UW EE CURRENTS

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This Newsletter appears three times per quarter. Please send any suggestions or comments to the editor, Veronica Young, at veronica@ee.washington.edu

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Professor Akira Ishimaru
1999 Recipient of IEEE Heinrich Hertz Medal

At its November 15th meeting in New Brunswick, New Jersey, the Institute of Electrical and Electronics Engineers (IEEE) announced that Professor Akira Ishimaru is the 1999 recipient of the Heinrich Hertz Medal.

IEEE's Heinrich Hertz Medal

The medal is named in honor of the renowned scientist whose experiment verified Maxwell's theory and proved that all forms of electromagnetic radiation are propagated as waves at a finite velocity—the speed of light.

Professor Ishimaru

This medal was established by the IEEE in 1987, as a centennial recognition of Hertz's experiments, which took place from 1886-1891. It is awarded "for outstanding achievements in Hertzian (radio) waves." It may be presented annually to an individual for achievements which are theoretical or experimental in nature, and which have been achieved in any year preceding the award.

The award consists of a gold medal, a bronze replica, a certificate and ten thousand dollars. Formal presentation of the award to Professor Ishimaru will take place in London during the summer of 1999, at the IEEE Honors Ceremony.

## UW-Led Group Awarded $4.7M To Fight Blackouts

A consortium of four universities, led by the Advanced Power Technologies (APT) Center of the EE Department of the University of Washington, has received funding from the Department of Defense and the Electric Power Research Institute (EPRI) for a research project entitled 'Innovative Technologies for Defense Against Catastrophic Failures of Complex, Interactive Power Networks.' Other universities in the consortium are Arizona State University (ASU), Iowa State University (ISU), and Virginia Tech (VPI).

The UW-led team was one of six to receive funding. Approximately 30 proposals responded to the announcement on "Complex Interactive Networks/ Systems Initiative". The lead institutions of the other teams were Cornell, Harvard, Cal Tech, Carnegie Mellon, and Purdue.

Widespread catastrophic failures of the electric power infrastructure can be extremely disruptive to our society. In the August 10, 1996 outage in the western United States, 4 million people in 9 states were affected. The APT Consortium will develop a fundamentally new systems approach to

the problem. It takes advantage of new and emerging techniques in information theory, sensing, control and optimization, intelligent systems, signal processing, and economics.

The APT Center Director is EE Professor Chen-Ching Liu. Other UW faculty participants are Professors Mark Damborg, Mohamed El-Sharkawi, Ming-Ting Sun, and Jenq-Neng Hwang from Electrical Engineering and Steve Tanimoto from Computer Science and Engineering.
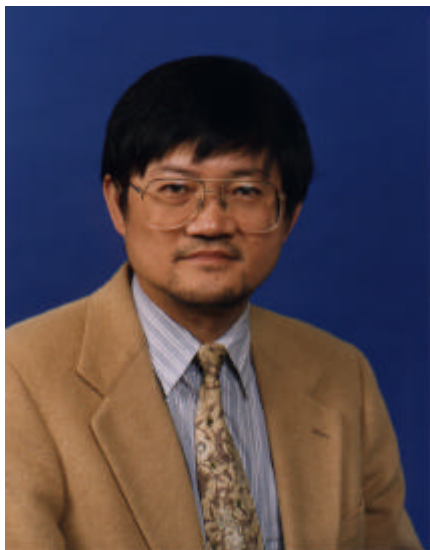
Chen-Ching Liu, APT Center Director

The 4-university APT team proposed a total budget of $3.75 million over a 5-year period; optional tasks will be performed with an additional funding amount of $1 million. The funding will be matched by a total of $973k from the APT institutions.

Circuits, Circuits
EE Faculty Active in Analog-Digital Design

The UW EE department is an active participant in an effort to keep the US electronic industry on the cutting edge of analog and analog/digital circuit design. CDADIC (The Center for Design of Analog-Digital Integrated Circuits) is an industry-university research consortium that is part of the National Science Foundation's IUCRC (Industry-University Cooperative Research Center) program. Its headquarters are located at Washington State University. Other affiliated universities include Oregon State University and the State University of New York at Stony Brook.

CDADIC's mission is to advance the state-of-the-art for design tools, testing techniques, and circuit design methodologies for analog and analog-digital integrated circuits.

Carl Sechen is active in CDADIC, and serves as CDADIC's Co-Director from the UW. Other EE faculty members active in CDADIC include Bruce Darling, Richard Shi, and Denise Wilson.

CDADIC projects for FY 99 include "An Adaptive Technique for A/D Conversion on the Focal Plane" (Wilson, Sechen), "Deep Submicron Analog Layout Automation for Performance and Manufacturability" (Sechen, Shi), and "Ultra High-Speed Digital Circuit Synthesis and Layout" (Sechen).

Carl Sechen, Co-Director of CDADIC

EE Professor Peter Lauritzen says, "I feel that working with CDADIC for the last nine years has been the highlight of my career. I have particularly enjoyed doing university research projects having a major design component like the compact modeling work with CDADIC support."

Mani Soma, EE professor and associate dean of organization and infrastructure of the College of Engineering, was a faculty member active in the development of CDADIC at the University of Washington. He urged Lauritzen to merge his own efforts involving compact model development for power devices with CDADIC, while the latter was in its infancy. "The rest", according to Lauritzen, "is CDADIC history."

CDADIC currently has 24 industrial sponsors and that number is expected to increase, due to the addition of new faculty with circuit design interests at the participating universities.

Chizeck Delivers Duisburg-Seattle-Siemens Lecture

Professor Chizeck visited Gerhard Mercator University in Duisburg Germany during the week of November 9 - November 13. The purpose was to renew ties between that university and the Electrical Engineering Department of UW and to explore opportunities for future cooperation. Duisburg is a small town in the Ruhr, near Dusseldorf. Formerly known principally for steel making, this region of Germany (and the nearby area in the Netherlands) is now a leader in electronic and computer technologies.

On November 11, Professor Chizeck presented the annual *Duisburg-Seattle-Siemens Lecture* at the university. The title was "Fuzzy Logic Methods and Biomedical Control." The Duisburg-Seattle-Siemens lectureship alternates yearly, between the University of Washington and Gerhard Mercator

University. It is supported by funds from the Siemens Corporation.

The Duisburg host for this visit was Professor Paul Frank, head of the Control Technologies laboratory at the University. Professor Frank arranged a very full 'around the clock' itinerary which included tours of the university's EE labs and facilities, meetings with various faculty and university officials, expeditions to clean room and advanced technology facilities (the Center of Semiconductor Technology and Optoelectronics, and the Fraunhofer Institute for Microelectronic Systems), meetings with technology transfer staff and local "spinoff" companies in Duisburg, attendance at the university's annual Research Day, an interview with the press (related to the lecture), and formal presentation of the university medallion in a meeting with the university rector. The itinerary also included a large number of excellent meals at restaurants in the Duisburg and Dusseldorf area.

A medallion containing the seal of Gerhard Mercator University, given to Prof. Chizeck in November.

Weekly Department Social Hour

Resumes Friday January 8 in the EE Atrium
3:30–4:30 pm

History of Partnership Between UW, University of Duisburg

The partnership between the UW and the Gerhard-Mercator-University of Duisburg has its roots in the early 1970's. UW Prof. Endrik Noges spent his sabbatical year in Duisburg in 1972-73, and GMU Prof. Paul Frank came to Seattle in 1974-75. Friendships developed between Frank and UW EE Professors Noges, Robert Clark, Jonny Andersen, John Bjorkstam, Rubens Siegelman, Mohamed El-Sharkawi, Bob Albrecht, Dan Dow, Mark Damborg, and Frank Alexandro. When Professor Frank became responsible for the international affairs of Gerhard-Mercator-University in 1980, he sought to develop a formal cooperation between his school and UW. A formal agreement was established in 1981.

Since that time there have been activities between the two schools involving the departments of electrical engineering and also mechanical engineering, aeronautics, physics, economics, germanics, mathematics, and social sciences. A number of EE professors (Clark, Lytle, Andersen, Siegelman, Venkata) have spent their sabbatical leaves in Duisburg since the origination of the program. Approximately thirty students from Duisburg have earned their master's degree from the UW Department of Electrical Engineering.

Professor Frank remarks that "I hope that our vision … has become a substantial factor in the scientific activities and education of our two universities, (and that) the next generation will take this opportunity and continue with new visions and maybe more success for the benefit of the science and education in our two countries, and most of all, for the benefit of young people."

EE Students Toby Wu Grant Kobayashi, Receive Mary Gates Award

Electrical Engineering students Grant Kobayashi and Toby Wu have been awarded a research training grant from the Mary Gates endowment. Kobayashi has been participating in research under Professor Yongmin Kim while Wu has been working with Professor Celeste Berg in Genetics. Past Electrical Engineering students who have received the endowment are Chris Hlvick, John Liptac, Peter Mattson and Joel Reiter.

This award provides support for outstanding students, enabling them to more fully pursue their undergraduate careers. The next research training grant competition will be held during Spring quarter. Additional information about the Mary Gates Endowment for Students research training grant program may be obtained by contacting Kim Johnson-Bogart at 616-7175 or by writing to urp@u.washington.edu.

Chizeck Named IEEE Fellow

One measure of the quality of a department is the number of faculty who have been recognized by professional societies for their contributions. The EE department at UW has a large number of IEEE Fellows, and has just gained one more. Professor and Chair Howard Chizeck was recently named a fellow of the IEEE. Chizeck's citation states that the award was given "For contributions to the use of control system theory in biomedical engineering." Other EE professors who have received this recognition include:

Akira Ishimaru, 1973, "For contributions to the theory of antennas and wave propagation, and to electrical engineering education"

James Meditch, 1976, "For contributions to the development and application of estimation theory"

Sinclair Yee, 1979, "For contributions to the development and application of biotransducers using hybrid technology"

Robert Haralick, 1984, "For contributions in Computer Vision and Image Processing"

Leung Tsang, 1990**,** "For contributions to wave propagation in random discrete scatters and the theory of microwave remote sensing"

Mohamed El-Sharkawi, 1994. "For contributions to the application of neural networks to power system analysis"

Chen-Ching Liu, 1994, "For contributions to development of knowledge-based systems for power system applications"

Robert J. Marks, II, 1994, "For leadership in and contributions to the field of neural networks"

Yongmin Kim, 1996, "For development of new techniques in medical imaging, computer modeling of the human body, picture archiving and communications systems (PACS), and the transfer of novel technology to industry"

Linda Shapiro, 1996, "For contributions in the theory of relational matching and its application to model-based computer vision"

The award of IEEE Fellow is one of unusual professional distinction conferred only by the Board of Directors upon a person of extraordinary qualifications and experience.

Developing An Interactive Virtual Classroom

Washington's population growth is among the highest in the nation, and with this increase in population comes a dramatic rise in the growth of the college age population As the number of young people pursuing a college education increases (nationally, 67% of high school graduates in 1997) and the changing economy requires those already in the workplace to upgrade their skills or choose new career paths, the need for access to higher education has risen at a rate that necessitates a re-thinking of the way in which our students are receiving their education.

The University of Washington has established two branch campuses, located in Tacoma and Bothell, which enable students who reside outside the Seattle hub to learn with fellow students and professors in the same room. Currently the UW has three degrees available through distance learning, and is looking to develop six more by 2000-01. Electrical Engineering Professors

Professor Jenq-Neng Hwang

Jenq-Neng Hwang and Ming-Ting Sun are hard at work developing ways to improve access for students through distance learning .

With progress in digital media compression, internet connectivity, affordable personal computers and low-cost PC video cameras, distance learning opportunities are becoming accessible to a large number of students. Thanks to a generous equipment donation from Intel and the financial support of the NSF ECSEL program, Professors Hwang and Sun at the Information Processing Laboratory of the EE Department have jointly developed a real-time interactive virtual classroom, which allows remote participants not only to receive a live class feed but also to interact in a live class by asking questions.

Professor Ming-Ting Sun

It is important to realize that a virtual classroom distance learning environment is not the same as a passive video broadcast system, neither is it a multipoint video conference. Distance learning services and products (such as from Stanfordonline, RealNetworks, Microsoft Vxtreme and Microsoft Netshow) allow real-time streaming broadcast of live contents (classes or lecture talks for the distance learning systems) or on-demand streaming of pre-stored contents. On the other hand there are various video phones, video conferencing and net meeting software

tools on the market (including Intel's Video Phone, White Pine's Enhanced CU-SEEME, Meeting Point, and Microsoft NetMeeting) which support real time interactive two-way communications. With affordable audio/video capture cards and cameras, as well as progress in low bit rate coding, phone-line modem users can participate in a video (and audio) conference at 56 Kb/s or lower. It is thus highly desirable to combine these two types of services and provide a virtual distance learning classroom which is interactive.

A virtual classroom environment aims at simulating the real classroom for the remote participants. In the normal course of a class, a remote participant will receive the live class feed. A remote student can participate in the class by asking questions via the local video camera hooked up to a PC with modem or LAN connections. This video can immediately be broadcast to all other remote participants .

All the participating terminals can passively receive live class broadcast and actively communicate in a point-to-point fashion with the control unit. If there is no local video camera at a site, it is possible to maintain a central database of currently registered remote participant students for the class and to display their pictures during the time

when their audio is being transmitted. The control unit also handles the job of recording the live interactive sessions. The live class is available afterwards as a stored on-demand course.

A large number of instructors use electronic presentation material in their classes. During the course of the lecture the instructor flips these slides according to the flow of his narrative. The flipping times are not known a priori. Low bit rate video encoding standards are not effective in encoding the slides used in a typical classroom. Professors Hwang and Sun have designed and developed a real-time interactive web based presentation system, called **slidecast**, to overcome this drawback. Currently a few web presentation systems (e.g. Contigo's Itinerary Web Presenter 2.1) exist. However they are restrictive and lack the features which are required for a distance learning environment. In the EE@UW system the instructor will select an appropriate slide URL on the server when the next slide is to be shown. The remote participant's client (a Java applet in a web browser) will automatically flip the slide to the new one every time it is flipped by the instructor. The instructor can also draw, mark or point on the slides in real-time and the same drawings, markings or pointers will appear on the client's slides. The markings are retained so that the instructor can go back and forth between the slides. Markings can also be cleared at any time.

The system will allow the instructor to send text instructions to the remote students. Similarly students can interact in real time by asking questions, or by sending text to the instructor in real-time. A private chat between students is also available. The system will also be capable of handling late arrivals, i.e., those remote participants who join the session in the middle. They will get all

the slides already shown along with the markings and text which have been sent in the class session.

It is also possible to use the slide presenter server as a whiteboard controlled by the instructor. Hwang and Sun found that a video of this writing (either on whiteboard or paper), when compressed at low bit rates using current low bit rate video coding techniques, results in a decoded video in which the written material is not very legible. They have formulated a new scheme suitable for coding the handwritten text in a more efficient and robust way, by utilizing and extending still image coding algorithms. This allows coding switches between video of instructor's face and the images of the written text. The video of the handwritten text typically need not be sent at a very high frame rate. This is because the speed at which an instructor writes is restricted. This will also result in a lower required bit rate. It is also possible for those remote participants with a very low connection speed to receive only the audio and the slides (electronic and handwritten).

Kim's Chip Debuts in Vegas
New Processor Platform For Video, Multimedia and DTV Products

Las Vegas, Nevada was the site for the recent public demonstration for the MAP1000, a new programmable media processor platform for building a variety of digital media and imaging products including set-top boxes (STBs), image processors, high-definition digital televisions (HDTVs), digital televisions (DTVs), video editors, and printers/copiers. This processor is the result of a four year development project between Equator Technologies, Inc., Hitachi, Ltd, and Professor

Yongmin Kim at the University of Washington. Professor Kim was first approached about the concept by Hitachi in September of 1994. In April 1996, Equator Technologies was formed and became involved in the joint development project.

One of the unique features of the MAP1000 is a powerful data transfer engine alongside a powerful 200MHz VLIW CPU that can perform 3.2 billion MAC 16-bit multiply/add operations, 1.6 billion 32-bit floating-point operations, and 20-billion pixel-level operation per second.

Professor Yongmin Kim

The combination of advanced, mature compiler technology and the innovative MAP 1000 processor architecture will greatly benefit consumer electronic and high-end imaging applications such as:

- image processing equipment used in medical applications, machine vision and remote sensing,

- video equipment used in video editing, surveillance products and HDTV encoders,

- end color copiers and other office automation products,

- wireless and wire-line communications servers (including cellular base stations and multi-line DSL/Modem servers), and

- next generation DTVs and STBs.

The processor will be available commercially in 1999.

EE Faculty Notes:

Deirdre Meldrum was elected to the IEEE EMBS (Engineering Medicine and Biology Society) Advisory Committee as the Region 6 Representative for the term 1999-2000.

Sumit Roy has been appointed to the Royalty Research Fund Review Committee beginning with the Autumn 1998 round of competition. The Committee is responsible for reviewing the proposals that are submitted and recommending to the vice provost for research the highest ranked proposals that should be funded. His tenure on this committee will conclude in June 2000.

Sinclair Yee has had a patent issued based on his work, entitled "Optical Lightpipe Sensor Based on Surface Plasmon Resonance".

EE Faculty Press Exposure:

- **Professor Marty Afromowitz** was quoted in *The New York Times'* November 5th article entitled "Behind Smart Bathroom Fixtures: No Genie, Just Technology".

- **Professor Afromowitz** received more press in a December 7th *Seattle Post-Intelligencer* story on faculty salaries entitled "Paying the Price".

- **Associate Professor John Sahr'**s work on rock-n-roll radar was the subject of an article in *Wired News'* December 16th edition.

Kudos

These EE graduate students have recently passed their qualifying exams:

Jinhun Joung

Selim Aksoy

Tsung-Hsing Yu

Chank Ick Kim

Ming Ye

Waisiu Law

Winyu Chinthammit

Suree Pumrin

Sang II Lee

John Rhodes Thomas

Seung-Woo Lee

A Warm Welcome to the Newest Member of the EE Team:

Stephen Lee	**Technical Support**
Paul Lausen	**Admin Support**
Mohan Saini	**Genomation Lab**
Sekar Thiagarajan	**Computing**

EE Professor Richard Christie Reports On Sabbatical Year in Norway

EE Associate Professor Richard Christie returned to the University of Washington for fall quarter, after completing a one year professional leave spent at the Norwegian University of Science and Technology (NUST) in Trondheim and the associated research institute, SINTEF Energiforskning (SEfAS).

Christie had the opportunity to learn about energy deregulation, as practiced

in Norway and Sweden. Norway, he notes, was one of the first two countries in the world to deregulate their electric power systems, a model that is a leading contender for adoption in other countries now embracing deregulation, the United States included.

"This knowledge," says Christie, "has provided me with a desire to share [such] information in teaching both undergraduate and graduate level power engineers about the subject, preparing them for productive careers in the reshaped electric energy industry rapidly emerging in this country and hopefully to spark their interest in helping to define some of the shaping."

During his sabbatical, Christie identified a significant issue concerning transmission reinforcement to both the national utility in Norway and the national regulatory agency. This resulted in three collaborative archival publications.

EE Professor Rich Christie Enjoys A Traditional Norway Vacation

In addition, Professor Christie visited Alta, a town hundreds of miles above the Arctic Circle. Near Nordkap, the furthest northern part of Norway, he caught sight of the northern lights on a cold, clear night. He also had the opportunity to take a ski-tour through the Trollheim mountains during Easter week, but reported seeing no trolls during this traditional Norwegian ski vacation time.

Chair's Message

Howard Jay Chizeck

Midst these short but very busy days of finals and grading, end-of-quarter tasks, holiday shopping, family visits, festive parties, winter sports and next-quarter preparation, I would like to encourage you to take a few moments to reflect upon the positive achievements of our faculty, staff and students during the past few months. There is good reason for pride and celebration. I would like to thank all of you for your efforts and assistance, and for the welcome that you have given to me and my family.

The next year will be a time of great change in the department. This is change you all are invited to help plan and implement.

A full review of our curriculum is underway, at both the undergraduate and graduate level. The review at the undergraduate level is not motivated only by the ABET accreditation visit (Fall 2000). It is essential to insure that the undergraduate program we offer is comprehensive and of the highest quality.

During the next quarter, we will begin a strategic planning process that will help to guide the department's future growth and development. We will formulate our best estimate of technological developments in electrical engineering during the next 5-10 years, as well as anticipated changes in educational needs and tools, and the external funding environment for research. We will then seek to position the department's research and educational activities to take advantage of these

changes. The strategic planning activity will involve input from our research partners, from students and from staff-- as well as from faculty. I urge you all to participate in this process, as it unfolds.

The faculty search committee is making good progress in evaluating applicants for our seven new faculty positions. We have already received an outstanding collection of applications. Candidate visits will begin in January. At the time of this writing, faculty candidate visits are anticipated on January 7 and 8, January 11 and January 29. I urge all faculty, graduate students and interested staff to attend the candidate's seminars, and to provide input to the search committee.

We are working with the college of engineering administration to address the department's space needs, which will become especially critical during the time between demolition of the old EE building and construction of Phase II space that we will share with Computer Science and Engineering. In particular, possibilities to extract more usable space from the building and to improve its space efficiency are being investigated. This may involve the construction or moving of a few walls and doors. During the coming year, our remaining activities in the old building will be moved to the new building, wherever possible. This will involve some relocation and compression of existing activities. I ask you all for your patience and understanding during this process.

In January, the Restructuring Process will enter its next stage. Based upon your interviews with our outside consultant and other suggestions, key questions and issues regarding department operations have been identified. A Restructuring Committee has been selected to coordinate a full review of our department's staff tasks and functions, staff position

requirements as well as training and resource needs. I am pleased to announce that all of the restructuring committee members have agreed to serve. They are the department administrative committee (selected by me):

Sharon Schlittenhard

Martha Kristjanson

Joles Tahara

and the following members who were selected from nominations by faculty and staff:

Helene Obradovich

James Hewitt

Pam Eisenheim

Sumit Roy

The committee is predominately a staff committee, and will provide recommendations to the faculty, the Associate Chairs and to me. Professor Roy will serve as the committee liason to the faculty, during its information gathering and deliberation stages. My sincere thanks to all of the committee members for their willingness to help.

The Restructuring Committee will examine questions such as:

•What computer and software support functions should be provided by the department, to whom should they be provided, and how should they be paid for?

•How do we change our computing and technical support operations to better accomplish the department's educational and research goals, bearing in mind the new restrictions of external funding agencies as well as the regulations of the state and university?

•How can the proposal preparation and management process be improved and expanded to reflect our sharp increase in external funding, the large number of new proposals, and our anticipated increase in faculty size and faculty research activity?

•How can we improve the delivery of advising services to our undergraduate and graduate students?

•Where should faculty administrative and clerical support be located (some on each floor? all in one place?)

•How can we implement cross-training, so that vital activities are carried out when key staff are absent?

•How can we work smarter and more efficiently?

•How can we maintain a positive and friendly work atmosphere?

Many of these and other questions involve both staffing and resources. The committee members will be requesting your help in addressing these issues, and in developing new ideas to improve our department. I urge you to work with them, for the common good.

Thanks once again to all of you who have contributed your efforts to the department during the past year. I would like to wish all of you the very best during this holiday season, and for the New Year.

May All Of You Have The Happiest of Holiday Seasons and Enjoy Peace, Prosperity, & Good Health Throughout The New Year.

Coming in January…

Department T-Shirts

T-Shirts (and possibly sweatshirts) with the department name will be sold to raise funds for the student IEEE chapter.

Final information about prices and sizes will appear on a link from the department web site.

Chair's Open Office Hours Resume Second Week of January
• *Staff* Tuesday 10-11 am
• *Faculty* Thursday 3-4 pm
• *Students* Friday 1-2 pm
Drop In! Room 253A