSI products and their technologies for 50 years since 1973 at Toshiba Corporation, Tokyo Institute of Technology, and National Yang Ming Chiao Tung

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