

Yoshio Nishi to Head SNF

By Dawn Levy, Stanford News Service, April 24, 2002

Yoshio Nishi, chief scientist of **Texas Instruments Inc. (TI)**, has accepted the directorship of the **Stanford Nanofabrication Facility**. He has also been appointed to a research professorship in the Department of Electrical Engineering, effective May 1. Nishi is senior vice president and director of silicon technology development at TI and has been a consulting professor at Stanford since 1986.



Prof. Yoshio Nishi, at left, with Prof. Bob Dutton, CIS Director of Research

“Stanford’s School of Engineering is delighted to welcome Yoshio Nishi to its faculty,” said **James D. Plummer**, the Frederick Emmons Terman Dean of the School of Engineering and the John M. Fluke Professor of Electrical Engineering. “Nishi is a well-respected researcher who brings a depth of industrial

experience. He has an international reputation in fundamental and practical contributions to the advancement of silicon devices and technology.”

The nanofabrication facility that Nishi will direct serves academic, industrial and governmental researchers. Work focuses on optics, microelectromechanical systems, biology and chemistry, as well as traditional electronics device fabrication and process characterization. Located on campus in the Center for Integrated Systems, it is

supported by the National Science Foundation.

In a separate announcement this week, TI said Nishi will continue his efforts as the company’s chief scientist as his successor, **Hans Stork**, transitions into the role. Nishi is keeping a twenty five percent appointment at the company while assuming his Stanford professorship.

“Since joining TI in 1995, Yoshio has led a transformation of the R&D function to an effective and well aligned organization providing substantial competitive technical

advantage to our digital signal processor and analog businesses,” said **Rich Templeton**, TI’s chief operating officer and executive vice president. “His continued efforts as TI’s chief scientist and director of Stanford’s Nanofabrication Facility will help maintain TI’s position at the forefront of semiconductor process technology.”

Said Plummer: “Texas Instruments has always been a valued partner of the School of Engineering, and Nishi’s appointment will be a strong bridge between the two organizations.” The company has headquarters in Dallas and manufacturing, design, or sales operations in more than twenty five countries.

Nishi holds a bachelor’s degree in metallurgy

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CIS WELCOMES NEW MEMBERS CANON INC. AND TOSHIBA CORPORATION. PLEASE LOOK FOR FEATURE ARTICLES ON OUR NEW MEMBERS IN UPCOMING ISSUES OF THE CIS NEWSLETTER.



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Project- and Platform-based Research and Education

From Bob Dutton
CIS Director of Research

It seems appropriate to acknowledge the profound impact of the events of September 11, 2001, and at the same time to reflect on what positive changes may emerge from these unsettled times. Some of you may remember **Professor John Linvill's** story about how the idea for CIS was conceived during the oil shortages of 1973-74 while he was waiting in a gas line behind the car of **George Pake**, Director of **Xerox PARC**. Their serendipitous meeting and extended conversation was the seminal event that launched efforts to form CIS. The story of the founding of the **VLSI Technology Symposium** is also an interesting one, related to the unsettled times of trade frictions between the US and Japan. The proactive engagement of the technical community around the globe opened a dialog that not only defused tension but also helped to build lasting friendships and even business partnerships.



tainly helped to put in perspective the Internet in the context of **DARPA's** pioneering motivations and efforts, more than a quarter-century ago, to create computer-based communications channels in the form of the "ARPA-net."

As everyone knows, the hallmark of **DARPA** (Defense Advanced Research Projects Agency) is to use demonstration projects as the vehicle to measure progress in achieving breakthroughs by simultaneously pushing advanced technologies and systems innovations. The first wave of electronic design automation (EDA) companies grew out of a

set of **DARPA** projects in **VLSI**. This was also the "golden age" of university-based **VLSI** design projects that used government-funded access to foundries for **IC** prototyping. Currently there are several **DARPA-**

and **MARCO-**funded research projects that have re-kindled the kind of excitement and activity level reminiscent of the **VLSI-era**. The table on the facing page gives a list of projects that have special relevance to the **CIS** research agenda.

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The exciting point about the current projects, like their pre-

decessors in the **VLSI-era**, is the synergy between challenges of designing new systems and simultaneously pushing the technology base, supporting design tools and methodologies. These projects include heterogenous integration of system functions, and they exploit spectra from radio to optical frequencies. Such projects also push the researchers—students and faculty alike—to address system-scale problems.

PROJECT EMPHASIS NETS REAL-WORLD GAINS

On September 11, I was in Greece, following a conference in Athens, and strolling on the island of Mykonos. After seeing the situation in New York on TV (with no English available), I was anxious to call our family. For the next twenty four hours, like many other travelers, we faced a global communications "gridlock." Our first contacts came via very expensive satellite phone calls from the ship we were traveling on. Over the next week-and-a-half while trying to get home I thought a lot about communications systems in a global context. Ultimately it was Internet-based logistics that were the quickest and most reliable paths to information and for making arrangements to return home. My experience cer-

AN INTEGRATED SYSTEM FOR LEARNING

Looking at the teaching mission of our top research universities, the use of projects in classes is the most effective way to encourage students to integrate and apply their learning experience. In such classes, graduate students routinely spend one or two intense weeks designing something—either hardware or software—

to meet specifications that are craftily prepared by the professors to make trade-offs inevitable. That is, meeting all the specifications is virtually (if not actually) impossible. And as faculty, we are delighted when students prove us wrong.

Currently Stanford's Electrical Engineering Department is revising its undergraduate curriculum. In very much the spirit of the graduate program, there is a strong interest in using integrated projects to help motivate the students and provide a very



National Semiconductor's NatCar engineering design competition challenges students to solve problems in electronic systems integration through the construction of a 1/10 scale electric car.

real context for the learning experience. Several years ago the faculty at CMU, mentored by **Professor Stephen Director** (now Dean of Engineering at the **University of Michigan**), used a programmable electronic robot kit as the educational vehicle for introducing electronics. I recently had the pleasure of hearing another such success story from **Professor Terri Fiez**, Chairman of Electrical Engineering at **Oregon State University**, again based on a programmable robot theme. The new twist that Terri and her colleagues added was to broaden the project concept to become a "learning platform." That is, the project didn't end with the introductory course but allowed modularity and flexibility to allow the platform to evolve and to become more sophisticated as the students moved through their upper division courses.

The above discussion is intended to put in context this exciting new venue that has emerged, both for graduate and undergraduate education. Whether the projects are "DARPA-scale" intended to effect paradigm shifts, or projects that help solidify the educational process, the educational enterprise and industry are extremely well-served by means of such ventures. Stanford's CIS is blessed to have industrial partners that support such project- and platform-based research and education. We thank you for your ongoing support of such efforts; this discussion may also inspire you to help us take this vision to still more exciting levels. □

MARCO Focus Center Research Programs

An overview of MARCO (Microelectronics Advanced Research Corporation) can be found at <http://fcrp.src.org/>. The programs listed below have particular relevance to CIS.

GIGASCALE SILICON RESEARCH CENTER (GSRC)

Lead Institution: U.C. Berkeley
(*Jan Rabaey*)

Focus: High-level system design methods and circuit fabrics to increase design efficiency.

URL: <http://www.gigascale.org>

INTERCONNECT FOCUS CENTER (IFC)

Lead Institution: Georgia Institute of Technology
(*Jim Meindl*)

Focus: Hierarchy from materials to circuit and system concepts to sustain growth in communications bandwidth.

URL: <http://www.ifc.gatech.edu/>

MATERIALS STRUCTURES AND DEVICES FOCUS CENTER (MSD)

Lead Institution: Massachusetts Institute of Technology
(*Dimitri Antoniadis*)

Focus: Demonstration of new devices and materials to sustain growth in nano-structures for high performance systems.

URL: <http://www-mtl.mit.edu/MSD/>

CENTER FOR CIRCUITS, SYSTEMS AND SOFTWARE (C2S2)

Lead Institution: Carnegie Mellon University
(*Rob Rutenbar*)

Focus: Explore circuits and integrated (hardware and software) system concepts that exploit advanced device/interconnect structures as well as heterogenous technology.

URL: <http://www.C2S2.org/> □

Fall Advisory Committee Meetings and Roundtables

Last November, CIS partners and other invited guests convened at CIS for the Fall 2001 Advisory Committee Meetings and Roundtables. Despite some absences due to transportation difficulties following the events of September 11th, the meetings were well-attended, and featured many good exchanges between CIS companies and the Stanford community.

Kicking off with the now-traditional CIS Mixer on November 12th, partner companies **Agilent**, **Applied Materials**, **IBM**, **Intel**, **National**, **Varian**, and **Hewlett-Packard** set up informational tables and got a headstart meeting



with students. Also in attendance were representatives from **Panasonic** and **Texas Instruments**. Fittingly, the EE201 talk that preceded the mixer featured CIS Executive Director Richard Dasher's talk, "University-Industry Relations and CIS."

On the first official day of the meetings on November 13th, attendees were given a window into some of the cutting-edge research being done at Stanford, including several presentations by new faculty members. At the dinner talk that evening, former U.S. Secretary of Defense **William Perry** provided insights into the events of September 11th, and their effects on U.S. policy.

The second and final day of the meetings featured updates on CIS-funded research, posterboard presentations by Ph.D. candidates, and the business meeting for CIS Advisory Committee representatives. A comprehensive list of posterboard presentations and a streaming video and slide archive of the first day's talks is available to company members at <http://www-cis.stanford.edu/events/events2.html>.



From left to right above: Bob Weissman of Agilent talked with Faculty Panel participant Gary Baldwin of U.C. Berkeley, along with two other Agilent researchers.

Right: At the AdCom dinner on November 13th, Professor William Perry, former U.S. Secretary of State, provided an insider's perspective on the response to the September 11th attacks and their lasting effects.



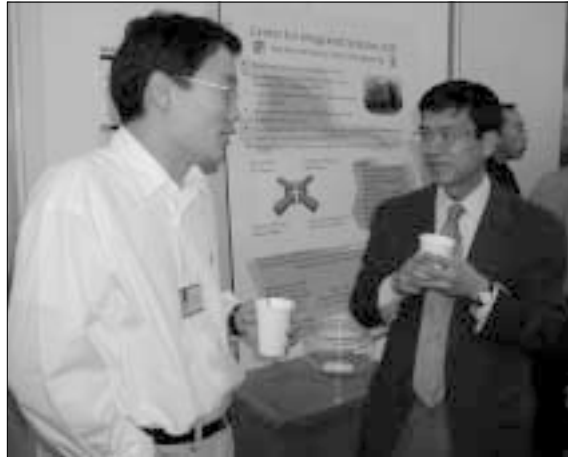
Above left: Ph.D. candidate Frank O'Mahony, a student of Prof. Simon Wong, talked with Intel's George Bourianoff about his posterboard presentation, "10-GHz Clock Distribution Using Standing Waves." Below: CIS Director of Research Bob Dutton led the faculty panel and audience members in discussion following the first day's talks.



Hitachi-Stanford Day

On February 11th, CIS hosted its third Hitachi-Stanford Day, which was also the sixteenth such event in Hitachi's decades-long relationship with Stanford.

Featuring presentations by Hitachi researchers and several advanced Ph.D. candidates from Stanford, the event was capped off by the EE201 talks by **Dr. Michiharu Nakamura**, Hitachi Corporate Officer, and



President of the Research and Development Group, and **Dr. Eiichi Amada**, Senior Vice President and CTO of the Research and Development Division, Hitachi America, Ltd. Above, Ph.D. candidate **Jaeha Kim** talks with a Hitachi researcher during a coffee break following his presentation. At left, Dr. Nakamura gives his EE201 presentation.

CIS Hosts EE201 Reception for Intel

On October 8th, CIS hosted a reception following the EE201 talk "Evolution of the Microelectronics Industry" by **Jai Hakhu**, Vice President of Intel's Technology and Manufacturing Group. Many of the approximately two hundred and fifty students who



attend the EE201 lectures joined Dr. Hakhu and other Intel researchers like Stanford alum **Todd Erdner** at the reception. Students enjoyed the opportunity to talk one-on-one with the Intel researchers. Above, Dr. Hakhu is pictured talking with newly admitted Masters student **Ammar Nayfeh**.

CIS Kudos

PROFESSOR JOHN CIOFFI (EE) was the 2001 recipient of the IEEE Koji Kobayashi Computers and Communications Award for his pioneering work in the development and commercialization of asymmetric digital subscriber line technology.

PROFESSOR WILLIAM DALLY (EE/CS) has been elected a Fellow of the IEEE for his contributions to parallel computing and interconnection networks.

ASSISTANT PROFESSOR DAVID GOLDHABER-GORDON (Physics) has been awarded the 2002 George E. Valley Prize for the discovery and elucidation of the physics of the Kondo Effect in Single Electron Transistors.

PROFESSOR STEPHEN HARRIS (EE) has been awarded the 2002 Arthur L. Schawlow Prize in Laser Science by The American Physical Society for his outstanding contributions to fundamental and applied research into laser sources, nonlinear optics, extreme ultraviolet laser sources, and laser physics.

ASSISTANT PROFESSOR KRISHNA SHENOY (EE) has been selected as an Alfred P. Sloan Research Fellow. This is an extraordinarily competitive award, involving the nomination of many outstanding young scientists and engineers from throughout the nation.

PROFESSOR BALAJI PRABHAKAR (EE) has been awarded the Rollo Davidson Prize by the Rollo Davidson Trust at the University of Cambridge for his achievements in stochastic network theory applied to communication networks.

PH.D. CANDIDATES HAEBUM LEE AND TING-YEN CHIANG shared the best paper award at the 2002 IEEE Interconnect Technology conference. **CONGRATULATIONS TO ALL!**

Steeple, Research Centers, and Future Directions of Stanford Research¹

From Richard Dasher
CIS Executive Director



Stanford University's strategy for faculty recruiting has often been summed up with the phrase "steeples of excellence," coined by **Prof. Frederick Terman**, Dean of Engineering (1944-58) and Provost of the University (1955-65). Since Stanford could not possibly hire a professor in every academic subdiscipline, it would find and recruit outstanding individuals whose research would likely have an impact on the direction of a technology, or indeed, an entire field.

At Stanford, such a "steeple" typically stands on two different foundations: an academic department and one or more interdisciplinary research centers. Inside the university, research centers form a second organizational matrix alongside academic departments and degree-granting programs. Academic departments make the determinations about hiring and tenure of faculty, and about the admission and graduation of students. Research centers provide funding resources to faculty that enhance their ability to do research, and strong human networks with industry that promote the transfer of university knowledge to applications outside of academia.

AN EPOCHAL CHANGE

Stanford is in the midst of an epochal change that may rival the birth of microelectronics out of radio engineering in the 1950's. For example, up to one-third of the faculty positions in Electrical Engineering may turn over within the next five years as the current generation of professors reaches retirement. Who will be the new "steeples of excellence"? What will be their research areas?

Research centers provide an insight into these questions, because they represent an important stage between a vision of the future and a future implementation. The initial vision may come from industry sponsors or from the university, and it is typically formulated without consideration of traditional academic boundaries. New visions for university research are often interdisciplinary. When a vision takes on the form of a research center, it means that both the university and industry have committed themselves to it. Funding resources from industry

are often matched with human resource commitments (professor billets) from the university's academic departments. Thus, in a research center, one sees not only a shared vision of future research directions,

but also the initial stages of a particular path of evolution in the academic fields involved. And, this brings us back to the "steeples of excellence."

MULTIDISCIPLINARY INITIATIVES

Dean of Engineering **James Plummer** has recently announced several major new multidisciplinary initiatives for the School of Engineering; these

include photonics, bio-engineering, materials and nanofabrication, and energy/environment. The photonics initiative has already resulted in a new research center, the **Stanford Photonics Research Center (SPRC)**, which held its first public program in September 2001. The vision behind the new "**Bio-X Program for Bioengineering, Biomedicine, and Biosciences**" will be implemented both through a new industry-funded research center and through a new academic department, which was announced in spring 2002. This new department will be the first ever at Stanford to be organizationally affiliated with two different schools: Engineering and the School of Medicine. In materials and nanofabrication, Stanford plans to adopt the open model of the **Stanford**

While no one can thoroughly predict the future, the speed of technological progress and ever-more-severe economic constraints on R&D mean that universities and industry increasingly must work together to bring their new visions to reality.

STANFORD PHOTONICS
RESEARCH CENTER (SPRC)
[http://www.stanford.edu/group/
SPRC](http://www.stanford.edu/group/SPRC)

BIO-X PROGRAM FOR
BIOENGINEERING, BIOMEDICINE,
AND BIOSCIENCES
<http://biochem.stanford.edu/biox>

Nanofabrication Facility in creating several new experimental and computational laboratories. The energy/environment initiative represents the highest-stake vision of the four; it focuses on developing technologies that will promote the sustainability of life on earth.

Perhaps with a shorter time depth, projects at existing research centers likewise provide insights into Stanford's future. CIS has recently seeded several research projects related to various aspects of nanotechnologies and neuro-electronics, as well as continuing to fund less exotic projects in device, circuit, and systems design, technology, and integration. Analog-related problems, even in digital systems, continue to be of particular interest, as feature sizes scale downward and operating speeds scale upward.

While no one can thoroughly predict the future, the speed of technological progress and ever-more-severe economic constraints on R&D mean that universities and industry increasingly must work together to bring their new visions to reality. Research centers will thus continue to play an important role in implementing many of the new visions for the university's future. □

¹ An earlier version of this article appeared in the *MEPTEC Newsletter*, Volume 6, Number 1, January/February 2002.

Distinguished Lectures and Technology Leaps

In recent months, the Center for Integrated Systems has added streaming video to our website to help bring CIS events to our members across the country and the globe. Spurred by the transportation difficulties following September



Prof. Hans Queisser with Bosch's Manfred Moellendorf

11th, CIS posted an archive of videos and slides of the November Advisory Committee Meetings for use by our partner company representatives who were unable to attend in person.

Separate from the AdCom videos, CIS is cooperating with **SemiZone**, the online semiconductor education resource, to make other talks of interest available online. The talks include "Distinguished Lectures" by established members of the engineering community, and "Technology Leaps," which feature innovative research of interest to our member companies and the Stanford community. Both types of talks are available in Media Player format on SemiZone's site, which can be accessed through the CIS Events page at <http://www-cis.stanford.edu/events/events2.html>.

Current offerings include **Professor Hans Queisser's** Distinguished Lecture, "Bringing Silicon to the Valley." Professor Queisser was a founding director of the **Max-Planck Institute for Solids** in Stuttgart, Germany, and until recently was a visiting professor at **U.C. Berkeley**. His talk on December 11th was instigated by **Manfred Moellendorf** of **Robert Bosch Corp.**, where Prof. Queisser serves as a member of the industrial board. Many "founding fathers" of Silicon Valley were in attendance on the day of the event, which featured a lively discussion of the early days of the Silicon boom.

Professor Mark Lundstrom of **Purdue University** impressed audience members with his informative and engaging January 28th talk, "FETs at the Frontier: Physics, Limits, and Options." This "Technology Leaps" seminar generated much interest and discussion among audience members. Prof. Lundstrom was extremely generous with his time, talking one-on-one with CIS company members after his presentation, and with Stanford students for several days following the event.

Many thanks to both Prof. Queisser and Prof. Lundstrom for coming to CIS, and for allowing us to make their talks available to a broader audience. Stay tuned to the CIS Events page for more additions to the video archive. □

NISHI TO LEAD SNF *cont. from front cover*

from **Waseda University** in Japan, and a doctorate in electronics engineering from the **University of Tokyo**. He is a Fellow of the **Institute of Electrical and Electronics Engineers (IEEE)**, the 1995 IEEE Jack Morton Award winner, and the 2002 Robert Noyce Medal recipient. □

NISHI'S LONG ASSOCIATION WITH CIS

We asked Prof. Nishi to provide some comments about his long-term association with CIS, and his vision for CIS's role in the future.

“The first time I had some interaction with CIS was in the early 80's, when **Professor Jim Meindl** visited **Toshiba** and shared his vision for CIS with us. This was followed by more direct interaction with CIS after I joined **HP** in '86. **Professor John Linvill**, then Director of CIS, and I talked on many occasions about how CIS and industry could create even more synergy through some kind of new coupling mechanism. The FMA program was one such idea. Fortunately, **Professor [Krishna] Saraswat** and one of his students, **Tim Schreyer**, and I were able to try such

an interaction, and this later became the FMA program. We met every Friday at 5:00 pm for about two hours and discussed advanced interconnect at low temperature for very high speed signal transmission, Tim's thesis subject. It was very exciting, and he made good progress. I certainly enjoyed it.

One view about which Professor Linvill and I agreed was that one could think of the Bay Area companies as one large diversified corporation, with Stanford playing the role of central research. Today, increasingly, more companies rely upon universities for advanced research, especially when new materials are involved. Industry simply cannot afford to do everything within a company any more; more positively, we see more diversified talents interacting effectively within the university environment and coming up with new ideas. **TI** is perhaps one of the pioneers to have recognized this situation, and we adopted TI's R&D model based upon it. Moreover, the progress of CIS programs in the last few years is even more encouraging. I look forward to seeing further progress with a broader talent base going forward.” □

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