



# IEEE NEWSLETTER KITCHENER - WATERLOO SECTION



September 1994

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## **DR. RISTIC ON MICROMACHINING - THE CORE OF MODERN SENSOR TECHNOLOGY**

Presented by the Circuits and Systems/Electron Devices Chapter.

Time: 2.00 p.m. Friday September 9th 1994.

Place: University of Waterloo Davis Centre room DC2577.

Speaker: Dr. Lj. Ristic, Motorola Inc.

Subject: Micromachining - The Core of Modern Sensor Technology.

Speaker: Dr. Lj. Ristic is a manager and a Senior Member of the technical staff at Motorola Inc. in Phoenix where he conducts R&D activities in development of sensor technology and devices. From 1975 to 1985 he was an R&D engineer and manager at the Electronics Industry Corporation in Yugoslavia. From 1985 to 1990 he was a Professor of Electrical Engineering at the University of Alberta, where he gave courses on VLSI processing, semiconductor device physics, microsensor devices and other subjects. Dr. Ristic is the author or co-author of more than 70 scientific papers and editor of a book on sensor technology and devices.

Subject: The lecture will review basic aspects of micromachining technology including bulk, surface, and semi-bulk micromachining; direct wafer bonding; and LIGA process. Also, the application of micromachining technology will be discussed. The examples include mechanical devices such as accelerometers, pressure sensors, magnetic field sensors, and some actuators. Finally, some comments on future seamless sensing systems will be presented.

## **GEOFFREY IMAI ON INTELLECTUAL PROPERTY**

The KW Section presents the following meeting:

Time: 5.30 p.m. Wednesday, September 28th 1994.

Place: University of Waterloo Davis Centre, room DC1302

Speaker: Geoffrey Imai, of Dowling, Strathy and Henderson

Subject: Intellectual Property, Copyright and Patents

Dinner: Meet the speaker for dinner after the talk at McGinnis Landing. Please phone Rosalind Hood-Morris evenings before September 27th for reservation, at 886-4571.

Speaker: Mr. Imai is a Patent Law Specialist at the firm of Dowling, Strathy and Henderson.

Subject: The talk will cover a subject of great interest to our members who are extending the boundaries of knowledge in electrotechnology, and hence generating intellectual property. To whom does it belong? What rights are associated with it, and how can they be protected?

## **DR. RICHARD HORNSEY ON TRANSVERSE ELECTRON FOCUSING: BASKETBALL WITH ELECTRONS**

Presented by the Circuits and Systems/Electron Devices Chapter.

Time: 5.30 p.m. Wednesday October 12th 1994.

Place: University of Waterloo Davis Centre room DC 1302.

Speaker: Dr. Richard I. Hornsey, SiDIC Group, University of Waterloo.

Subject: Transverse Electron Focusing.

Refreshments will be served.

Speaker: Dr. Richard Hornsey received his Bachelors, Masters and D.Phil. from Oxford University. He spent the following year at the Hitachi Central Research Laboratory in Tokyo, developing the application of focused ion beams to the inspection and repair of semiconductor devices. He joined the Microelectronics Research Centre at the Cavendish Laboratory, Cambridge University to study the boundary scattering of electrons in two dimensional electron gases. He took up a faculty appointment in the Silicon Devices and Integrated Circuits Group at the University of Waterloo in April 1994, working on amorphous silicon.

Subject: Transverse Electron Focusing was first proposed in the early 1970s as a method for investigating the surface roughness of single-crystal metals such as bismuth. Electrons are injected into the sample from a point contact and focussed on to a similar electrode on the same surface by a magnetic field. Increasing the magnetic field leads to additional signal peaks which yield information about the roughness of the surface. More recently, analogous arrangements have been implemented in GaAs/AlGaAs heterostructures. This presentation will review the principles of transverse electron focusing and discuss its application to the study of boundary scattering of electrons.

## **UPCOMING VIDEOCONFERENCES**

by Rosalind Hood-Morris, Education Chair

You may have noticed a videoconference that was made available in May through Rogers Cable and the K-W IEEE Section. The videoconference was transmitted via satellite from California, picked up by Rogers, and broadcast on a spare Cable Channel. This enabled local sites such as the University of Waterloo to pick up the conference through a normal cable connection in a room with telephone and/or FAX services available for the interactive part of the conference. Other people could view it at home. Because of the experimental nature of this pickup, the K-W Section picked up the costs, particularly the reimbursement to the IEEE's "Seminars via Satellite" group for a reduced rate.

Rogers were very supportive of this initiative and would be interested in helping us with future broadcasts, possibly for their community channel. The next five conferences to be run by the IEEE are listed below. The problem is that the Section cannot afford to continue picking up the costs. We are therefore soliciting interest from local industry to help defray our costs in

return for participating in upcoming conferences with free conference notes. Each site would need a cable connection plus a television. We are asking for a donation of \$200.00 per conference from large companies (over 50 employees), and \$50.00 from smaller companies. For further information call me at 570-0300 x 4425 (day) or 886-4571 (evenings).

<u>Date</u>	<u>Title</u>
Oct 5	ISO 9000: a Critical Review of the 1994 Revisions
Oct 19	Maximising Productivity: Information Integration for User Productivity
Nov 9	Mechatronics
Nov 30	Maximising Productivity: Multimedia
Dec 7	Maximizing Productivity: Redesigning the Engineer and Designing for Maintainability

All conferences run from 12.00 noon to 3.00 pm unless stated otherwise. A final conference schedule and details on the time and channel will be forwarded to those who are interested.

### **IEEE STRATEGIES FOR THE FUTURE: MEETING MEMBER NEEDS IN THE 21ST CENTURY**

In 1992, volunteers and IEEE staff started development of a strategic plan to lead the Institute into the 21st century. The IEEE Strategic Planning Committee prepared a first draft of the plan in November 1992: several drafts later, and after inviting and receiving hundreds of comments from members, sections, societies and the major Boards, and review by the Executive Committee, the Planning Committee has issued a draft for consideration by the Board of Directors.

[The draft is 32 pages of single spaced typing: I have summarised the introductory sections below. I have also extracted from the rest of the document, the recommendations, goals and objectives, and will publish them in the next issue of this newsletter - Ed]

The IEEE calls itself "A Global Organization for the Electrotechnology Profession".

In this document, we set forth a vision of what the IEEE should be at the beginning of the 21st century and the goals we must reach to achieve that vision.

**Our Mission:** The IEEE promotes the development of electrotechnology and allied sciences, the application of those technologies for the benefit of humanity, the advancement of the profession, and the well-being of its members. The IEEE supports its mission by:

- fostering interchange of information
- supporting and influencing education
- encouraging members to enhance competency and competitiveness
- developing, promulgating and promoting standards world-wide
- establishing ethical standards

collaborating with governments and other organizations promoting public understanding and constructive use of electrotechnology.

The environment in which we work is changing rapidly: the cold war has ended, there is economic growth in the Pacific Rim and Europe, Eastern Europe is changing to a free market economy, trade barriers are being lowered. Attention is being paid to the impact of human activities on the global environment. Rapid progress continues in the technological environment. The IEEE faces competition from other organizations. Professionals must keep up.

The IEEE must face the following issues:

- Global interactions in a global economic system
- Environmental Consciousness
- Career Opportunities - need for initial and continuing education
- Global Standards
- Global Membership
- Competition from other organizations
- Technology Policy and the social impacts of technology need attention

The Vision

1. Meeting future challenges in Electrotechnology: people will expect the electrotechnology community to provide a means by which they can communicate with each other instantaneously, access to large volumes of information and entertainment, and transportation and other services that are safe, efficient and environmentally responsible.
2. Achieving worldwide membership growth.
3. Disseminating technical information: at the beginning of the 21st century, the IEEE should be the acknowledged leader in providing engineers and scientists around the world with the most current, complete, and accurate electrotechnology information available.
4. Improving organizational effectiveness and ensuring financial soundness.
5. Delivering products and services: the IEEE should be recognized for its excellence in providing affordable products and services.
6. Enhancing public awareness and image of the profession.

### **WALLY READ RUNNING FOR PRESIDENT-ELECT**

Wallace S. Read, one of the most distinguished Canadian members of IEEE, has been nominated by the IEEE Board as one of the candidates for 1995 President-Elect: if elected, he would become President in 1996. He has already been Secretary and Treasurer of the IEEE, and was VP for Standards. He is active in many Canadian organizations.

If all Canadian members vote for him, it might well go his way.

## CONFERENCES IN CANADA 1994

### 1994

- Sep 12-14 PCIC 94 IEEE Petroleum and Chemical Industry Technical Conference. Vancouver. S.W. Hagemoen 604/736-3381.
- Sep 13-14 AFCEA Training Technology 94 Trade Show. Kingston Ont. Richmor Enterprises 613/563-0093.
- Sep 19-21 REF 94 Fourth Reengineering Forum. Victoria. E.J. Chikofsky 617/272-0049.
- Sep 19-23 ICSM 94 International Conference on Software Maintenance. Victoria. L.J. White 216/368-2802.
- Sep 25-28 1994 Canadian Conference on Electrical and Computer Engineering. Halifax. 902/420-7717.
- Sep 28-30 IPCC94 IEEE International Professional Communication Conference. Banff Alta. P.R. Kostur 306/777-2894
- Oct 30-Nov 2 INTELEC 94 IEEE International Telecommunications Energy Conference. Vancouver. E. Parker 514/639-3030

### 1995

- Feb 20-22 MTT-S International Topical Symposium on Technologies for Wireless Applications. Vancouver. G.L. Heiter 410/647-1591, 508/960-6316.
- Feb 20-23 INTELCOMM95 - Global Telecommunication Congress and Exhibition. Vancouver. Will Fong 604/669-1090
- May 9-11 IEEE Intelligent Networks Workshop. Ottawa. Javan Erfanian 905/615-6486.
- June 4-11 1995 IEEE Holm Conference on Electrical Contacts. Montreal. 908/562-3895.
- Sep 17-22 International Symposium on Information Theory. Whistler BC. V. Barghava 604/721-8617.
- Sep 20-23 IEEE Engineering in Medicine and Biology Society. Montreal. Fernand Roberge 514/343-7515.

### 1997

- June 8-12 ICC97 International Conference on Communications. Montreal. Celia Desmond 905/615-6507.

## HIROSHI IWAI ON SUB-MICRON CMOS METHODOLOGY

by Tom East

On May 16 Professor Hiroshi Iwai gave a fascinating address to the Electron Devices Chapter on the next stage of device fabrication. Current devices use features of around one micron width, in order to obtain good performance as amplifiers and oscillators at millimetre wavelengths.

Prof. Iwai described work at Toshiba with even smaller scale features to achieve higher frequency performance, or faster action in logic devices. He pointed out that it is not adequate simply to scale everything down to, say, 0.1 micron. For example, tracks will have ten times the resistance and will become lossy and slower: this is overcome by increasing the thickness of the tracks while reducing the width.

Limitations experienced with aluminum tracks are overcome by using other materials such as silver and nickel silicide.

In twenty years' time, Prof. Iwai foresees a 100 Gbit memory on a 4 x 4 cm wafer, and a 25 Ggate circuit on a 7 x 7 cm wafer.

## REVOLUTIONARY CONCEPTS IN HUMAN/COMPUTER INTERACTION IEEE Videoconference May 18th 1994

by Rosalind Hood-Morris, Education Chair

In the words of Mat Kaplan, the moderator, this was the most visually interesting videoconference yet. The conference presentations were given by Dr. Stewart Card, who is a research fellow at Xerox Palo Alto Research Center and the Manager of the User Interface Research Group. His co-presenter was Professor William Buxton, an associate professor at the University of Toronto and Director of the Ontario Telepresence project at U of T.

Dr. Card and Professor Buxton covered what comes next after the windows/mouse/pointer interface. They talked about what new input/output techniques are changing the nature of human/computer interaction and how the workplace is being expanded into new types of augmented physical and electronic reality. The conference was to "help those of us who are mere mortals merge with the new metaphysics of modern communications".

As Professor Buxton said, "The paradigm shift is that instead of trying to fit new interfaces to existing concepts of computers, we are shaping our notions of computers to fit the new concepts of interface". The last portion of the conference was devoted to answering questions that were presented by FAX or telephone.

If anyone would like to borrow a videotape of the conference for viewing, please contact me at 886-4571 (evenings only). I only ask that you respect the IEEE copyright and consider helping to sponsor further conferences.

## **TOM LEE OF MAPLE SOFTWARE PRESENTED MATHEMATICAL COMPUTING**

by Manh Le

At the Computer Chapter meeting on May 26th, Tom Lee of Waterloo Maple Software gave a talk and demonstration on "New dimensions for mathematical computing for electrical engineers".

Waterloo Maple Software Company was rooted from the University of Waterloo. Its products have ranged from entry-level Theorist, with direct manipulation of graphical user interface, to Expressionist, with equation edit feature for MS-Windows and Macintosh. The flagship Maple V software is the symbolic engine found in various mathematical products currently available on the market including MathCad, MatLab, PV-Wave and Claris-Work. This software was originally developed at UW. It has symbolic and numeric computation, graphics and programming capabilities on different software environments including MS-Windows and UNIX.

Lee gave a brief history of symbolic computation: Altran in the 1960s, Macsyma and Reduce in the 1970s, Maple, Mathematica and Derive in the 1980s and Theorist, MathCad, Apple Graphical Calculator, Calculators and Axiom in the 1990s.

These tools impact education, particularly in engineering, and they are applied to different fields such as circuit analysis and computer-aided engineering.

A live demonstration was given on a portable 486/66 machine with colour LCD display. Symbolic computation of the transfer function of an analog control system and plotting of the root locus were demonstrated.

## **MCNAUGHTON SCHOLARSHIP AWARDED TO MARK PUNDSACK**

The IEEE Canadian Foundation has granted a scholarship to support the tuition fees of Mark Pundsack at the University of Waterloo. He was highly recommended for this award by the IEEE Student Branch Councillor for Stream A, Daniel Miller.

The Board of Directors of the Foundation "congratulates Mark for his dedication to the development of the profession". We congratulate Mark for this award.

## **JAMES FRASER OF UW WINS PRIZE**

The 1993 Undergraduate Physics Conference was held last November at the University of Saskatoon. Among the top three prize-winners for student papers was James Fraser of the University of Waterloo, for his paper "Will the Lights Come Out and Play?: Predicting Magnetic Substorms from the Ground". Congratulations!

## **COM DEV EXPERIMENT TO TEST MATERIALS IN SPACE**

ComDev Atlantic of Moncton, New Brunswick has received a contract from the Canadian Space Agency to design and build the Nanogas microgravity experiment. It will make large semiconductor specimens which would be free of defects that emerge during production on earth.

The experiment is scheduled to be launched on a space shuttle in December 1995.

## **COOL COATING OF TITANIUM NITRIDE**

At the Fraunhofer Institute for Thin Films and Surface Engineering in Hamburg, Germany, a team has developed a process for depositing Titanium Nitride from a volatile organic compound at 100°C. Other methods require temperatures of over 500°C.

Titanium Nitride is a hard, wear-resistant coating used for tools. It can also be used to prevent diffusion of silicon into metal conductors in integrated circuits.

## **NUMERICAL WEATHER PREDICTION - FORECASTS IMPROVING**

by Tom East

Elephants never forget, stepmothers are wicked, mothers-in-law are bossy, and weather forecasts are wrong, according to conventional wisdom. Researchers at Environment Canada in Dorval, Quebec are working hard to remove at least the last of those impressions.

Recently I attended two lectures in Toronto about the computer programs which are used by Environment Canada to forecast the weather. The one in use at present was introduced in 1991: it was a great advance over the previous one, and made a noticeable improvement in the forecasts.

The current program is called T119. It is a mathematical model of the atmosphere, defined every 1° in longitude and latitude - about 65,000 locations. For every location, the state of the atmosphere is defined at 25 levels from sea level up to about 30 km (100,000 ft). The model incorporates the laws of physics. Weather observations taken every 6 hours on the ground and by balloon borne radiosondes are gathered, and by interpolation, values are assigned to points on the model. Future states of the atmosphere are calculated, up to five days ahead.

The program is run on an NEC "supercomputer" which has four processors, though T119 only requires one of them, running at around 2 Gigaflops. Future versions of the program will need more than one processor.

Tests show that the program achieves accuracies similar to or better than those run by other countries.

Development continues: improvements include finer mesh, upward extension into the stratosphere, incorporation of more than 100 chemical concentrations, use of humidity data obtained from satellites and temperature of the ocean surface, and more refined physical and mathematical laws. Such changes would result in more accurate and longer range forecasts: accuracy of the weather observations does not appear to be a limitation so far. Trial runs using old data indicate that some parameters could be predicted as far as 15 days ahead, others only 6 or 7 days.

In another new version of the program, the same number of points is used, but they are crowded together in one area, and spread out over the rest of the globe. In this way, finer details can be obtained over a province, or even over a metropolitan area.

## **HANSARD ON TV**

Hansard is the official record of the proceedings of the Federal or Provincial legislatures. It is taken down by specialised reporters and published. It has been announced that Hansard for the Ontario Legislature will be broadcast on cable on the Ontario Legislative channel (Rogers 52). However, it will be coded and broadcast in the vertical blanking interval, so you will need a decoder to see it on the screen.

It is hoped that, since many people who buy the printed version only want to see a small portion of it, they will be satisfied with the electronic version, which will save a lot of trees!

## **REPAIRING THE OZONE LAYER**

You will be pleased to hear that, in Ontario at least, venting or releasing fluorocarbons into the atmosphere is prohibited. These are the chemicals which are blamed for thinning the ozone layer in the stratosphere and letting in more UV rays. As well, effective October 1 this year, anyone who services or repairs refrigerators or air conditioners must have an "Ozone Depletion Prevention Card": to get this, they have to take a Ministry training course.

## **HOSPITALS REQUEST CELLPHONE SILENCE**

Two hospitals in Hamilton (Chedoke and McMaster Medical Centre) are asking anyone in critical areas to switch off their cellular telephones. The phones radiate while in standby mode or in operation, and can shut off pumps or change the temperature of isolettes for premature babies.

## **CHURCH STEEPLES FOR CELLULAR ANTENNAS**

Meanwhile, in the Netherlands, it is planned to instal about 600 cellular telephone antennas to start their system. Many towers will appear on the flat landscape, but about 100 sites will use church steeples by agreement with the Dutch Catholic Church. "It is very Christian to want to stimulate communication among people" a church spokesman said.

## **MORSE CODE RETIRED**

The Canadian Coast Guard College in Sydney, Nova Scotia has graduated its last class for Morse Code Operators. Ship to shore communications now use satellites, so there is no need to use the invention of Samuel Morse which was first used via land lines in 1844. [I remember in the 1940s struggling to achieve 12 words per minute, equivalent to about 6 b/s - Ed.]

## **SOUND ADVICE**

"Those who think they have no time for bodily exercise will sooner or later have to find time for illness".

Edward Stanley, Earl of Derby.

[The same could be said of those who think they have no time for vacations. - Ed]

