

NEWS RELEASE

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NTU's new institute to collaborate with Rice University on sustainable nanoelectronics

US-Singapore team hopes to revolutionise the way Integrated Circuit (IC) chips are fabricated, designed and developed in the future

Nanyang Technological University (NTU) has established the Institute for Sustainable Nanoelectronics (ISNE), an initiative aimed at designing and developing the next generation of embedded IC chips which will consume over 100 times less energy and cut its design and production costs. The Institute will receive seed funding of S\$4m over two years from NTU.

ISNE's strategy will be directed by Professor Krishna Palem, the Ken and Audrey Kennedy Professor in Computer Science at Rice University in Houston. Professor Palem is also the Canon Visiting Professor at NTU's School of Electrical and Electronic Engineering. The ISNE will collaborate closely with Rice University's new Value of Information-based Sustainable Embedded Nanocomputing Center (VISEN), founded and directed by Professor Palem.

Associate Professor Yeo Kiat Seng, Head of Circuits and Systems at NTU's School of Electrical and Electronic Engineering and a key member of ISNE, explains the Institute's objectives, "The microelectronics and IC design industry worldwide has experienced rapid growth in the last four decades, during which transistors have shrunk in size tremendously, resulting in cell phones and computers that are much smaller, lighter, more powerful and cost less to produce, for example. However, transistors are now so small they have reached their physical limitations, with power consumption, heat dissipation and static current leakage becoming major challenges."

What ISNE aims to do is to radically change the approach to chip design and evolve a design methodology that is platform-independent. One such approach

is the Probabilistic Complementary Metal Oxide Semiconductor (PCMOS), invented by Prof Palem and his team.

Such a new approach will allow IC chips to use less energy, and enable them to attain nano-dimensions without encountering the problems listed earlier. With this, consumers can look forward to enjoying longer battery life, less energy consumption and faster turn-around in new designs.

Prof Palem says, "A major goal of this collaboration is to exploit the exponential rate at which the size of electronic component has been shrinking. The key is tying the costs for design, energy consumption and production to the value that the computed information has for the user."

For instance, in a streaming video application in a cell phone, it is unnecessary to conduct precise calculations. The small screen, combined with the human brain's ability to process less-than-perfect pictures, results in a case where the picture looks good enough with calculations that are only approximately correct. This means that for slightly less-than-perfect picture quality, the user may need to charge the phone only every few weeks instead of every few days. Another potential application is in medical equipment such as a 'silicon retina', an implant that requires a battery. Similarly, for slightly less-than-perfect images received, the patient will only need to replace his battery every 10 years instead of every year.

The research team is currently designing and building the first production prototype of these new IC chips.

Dr Su Guanng, President of NTU, said, "NTU is pleased to be collaborating with Rice to spearhead research in sustainable nanoelectronics. Leveraging the strengths of NTU and Rice, both top technological universities, will no doubt bring about exciting breakthroughs. We are also glad to have Prof Palem, renowned for his computing methodology, head the ISNE."

"Rice and NTU are well-positioned to lead the search for sustainable new technologies in nanoelectronics," said Rice President David Leebron. "NTU is a leader in electronics and a well-known contributor to Singapore's economic vitality. Rice is a leader in engineering and nanotechnology, with a well-deserved reputation for international collaboration and the development and application of new ideas."

The ISNE will also get to draw upon an International Network of Excellence, directed by Prof Palem, comprising world-class electronics and computing experts from several leading US universities such as Rice, Georgia Institute of Technology, Caltech and others. The first visit by six of these renowned researchers will take place this October.

Professor Kam Chan Hin, Chair, NTU's School of Electrical and Electronic Engineering, says, "The setting up of ISNE is an extension of NTU's established strength in IC design and development. Prof Palem and his network is renowned for computing methodology and architecture. We look forward to leveraging our strengths to create revolutionary work in this area at NTU. When ready, our breakthrough research will be highly attractive to international semiconductor and IC design companies."

ISNE's focus on research, design and development work will also serve Singapore well as it climbs up the semiconductor technology ladder. IC design is a high value added activity to the electronic industry, which increasingly employs designers with higher degrees. In addition to reducing Singapore's water and energy dependency, revolutionary and innovative IC design is in line with the increasing global awareness of environmental concerns.

Mr Lim Swee Nian, Executive Director, Electronics Cluster at EDB says: "EDB has identified IC design as one of the critical capabilities needed to drive the growth of Singapore's semiconductor industry. We are therefore pleased to see the setting up of ISNE by NTU to groom researchers in next generation IC design, and to further augment the pool of research scientists and engineers in Singapore's semiconductor industry." He added that research scientists and engineers currently engaged in semiconductor R&D comprise close to 10 per cent of the total semiconductor workforce.

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About Nanyang Technological University

Nanyang Technological University (NTU) is a research-intensive university with globally acknowledged strengths in science, engineering, business, humanities, arts and social sciences. The university has two campuses in Singapore - the Yunnan Garden campus - NTU's main campus - is located in the southwestern part of Singapore. The NTU@one-north campus, home to educational and alumni clubhouse facilities, is located near Singapore's biomedical research hub, Biopolis; and the new infocomm and media hub, Fusionopolis.

NTU has four colleges comprising 12 schools. The College of Engineering comprises six schools focused on technology and innovation. Its research output ranks among the top four in the world. The College of Science pushes the boundaries of Singapore's life sciences initiatives. The Nanyang Business School (the College of Business) offers one of the world's top 100 MBA programmes. The College of Humanities, Arts, & Social Sciences boasts Singapore's first professional art school offering degree courses in art, design and interactive digital media, the Humanities and Social Science School, and the Wee Kim Wee School of Communication and Information, a top journalism and media school in Asia.

The 13th school, S Rajaratnam School of International Studies, was inaugurated on 1 January 2007. An important component of this autonomous school is the Institute of Defence and Strategic Studies, long recognised as a world authority on strategic studies and terrorism. NTU is also home to the internationally-acclaimed National Institute of Education, Singapore's only teacher-training institute.

NTU has in place multi-country programmes and initiatives with established institutions worldwide. Key partners include MIT, Stanford University, Cornell University, Caltech, University of Washington, Georgia Institute of Technology, Carnegie Mellon University in USA, Peking University, Shanghai Jiaotong University, Waseda University, Indian Institute of Technology in Asia, Cambridge University, Imperial College and Swiss Federal Institute of Technology in Europe.

For more information, visit www.ntu.edu.sg

About Rice University

Rice University is consistently ranked one of America's best teaching and research universities. It is distinguished by its: size—2,850 undergraduates and 1,950 graduate students; selectivity—10 applicants for each place in the freshman class; resources—an undergraduate student-to-faculty ratio of 6-to-1, and the fifth largest endowment per student among American universities; residential college system, which builds communities that are both close-knit and diverse; and collaborative culture, which crosses disciplines, integrates teaching and research, and intermingles undergraduate

and graduate work. Rice's wooded campus is located in the nation's fourth largest city and on America's South Coast. For more information, visit www.rice.edu.

About EDB

The Economic Development Board (EDB) is the lead government agency responsible for planning and executing economic strategies to enhance Singapore's position as a global hub for business and investment. We are the one-stop agency that facilitates and supports local and foreign investors in both the manufacturing and services sectors as they seek more value-creating operations, higher sustainable returns and new business opportunities.

Singapore commands global leadership positions in many areas. EDB is expanding and extending existing industry clusters, as well as exploring new growth areas to create good jobs and secure Singapore's future competitiveness. Our emphasis is on capital-intensive, knowledge-intensive and innovation-intensive activities. For more information, visit www.sedb.com