

IEEE/SEM Officer Nominations

by David G. McKendry, Past Chair

WAVELENGTHS

It is that time of the year again to start the process for election of IEEE/SEM officers for the 1997-98 program year which runs from July 1st through June 30th each year. To start the process, the Nominating Committee is requesting nominations from the membership for the following section officer positions: **Chair, Vice Chair, Secretary, Treasurer, Director of Educational Activities, and Director of Student Activities.** These positions are for a one year term except for the Directors of Educational Activities and Student Activities which are for a two year term.

Nominations are also being sought for officer positions in all ten IEEE/SEM chapters. All chapters have positions as **Chair, Vice Chair, Secretary, and Treasurer** with the exception of Chapter 5, Computer Society, which has a **Chair and seven Vice Chair** positions. This includes the new, tenth chapter which is the Engineering Management Society. All chapter officer positions are for a one year term. The complete list of chapters is included below:

- Chapter I:** Acoustics, Speech, & Signal Processing (ASSP-01); Circuits & Systems (CAS-04); Information Theory (IT-12); Control Systems (CS-23)
- Chapter II:** Vehicular Technology (VT-06)
- Chapter III:** Aerospace & Electronic Systems (AES-10); Communications (COM-19)
- Chapter IV:** (Trident) Antennas & Propagation (AP-03); Electron Devices (ED-15); Microwave Theory & Techniques (MTT-17)
- Chapter V:** Computers (C-16)
- Chapter VI:** Geoscience & Remote Sensing (GRS-29)
- Chapter VII:** Power Engineering (PE-31); Industrial Applications (IA-34)
- Chapter VIII:** (EMC) Electromagnetic Compatibility (EMC-27)
- Chapter IX:** Power Electronics (PE-35); Industrial Electronics (IE-16)
- Chapter X:** Engineering Management (EM-14)

Nominations will be accepted for yourself or others provided that the nominator and nominee are both qualified members of IEEE for any of the section officer positions and both qualified members of any chapter to which the nomination applies. Nominations must be received by Wednesday, January 15, 1997 to be included on the ballot in the February *Wavelengths*. All nominations must include the nominee's name, phone number, and IEEE membership number as well as the nominator's name, phone number, and IEEE membership number. IEEE membership numbers can be found on the mailing labels of *Wavelengths*, IEEE mailings, and of course your membership card.

For information on a specific office you may refer to the September, 1996 edition of *Wavelengths* which is our yearbook edition containing all current officers for the section and chapters. Please send all nominations to me by email, d.mckendry@computer.org, by fax to 810-257-8230, or by regular mail to:

David G. McKendry
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Bloomfield Hills, MI 48304

If you have any questions about the nominations process or qualifications for officer positions, please call me at work, 810-257-8868, or contact any of the section officers.



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- Who sponsors National Engineers Week?
- What is the purpose of National Engineers Week?

See the NEW article on page 10 to find the answers plus learn about opportunities for engineers to visit classrooms, help our youth build a future city and how to tell the world you're an engineer.

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IEEE/SEM Chapters

- I Circuits & Signal Processing:** Acoustics, Speech & Signal Processing (ASSP-01), Circuits & Systems (CAS-04), Information Theory (IT-12) and Control Systems (CS-23)
- II Vehicular Technology:** Vehicular Technology (VT-06)
- III Comm. & Aero. Electronics:** Aerospace & Electronics Systems (AES-10) and Communications (COM-19)
- IV Trident:** Electron Devices (ED-15), Microwave Theory & Techniques (MTT-17) and Antennas & Propagation (AP-03)
- V Computer:** Computer (C-16)
- VI Geoscience & Remote Sensing:** Geoscience & Remote Sensing (GRS-29)
- VII Power Eng. & Ind. Apps.:** Power Engineering (PE-31) and Industrial Applications (IA-34)
- VIII EMC:** Electromagnetic Compatibility (EMC-27)
- IX Power & Ind. Electronics:** Power Electronics (PEL-35) and Industrial Electronics (IE-16)
- X Engineering Management:** Eng. Management (EM-14)

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Calendar of Events

Monday Meeting: **Executive Committee**
January 6 Time: Dinner at 6:00 p.m., meeting 6:30 p.m.
 Location: Eaton Corporation,
 26201 Northwestern Highway, Southfield
 Sponsor: IEEE/SEM
 Contact: Kimball Williams at 810-354-2845

Wednesday Deadline: **Officer Nominations Due**
January 15 Contact: David Mckendry
 Comment: See article on page 1.

Monday Tour: **Driver Training System, Commercial**
January 27 **Virtual Reality - Training & Simulation**
 Time: 5 - 7 p.m.
 Location: FAAC Incorporated, 825 Victors Way, Ann Arbor
 Sponsor: Chapter V: Computer
 Comments: See article in this issue.
 Contact: Paul Nelson, 313-769-1408,
 ir000135@mindspring.com

Monday Meeting: **Executive Committee**
February 3 Time: Dinner at 6:00 p.m., meeting 6:30 p.m.
 Location: Eaton Corporation,
 26201 Northwestern Highway, Southfield
 Sponsor: IEEE/SEM
 Contact: Kimball Williams at 810-354-2845

February 16-22 Event: **National Engineers Week**
 Comment: See article on page 10.

Monday Meeting: **IEEE/SEM Spring Section Meeting**
April 14 Location: Fairlane Club, Dearborn
 Sponsor: IEEE/SEM
 Comment: Mark your calendar.

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Detroit Science Fair Judges Needed In April!!

by D. Bramlett, IEEE/SEM Advisor

For the third straight year, IEEE/SEM will provide judges and awards for projects related to electrical, electronics, and computer engineering subjects at the Science and Engineering Fair of Metropolitan Detroit (SEFMD). Judging for the 40th annual Science Fair will be conducted on Wednesday, April 16, 1997 in the Michigan Room, on the lower level of Cobo Hall, on the waterfront in downtown Detroit. Judging will be from 8 a.m. to noon.

The plans are for the section to provide judges and awards in both the Junior (middle school) Division and the Senior (high school) Division of the Science Fair. In addition to two IEEE/SEM Grand Awards consisting of a check for \$100 and a framed certificate, the section has taken the recommendation of several previous judges to present honorable mention awards to deserving students.

I encourage anyone that has an interest in the science and math education of our youth or student outreach programs to consider being a judge at the Science Fair. As a judge myself for the last two years, I found the experience of talking with the students, finding out their interests, and observing their projects to be very rewarding. So come out and spend the morning with us as we meet with some of the potential engineers, scientists, and Nobel Prize winners of the future.

As a point of interest, the two recipients of the IEEE/SEM Grand Awards in 1996, Ryan Dibble of Divine Child High School in Dearborn Heights and Ketan Vyas of Renaissance High School in Detroit, both were SEFMD Grand Award winners and both went to the International Science and Engineering Fair (ISEF) in Tucson in May. Ryan Dibble received a Fourth Place Grand Award in the category of Computer Science at the ISEF. One additional important point of interest is the fact, that the ISEF will be held in Detroit in the year 2000.

If you are interested in more information concerning being a judge for the IEEE/SEM professional awards at the Science Fair, contact Don Bramlett at 313-586-1774 during normal weekday business hours or by e-mail at d.bramlett@ieee.org.

Educational Activities Report

by Lisa Anneberg, Director of Educational Activities



IEEE/SEM is a very vibrant professional organization representing electrical and computer engineers in our area. General section meetings are held twice annually, in October and April. These general membership section meetings are a great educational resource for the busy EE or CE professional. The speakers are very educational, convenient, and a great bargain. In addition to these biannual meetings, IEEE/SEM has an Educational Activities Committee, which also meets

twice a year. The committee consists of myself from Lawrence Technological University, Dr. Ece Yaprak from Wayne State University, and Dr. Bahram Mirshab, also of LTU. The committee attempts to supplement Educational Activities for IEEE/SEM by being an additional resource for educational activities in our area.

In particular, we have scheduled an additional speaker per year, for a student IEEE organization. In 1995, Dave Horvath, of Advent Engineering, in Ann Arbor, gave a wonderful introduction to power for the student section at Lawrence Technological University. In the past, we have had Kimball Williams from Eaton Corporation of Southfield as a lunch speaker. Not surprisingly, our meeting was a lunch and Domino's pizza meeting for hungry students! In another activity, a small survey of IEEE/SEM section meeting attendees was conducted and published in 1996, primarily regarding the educational interests of attendees. The top three items of interest were: control systems, computer architecture, and computer networking. However, the most exciting item to report for my committee this year is the nomination of a new Director of Educational Activities, Dr. Ece Yaprak from Wayne State University. She has been an active committee participant for the past three years, and looks forward to more participation as Director!

This Committee is a good way for IEEE/SEM members to contribute on the local level, either in planning or speaking to student organizations. Upcoming activities include IEEE Web interfacing (electronic publishing of educational activities), student organization speakers, and IEEE video tape notification. IEEE continues to be a very good resource for the busy professional in the educational arena.



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Secretary's Report

by K. C. Liu

As many of you have read the Secretary's reports written by my predecessors, I won't reiterate the section Secretary's duties here. I've been involved in the section's operations in the past, holding various chapter and section officer positions. I anticipated that I would be busier as I made the transition from treasurer to secretary. And yet, there is still room for improvement with suggestions from members and help from new technology. Therefore, in addition to the routine monthly tasks that I perform each month as Secretary, I have improved the communication of meeting reports to the Executive Committee (EXCOM) and members at large.



I write up the report for each EXCOM meeting and e-mail it to the *Wavelengths* editors within a few days of the meeting. This ensures minimal delay in communicating with members of the Southeastern Michigan section. The minutes of the previous month's EXCOM meeting are also e-mailed to the EXCOM members several days prior to upcoming meetings. In this way, the EXCOM members will have plenty of time to review the minutes before the meeting, which shortens the meeting. It also reminds EXCOM members of any action items that they have.

Additionally, my previous post as treasurer gave me an opportunity to have a close and insightful look into the financial status of our IEEE/SEM Section. (See Treasurer's Report in *Wavelengths*, March 1996, p.5.) As a result, I am convinced that the section cannot afford to let the section's major source of income fall off. I resolved, in my capacity as Secretary, to assure that we are eligible to get the maximum annual rebate from IEEE headquarters, which is based on the membership of our section as a whole and the qualification of the member chapters within IEEE/SEM section as active chapters. Therefore, as a Secretary who is responsible for keeping the meeting reports submitted by the chapters, I took the initiative to closely monitor the chapter activities and meeting reports submission. I am pleased to report that the record of chapter activities in IEEE/SEM section is in very good standing due to the cooperation of chapter officers.



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Chapter X: Engineering Management

EMS Meeting Report

by Steve Kishok

The second meeting of the Southeastern Michigan Chapter of the Engineering Management Society was held Tuesday, October 22. The meeting was chaired by Dr. Prakash Shrivastava.

Dr. Shrivastava announced that there had been an increase in the membership of the EMS since the first meeting in August. Several of the new members were in attendance, as well as all of the attendees of the August meeting. All present agreed that the rapid increase in membership and the enthusiasm of the attendees bode well for the long term growth of the chapter and the information exchange and networking opportunities available to its members.

The meeting began with a discussion of organizational issues related to the formal establishment of the chapter, promotion of the chapter, and recruitment of members. Ideas were discussed for future meetings and activities, such as social events and outings, military and industrial plant tours, and co-sponsored events held in conjunction with the IEEE/SEM Spring Meeting and the IEEE EMS National Conference. A list of future speaker/discussion topics was presented, along with a discussion of leveraging programs such as the IEEE Distinguished Speaker Series to attract first class talent.

Dr. Shrivastava gave a presentation on "The Fifth Discipline in a Technical Environment". The presentation on systems thinking and dynamic mathematical modeling for long term solutions was well peppered with amusing stories and vivid analogies to illustrate the systems issues discussed. An open discussion followed, with the meeting participants discussing the featured topic, as well as their professional backgrounds and related experiences.

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Student Branch

University of Windsor Student Branch Report

by Joseph Place

September of 1995 saw the resurrection of the University of Windsor IEEE Student Branch. Since that time the branch has added many new members and begun the process of organizing and stabilizing to ensure survival. Our two main goals for this year are to become a more visible society on campus and to offer activities that are both entertaining and educational. The opportunities presented to members of the IEEE are important to the development and success of up and coming electrical engineers. It is our intention to ensure that future generations of students at the University of Windsor will have the chance to take advantage of the benefits of membership in the IEEE. Our most recent initiative is the very popular Design Group. Every week, the members meet to discuss, design, and build various projects. The design group is an excellent way for students to get practical experience in the design process.

We would like to extend a special thanks to George Peters and the St. Clair College Branch for their help and support.

Photo: The U. of Windsor student branch members attending the recent Chapter III meeting on Nuclear Fusion Propulsion in Space are shown with speaker Dr. Terry Kammash. (lower left, page 5)

Nuclear Fusion Propulsion in Space

by Dave Horvath, IEEE/SEM Section Chair

On November 14, 1996, Dr. Terry Kammash described to an attentive audience of IEEE and American Nuclear Society (ANS) members why nuclear fusion propulsion holds the most promise of any near term technology for achieving practical manned deep space mission successes. ANS Michigan Section Chair Lynne Goodman and IEEE Communication and Aerospace Chapter Chair Bob Desoff welcomed a diverse, international audience which included 10 students from the University of Windsor and representatives from Michigan State, Wayne State, U of Michigan, Ford Motor, Mitsubishi Electronics, EDS, Ameritech, Detroit Edison, Toledo Edison, Advent Engineering and Link Engineering to Ann Arbor to hear Dr. Kammash discuss the basic theory of rocket propulsion as well as the details of his gas dynamic mirror (GDM) nuclear fusion propulsion brainchild.

The Clinton administration has recently announced plans for continued research and development of nuclear technology for use in interplanetary travel. Also, Daniel Goldin NASA Administrator has separately announced a goal of achieving a manned mission to Mars by the year 2018 at a present estimated program cost of \$US25 billion. This program will include demonstration of a transfer stage fusion propulsion breadboard by year 2005 and construction of a prototype by year 2015.

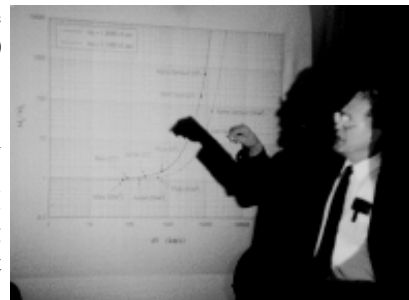
Dr. Kammash began the technical portion of the talk by presenting the standard Rocket Equation which states that the rocket's mass (M) times the time rate of change of its velocity (dv/dt) is equal to the rate of change of its mass (dM/dt) times the velocity (V_e) of its exhaust propellant or $(M)(dv/dt) = (dM/dt)(V_e)$. This exhaust velocity can be used to define a parameter called the specific impulse (Isp) which has units of seconds. Specific impulse is the exhaust velocity divided by the acceleration due to gravity (or $Isp = V_e/g$). The specific impulse is a convenient parameter for comparing various propulsion systems and goes up significantly when changing from chemical to nuclear fission technology and increases by two orders of magnitude by the use of nuclear fusion. Specific impulse is especially important because the round trip time for a space mission is inversely proportional to this quantity.

NASA is currently interested in solid core and gas core nuclear fission systems and in Dr. Kammash's concept namely the GDM nuclear fusion system. It is interesting to note that the solid core and gas

core fission rockets have specific impulses of about 500 seconds and 3,000 seconds, respectively. While the GDM can produce an Isp of several hundred thousand seconds. For this reason, the GDM concept is currently receiving a lot of attention at the highest levels of NASA. Dr. Kammash has been sought out for interviews on this topic by several publications including the Detroit News and the Ann Arbor News.

A working prototype of a nuclear fusion mirror machine is presently mothballed at Lawrence Livermore Laboratory. In a mirror machine, a low density fuel such as deuterium and tritium is heated to temperatures on the order of several hundred million degrees Kelvin where it exists as an ionized gas (plasma) and is confined by a magnetic field. The higher the temperature and the higher the density, the higher the probability for energy producing reactions. The energy released from fusion shows up as high velocity of the plasma components. The energetic plasma particles bounce back and forth along the magnetic field lines created by external magnets (which in a GDM basically follow the axis of the mirror machine) and a fraction of them escapes through one end of the mirror machine. This energy and particle loss made the mirror machine unattractive as a power producing reactor. However, the leakage is a major advantage when used as a rocket engine. The plasma confinement time in a GDM can be improved by making the plasma confinement chamber long compared to its diameter. Also, by making the magnetic field stronger at one end of the mirror to reduce the leakage at that end, the propellant can be preferentially directed out the other end of the rocket engine to create thrust. Analysis to date shows that for a magnetic field strength of 9.2 Tesla, reaction chamber length of 43 meters, chamber radius of 5cm, plasma energy gain factor of 1.222, and a total vehicle mass of 412 metric tonnes, a thrust of above 1000 pounds and a round trip time to Mars of approximately six months is possible. Such a round trip time is both very attractive and much shorter than achievable by any other readily available technology.

Dr. Kammash is the Stephen S. Atwood Professor Emeritus of Nuclear Engineering at the University of Michigan where he teaches a graduate level course on Advanced Techniques for Space Propulsion (believed to be the only course of its kind in the country). He has completed numerous research projects and studies related to nuclear rocket propulsion and nuclear power plant applications in space. Dr. Kammash is nationally recognized as a leading expert in advanced nuclear technology, particularly in the areas of gas core fission and magnetic and inertial fusion reactors for space application. He developed and continues to be the leading researcher of the GDM concept for deep space propulsion use. He is also a part-time consultant to Advent Engineering on the GDM concept.



Pictures: Dr. Kammash computes specific impulse for various rocket propulsion systems (upper right), Dr. Kammash receives IEEE/SEM mug from section chair Dave Horvath (lower right), Dr. Kammash and the strong showing of U. of Windsor students attending the meeting (lower left).

Workshop on Power Electronics in Transportation Report

This is a summary of the presentations and deliberations at the two day workshop on power electronics in transportation. The first session was a symposium on automotive power system electrical and electronic architectures and consisted of papers on architecture, charging system proposals and CAE tools for architecture evaluation. Session two addressed relevant topics in electric and hybrid electric vehicles. Session three on the second day covered automotive power electronics and session four addressed electric machine control. Attendance at the Symposium session was approximately 110 and on day two approximately 90.

The format of hosting a panel discussion on topics relevant to the automotive industry was followed. Panelists for the Automotive E/E Architecture discussion were:

Khurram Afridi	Graduate student at MIT and co-developer of MAESTrO CAE tool
Mark Harris	Navy/DoE expert in power electronics packaging/PEBB program
Chuck Hurton	Manager, electrical subsystems, GM NAO Engineering Center
Iftikhar Khan	Manager, automotive electrical systems, Delphi-E, GM Corp.
John Miller	Staff Technical Specialist, Ford Research
Fritz Schmidt	Advanced Engineering Group, Mercedes-Benz
Norm Traub	Technology Integration Manager, Delphi Packard Electric
John G. Kassakian	Professor, MIT and Director, Laboratory for Electromagnetic and Electronic Systems. Moderator for E/E Architecture Panel.

Discussion focused on the two dual battery architectures proposed by Miller and Schmidt. There was interest in the six phase heteropolar generator efficiency and whether or not its inertia could be smaller than current Lundel alternator technology. The reply was that heteropolar alternator technology could offer comparable efficiency and inertia could be lower since the rotor diameter was not constrained by a field coil. Additionally, heteropolar alternators can be cost competitive with Lundel but tend to have lower power density because of the multiple field coils.

Standardization and safety concerns were raised regarding the topic of automotive power system architectures. Prof. John Kassakian and Dr. Fritz Schmidt discussed a proposed 14V/42V dual voltage architecture. Dr. Ralf Bergholz of Volkswagen AG commented that standards for power system architecture will be needed since all OEM's are becoming so global. There was mention of involving the SAE in such standards activity. There was no obvious dissent to the 14V/42V architecture. Dr. Schmidt then mentioned that we must find a voltage level that best matches most loads and that at the present time 42V makes sense. The discussion shifted somewhat when Mr. Robert Chapman of the US Department of Commerce and PNGV Secretariat inquired whether these conclusions would change if the vehicle used electric propulsion. During the second day panel discussion on this topic Dr. Miller commented that the dc/dc converter used between the high voltage and 14V regulated bus acts as a gateway between the two systems. In the case of EV/HEV this converter then becomes the only access between the low voltage regulated bus and the fully shielded high voltage distribution system of the EV/HEV.

Prof. Jason Lai of Virginia Tech mentioned that in telecommunications industry 48V is common and at a safe level. Prof. James Sargeant of New York State University pointed out that on Space Station Freedom the system was 120V external (non-shielded) and if touched was designed to shut down within one cycle since it was a balanced system. He recommended that this sort of safety feature be looked into. The group concurred that below the 50V level there was no safety issue.

An objection to architectural change came from an OEM participant and was motivated by the fuel efficiency penalty of generation and distribution system losses. His comment was that if inefficiency costs the average driver \$6/100W/year, what is the point and shouldn't the focus be on reduction of capital costs rather than operating costs. This was a good point, especially in light of the fact that the dc/dc converter used in the proposed dual voltage architecture must offset its cost by net cost savings for the complete vehicle system. However, the OEM penalty for not meeting CAFE cannot be calculated incrementally as proposed by this member of the audience.

Power quality on the 14V distribution bus on the 14V/42V dual voltage system is insured by the dc/dc converter. With the need for load dump protection eliminated, the electronic modules can use lower cost, more efficient power MOSFET's according to Mr. Richard Valentine of Motorola.

October 24 & 25, 1996 Hyatt-Regency, Dearborn, Michigan

by John Miller, Chapter Chair

During the discussion on Electric and Hybrid Electric Vehicles, Prof. James Sargeant presented an interesting perspective on voltage effects in insulation systems, especially as it relates to motor winding insulation aging. Prof. Sargeant commented that component aging and failure is strongly influenced by the occurrence of microdischarges and corona effects. He mentioned that the common practice of epoxy impregnation under vacuum can leave voids in which the corona and partial discharges occur since these are at the Paschen limited voltage of about 130V. Prof. Sargeant discussed capacitor systems in general and capacitor technologies suitable to power electronics applications. He noted that dielectric withstand capability in capacitor and other insulation systems is inversely proportional to frequency cubed.



Panelists for the Electric/Hybrid Vehicles discussion were:

Prof. Richard Bass	Georgia Institute of Technology
Mr. Brad Bates	Manager, Alternative Power Source Technologies Dept., Ford
Mr. Jon Beriesa	Chief Engineer, GM Advanced Technology Vehicle Programs
Mr. Jerry Cilibraise	Chrysler
Mr. James Worden	CEO/Director of R&D, Solectria Corp.

Kaushik Rajashekara of Delphi-E was the panel moderator.

Mr. Jon Beriesa commented that power electronics are essential for efficiency improvement and control of automotive electronic systems. He commented further that power electronic module cost reduction will come about through common standards and specifications leading to continual increase in the level of integration in silicon, in modules and systems. Prof. John Kassakian offered a caveat to this philosophy stating that we should be careful since extrapolating from digital electronics to power electronics may not be valid.

A more controversial topic was raised by Dr. Victor Stefanovic on the re-use of EV/HEV powertrains rather than recycling. His point was that when a consumer buys their next HEV, why not re-use the motor and power electronics and hence lower the new vehicle purchase price. Mr. Jerry Cilibraise commented that since these products change so quickly, the original powertrain will become obsolete and hence should be designed to only last the lifetime of the vehicle. The prior art technology may not become obsolete in powertrain electronics. Dr. Stefanovic commented further that the powertrain would be modular by design. Others commented that standardization would help on this topic.

Mr. Richard Granitz of AMP opened up discussion on MEMs or micro-electro-mechanical systems. Mr. Randy Frank of Motorola pointed out that he presented a paper at Convergence earlier in the week on embedded micromachines and their potential for operation at elevated temperatures. He gave application examples such as on chip cooling with MEM pumps in which cooling channels were cut into the power electronics chips. Other examples included medical electronics as most likely first applications. The topic of MEMs in sensor applications was discussed, including applications such as yaw rate sensing.

The workshop concluded with a session on electric motor control. In this session, the paper presented by Mr. Nakazawa from Toshiba provoked an interesting discussion from the audience regarding the torque control of induction motors in the six step operation mode. Issues discussed include: a) how to transition smoothly from PWM mode to the six step mode (or one-pulse PWM mode as termed by the Toshiba paper); and b) how to place the voltage vector in a field oriented induction motor drive so as to retain control of the average torque while avoiding excessive peak current. Dr. Xingyi Xu of Ford Motor Company commented that the voltage feedforward method suggested by the paper may be sensitive to the machine parameters. Keeping the current regulator in operation and adjusting motor flux (ids) in the six step mode operation could be a preferred control method.

This article is an excerpt from John Miller's meeting summary. The complete version of this report may be found on the IEEE/SEM web page.

October 30, 1996, Technical Session Re-Cap

by Timothy J. Rowden, Secretary/Treasurer

This session was presented by William G. Edwards, Jr., territory manager, S&C Company. His presentation was on protection of underground medium voltage systems using power fuses. He emphasized that this presentation was an over-simplification of the subject matter due to the 45 minute limitation. He pointed out that the first thing necessary for obtaining proper system protection is to understand your system components and what, if any, assumptions must be made. For example the following system data is required:

- Primary fault current available from the utility company in amperes, if available.
- Any large motor loads that would contribute to fault current calculations or the transformer's inrush characteristics.
- Cable size and type
- Transformer type, size and voltage ratings
- Transformer load factor
- Ambient temperature
- Any existing upstream fuse size, type and manufacturer

From this data, Mr. Edwards recommended development of a one-line diagram showing the system being studied. This one-line should show the transformer and fuse locations relative to each other and include system data such as transformer size and voltage ratings, cable type and size and any existing fuse sizes and type. Once the system data is compiled, the following procedures should be utilized to assure proper protection of the system components and coordination with other protection devices. Keep in mind that the two theories of system protection are component protection and high speed fault clearing.

1. Plot the entire transformer inrush, secondary full load amperage and thermal damage curves. A common mistake is to only plot the one second transformer inrush point.
2. Plot the thermal damage curve for the cable being used.
3. Plot the utility companies maximum allowed fuse size, if this is known.
4. Pick a transformer primary fuse based on 1.4 times the full load amps of the transformer. Normally a standard speed fuse will be used.
5. Plot the fuse minimum melt and maximum clearing time current curves. For assured coordination and protection these curves should be adjusted for efforts of preloading and ambient temperature variations. This is done by using the coordination factors determined from graphs provided by fuse manufacturers. This can result in increasing the fuse size determined in step 4 above.
6. Pick the system entrance fuse based on entire systems full load and inrush characteristics while at the same time trying to coordinate with the utilities upstream riser pole fuse.

Mr. Edwards pointed out that typically the largest fuse the utilities will use without special arrangements is a 200E Positrol Fuse Link. Special arrangements might allow the use of the S&C Fault Filter electronic fuse, but this is a much more expensive application.

Mr. Edward's presentation included an example problem using overheads and Time Current Curve graphs commonly used for coordination studies. He ended his session taking questions from the attendees.

Student Branch

St. Clair College Student Branch Report

by Chris Sterling, Student Branch Editor

Established in 1963, the IEEE Student Branch remains a valuable asset to the students of St. Clair College. We were recognized by the Southeastern Michigan chapter as the "Outstanding Branch of the Year" in 1995-1996. We plan on making the 1996-1997 student year no less memorable. We will be duplicating a past success by holding the second annual Technology and Trades Career Fair. The Career Fair proved to be rewarding last year as students networked with local employers and began building contacts upon graduation.



This year we plan on providing a Workplace Hazardous Materials Information Systems (WHMIS) workshop for the IEEE members at St. Clair. We are also in the process of planning tours to industry such as the Ford Essex Plant, the Chrysler Technology Center in Auburn Hills Michigan, and the

NASA Aerospace Museum in Cleveland, Ohio. Our branch will fund these events by monthly raffles, selling of snacks, and collaboration with the Electrical/Electronics Department to sell tool boxes and laboratory supplies to the department's students.

We also hope to be connected to the Internet very shortly. With this in mind, we will create our very own student branch web site. In the future we hope to expand this web site into an informative learning tool for the students in the field of electronics.

The student branch also boasts increasing numbers of student members. This, in conjunction with hard work by this years' executive committee, can only enhance our foothold on our continued success as a student branch.

Sections Congress '96 Report

by George Peters, IEEE/SEM Vice Chair

Greetings, fellow members. I was fortunate to be the IEEE/SEM



delegate to attend the Sections Congress '96 which took place in Denver, Colorado November 1-4. The theme of the event was "Ideas for the Future". Plenary session topics such as the "21st Century Engineer" and "IEEE of the Future" reinforced this theme. The numerous breakout seminars dealt with a variety of issues which hinged on future challenges: the recent graduate, volunteer recruitment, section management, membership development and retention, and lifelong learning to name a few.

Being an educator, I spent much of the time attending student-related seminars. For example, one seminar dealt with the Graduates of the Last Decade (GOLD) program. This program offers new and innovative strategies to retain recent graduates as IEEE members by inspiring them to become student branch mentors and/or to become active in their sections.

Another tutorial dealt with life-long learning. The focus of this tutorial was to highlight the current offerings available from the IEEE Educational Activities Board. Tools such as Career Asset Manager (CAM), a guide which enables the engineer to assess his/her professional goals, and a host of other career-enhancing video and self-study materials were noteworthy.

Between sessions and at the day's end, there was ample time to network with engineers from sections around the world. Saturday evening's Western Gala event was a great success and a wonderful opportunity for the 600 plus delegates and partners to relax and enjoy the social aspects of this busy and informative weekend.

From the Opening Ceremony to the Adjournment, the Sections Congress '96 brought forth a wealth of ideas for the future. Delegates worldwide had the opportunity to both share and acquire winning tips used by the most successful sections.

Chapter V: Computer

Virtual Reality Training Tour

by Paul Nelson

The Computer Chapter has arranged for a tour and demonstration of FAAC Incorporated's Driver Training System (DTS). The DTS evolved from the TT150, the world's first tractor/trailer driver training system. The DTS sets even higher standards with simulator-based training, which now includes programs for buses, police cars, and automobiles. The Driver Training System provides real-time simulation economically at costs far below that of traditional simulator technology.



FAAC is a world leader in the research, analysis and development of simulation for complex training tasks. Founded in 1962, the company has its roots in advanced technology training software and hardware for the military. FAAC provided systems to the U.S. Air Force and Navy Aviation Group for such programs as 'Top Gun', 'TACTS' (Tactical Aircrew Combat Training System), and 'SOFATS' (Special Operation Forces Aircrew Training System). Of particular note is FAAC's participation in the development of decision-support software for onboard computers used by fighter pilots in actual air combat dog-fights during the Gulf War.

The tour will be conducted on January 27 from 5:00 - 7:00 p.m. at FAAC Inc., 825 Victors Way, Ann Arbor. Contact Paul Nelson at ir000135@mindspring.com or 313-769-1408 for directions or more information.

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NEW? What's NEW? What's NEW to You?

by D. Bramlett, IEEE/SEM Advisor

NEW: National Engineers Week, February 16-22, 1997.

How and when did National Engineers Week begin?

NEW was founded in 1951 by the National Society of Professional Engineers. It's always celebrated at the time of George Washington's birthday. Our nation's first president was a military engineer and a land surveyor.

Who sponsors National Engineers Week?

At the national level, there is a National Engineers Week Committee, comprised of volunteer leaders from the 14 U.S. engineering societies, including IEEE, and 12 major U.S. corporations that contribute financially to the annual event. Each year a different engineering society and a corporate partner team up to chair the event. The chairs of NEW in 1997 are the National Society of Black Engineers and Motorola.

What's the purpose of National Engineers Week?

The mission is to increase public awareness and appreciation of the engineering profession and its practitioners. Engineers can promote the image and achievements of engineering to the general public and encourage youngsters to consider careers in engineering or related math/science fields through involvement in a number of established national and local programs.

What are the national programs associated with NEW?

Three of the more prominent national programs associated with NEW include the Discover "E" Program, the Future City Competition, and Engineering Goes Public.

The Discover "E" (E for Engineering) Program, in its eighth year, offers an opportunity for engineers to visit K-12 classrooms and show practical applications of math, science and engineering, and talk with students about what engineers do. Working with school teachers, engineers can choose the elementary, middle or high school classes in which to provide presentations. IEEE/SEM can provide materials, including one of several short videos and brochures and bookmarks, to support section members interested in participating in this worthwhile program.



ENGINEERS
Turning Ideas
Into Reality

NATIONAL ENGINEERS WEEK
FEBRUARY 16-22, 1997

The Future City Competition, in its fifth year, enables engineer-volunteers to act as advisors to help seventh- and eighth-grade students design and build computer-generated cities of the 21st century. Extensive media coverage educates millions about the role of engineering in creating the world around us. Response from section members to be advisors and judges for the local contest has been outstanding both in 1996 and for the upcoming local competition in be held at Henry Ford Museum on Thursday, January 23, 1997. The local contest is being coordinated by a partnership of the Society of Manufacturing Engineers (SME) and ESD-the Engineering Society of Detroit. There are 48 middle schools registered to participate in the local contest. A few more judges are needed to complete the panel of 28 judges needed.

Engineering Goes Public is the newest national program, in its fourth year. Engineers and engineering students sponsor

special exhibits at shopping malls. Demonstrations, contests and family hands-on activities also run at local science centers, libraries, businesses, and college campuses. A number of section members are involved with tours and programs held at their place of employment. Some of the IEEE student branches in our section also sponsor on-campus programs for K-12 students and the public. So far, the section has not been involved in a program at a shopping mall. Suggestions are solicited from members or companies for conceptual ideas for such a program. A weekend program on Saturday, February 15 or 22 would probably have the most impact, attendance, and public exposure in the media.

Inquires or suggestions related to NEW can be addressed to Don Bramlett, PE, in person at 313-586-1774 during normal

Chapter II: Vehicular Technology

Technology Forecasting Report

by Ken Rao, Chapter Chair

The vehicular technology presentation at the Fall Section Meeting was delivered by Mr. Stephen P. Stonestreet. The topic of Mr. Stonestreet's presentation was "Technology Forecasting for Leadership and Planning". Mr. Stonestreet gave a panoramic view of vehicle electronics for the auto industry in general and GM in particular. He described the future for electronics in the vehicle from the user's point of view as well as the difficulty of predicting user needs beyond a few years. In particular Mr. Stonestreet emphasized that change is an inevitable process in the automotive electronics



world. A good example is driver navigation systems using the global positioning system (GPS), collision avoidance systems, anti-theft, and safety gear, which use sophisticated electronics including radar and satellite communications. Mr. Stonestreet presented current data on the automotive electronics industry to enable the audience to become good leaders and planners. There were questions from the audience which Mr. Stonestreet answered to everyone's satisfaction.

November Executive Committee Meeting Report

The fourth Executive Committee meeting for the 1996-1997 year was held on November 11 at Eaton Corporate Research and Development facility in Southfield, Michigan.

- M. and S. Hunter reported several members felt the cream-colored *Wavelengths* November issue looked drab. The cream-color would also cost about \$750 more per year, so *Wavelengths* will generally be printed on white paper from now on.
- G. Peters noted that 114 attended the Fall Section Meeting. The date of Spring Section Meeting has been set for April 14. The location will be the Fairlane Club in Dearborn.
- D. Silversmith reported the success of the vendor display tables and student tables sponsored by the corporations and plans to increase its scale in the future. He also reported that there was a job fair conducted by the Lendman Group in October, but he expressed concern about the lack of student interest and support of job fairs sponsored by IEEE/SEM lately.
- M. Hunter presented the statistics of IEEE/SEM membership, 3705 members according to the database from IEEE headquarters. He sent an EXCEL spreadsheet listing student members to each local university. He also pointed out that some students from the area who attend schools outside IEEE/SEM jurisdiction use home addresses for correspondence, which causes errors in the count of student members.
- D. Rover has been making an effort to improve the coordination of technical activities among the chapters.
- L. Anneberg submitted a written report that she is getting more volunteers to help her organize subcommittees for Educational Activities.
- M. Zohdy reported the Student Track session has requested a student table at section meetings. The Student Activities budget will have a deficit. He reported the Oakland University student branch planned to have a student-professional meeting with UAW, which may need IEEE/SEM Section's financial support. He also plans to get students from the University of Michigan-Dearborn to attend the Spring Section Meeting.
- D. Bramlett reported that he submitted 2 articles to *Wavelengths* on the Outstanding Engineer Award and Gold Award Banquet. He also reported that the Future City Competition will be held in the second week of February and many had volunteered to

by K. C. Liu, IEEE/SEM Secretary

serve as judges and mentors. He added that a new award category, Honorable Mention, will be added in the Detroit Science Fair. He noted that Region 4 will hold the annual meeting from January 24 to 26, 1997 in Chicago. He encouraged the section officers to attend the meeting and even take part in serving as Region 4 officers.

- H. Abdel-Aty-Zohdy reported the Chapter I technical meeting at the Fall Section Meeting was well attended. Meetings are planned for January and April 1997.
- D. Horvath reported for Chapter III that a joint dinner meeting with American Nuclear Society will be held on Nov. 14. More technical meetings have also been scheduled.
- C. Severance reported for Chapter V that the chapter had a good technical meeting at the Fall Section Meeting.
- D. Barberi reported that Chapter VIII had good turn out at the Fall Section Meeting.
- J. Miller reported for Chapter IX that the Fall Section Meeting technical session was very interesting.
- P. Shrivastava announced that Chapter X, the Engineering Management Chapter, was officially established in southeastern Michigan. He reported that the chapter held an administrative meeting on October 22.
- D. Horvath reported that Sat Basu is the volunteer coordinator for the section. Any director or chapter which needs volunteers or any members seeking an opportunity to take part in IEEE/SEM section activities can contact Sat.
- S. Basu proposed the November issue of *Wavelengths* be replaced by a combined November/December issue delivered in early December. A motion was made and approved by EC for the combined November/December *Wavelengths* starting in 1997.
- G. Peters gave a brief report for his participation in Sections Congress held in Denver, Colorado. The conference had many ad hoc meetings and discussions. The GOLD program got great deal of attention and many programs were geared towards continued education. He also confirmed that Region 7 which covers the metro Windsor area is still part of IEEE/SEM section.
- C. Severance reported that IEEE/SEM web site has permanently been moved to Michigan State University.

December Executive Committee Meeting Report

The fifth IEEE/SEM Executive Committee meeting for the 1996-1997 year was held on December 2 at the Eaton Corporate Research and Development facility in Southfield, Michigan. Thirteen people attended the meeting, presided over by Section Chair David Horvath. The EXCOM meeting was conducted via teleconference for the first time in the section's history.

- J. Woodyard presented the 1997 fiscal year budget. He suggested several changes for consistency. Some intense discussion followed as to the amount of dollars appropriated for chapters that failed to submit a budget. Members discussed how the budget should be structured to better reflect the cash flow in the section. The November Treasurer's report requires several corrections. J. Woodyard noted that some dollar amounts for the Fall Section Meeting and *Wavelengths* expenses need to be straightened out. Overall the treasurer's report was accepted with amendments.
- D. McKendry presented the candidates for IEEE/SEM section awards to the Executive Committee for consideration. The recipients of the Outstanding Engineer, Outstanding Section Award, and Outstanding Chapter Award were selected. However, the Outstanding Student Chapter is pending further consideration.
- M. Hunter reported the January issue of *Wavelengths* should be delivered by 1/9/97. The deadlines for the January and February issues were reviewed. He presented the December budget for *Wavelengths*. He also presented the chapter short titles that will be adopted by *Wavelengths* and discussed plans to reduce postage and printing costs.
- G. Peters reported the date of Spring Section Meeting has been set for Monday, April 14. The location of the meeting rooms at the Fairlane Club will be confirmed soon.
- D. Silversmith reported that copies of the contract with the Lendman Group have been sent to Bill Anderson for approval. A video from IEEE-USA highlighting the recent National Technology Symposium is available for loan.
- M. Hunter submitted a budget for Director of Membership which includes the budget for GOLD program he plans to initiate for the section. He also reported that IEEE has a set of CAM (Career Asset Manager) materials that can be sold at our section meetings.

by K. C. Liu, IEEE/SEM Secretary

- D. Rover submitted a written report that she has contacted several persons as candidates for chapter officers.
- L. Anneberg reported that Prof. Ece Yaprak of Wayne State University agreed to be a candidate for Director of Educational Activities.
- M. Zohdy reported that he is working with the Wayne State University student branch to host the Region 4 Leadership Conference. He also reported that the "Neuro-Fuzzy Computing and Applications Workshop" at Oakland University made a profit.
- D. Bramlett reported that the Science and Engineering Fair will take place on April 16. More volunteers are still needed. Nation Engineers Week is February 16 to 22. He recommended that the section allocate \$250 for the Detroit Science Fair and \$100 for ESD affiliation.
- N. Al-holou reported that Chapter V has scheduled about 2 activities per month. Upcoming events were announced. The chapter's speaker for the Spring Section meeting will be an IEEE distinguished speaker.
- P. Shrivastava reported that Chapter X will have a meeting on "Analytic Hierarchy Process for Decision Making" on Tuesday, 12/10/96. The chapter plans to hold a meeting each quarter in 1997.
- K. Liu brought up the meeting dates for 1997. The Executive Committee resolved to meet on the first Monday of the month.
- D. McKendry reported the status of nomination for the IEEE/SEM officers of 1997. He mentioned that most of chapters have the current officers as candidates for election, and some still have posts to be filled by volunteers.

**The next Executive Committee meeting will be held on
Monday, January 6, 1997 at Eaton.**



IEEE/SEM Fall '96 Section Meeting Attendance

The IEEE/SEM Fall '96 Section Meeting was held on October 30, 1996. The evening began with about 122 people attending the diverse chapter and student track technical sessions. The technical sessions were followed by a social period which allowed attendees to partake of the hors d' oeuvres and mingle with engineers from many fields. A variety of companies set up displays in the social area. The number of companies participating with informative and relevant displays at the fall and spring section meetings keeps increasing.

The dinner followed the social period. For the first time at IEEE/SEM section meetings, two companies hosted students at their tables. This allowed the company representatives to interact directly with the students informally. The information exchange seemed quite beneficial to both sides, and the section plans to continue this new program at future section meetings.

There were 114 people attending the dinner presentation on "Development in Windsor in the 1990's" by Mr. Paul Bondy, the City of Windsor's Development Commissioner.

The student branches had an exceptionally strong showing at the meeting with 47 of the 114 attendees being students. The number of pre-paid attendees was also very high which greatly helps the section plan for the technical sessions and dinner reservations.

IEEE/SEM Spring '97 Section Meeting:

The IEEE/SEM Spring '97 Section Meeting has been scheduled for Monday, April 14, 1997 at the Fairlane Club in Dearborn, Michigan.

Mark your calendar now and look for more detailed information in upcoming *Wavelengths* and on the section's web page.



IEEE/SEM and Associated IEEE World Wide Web sites:

IEEE/SEM Section Home Page: www.ieee.org/regional/section/se_michigan

IEEE/SEM Computer Chapter: www.egr.msu.edu/ieeesem/chapv/ (**NEW ADDRESS !**)

IEEE Region 4 Home Page: www.ieee.org/regional/r4/

IEEE Home Page: www.ieee.org

Keep an eye on the IEEE/SEM Section Home Page for the latest meetings announcements and updates that don't make it into *Wavelengths*. All of the information and articles presented in *Wavelengths* including some past issues will soon be available at www.ieee.org/regional/section/se_michigan.