



# Wavelengths



March 2005

Vol. 44, No. 6

Wavelengths is a publication of the Southeastern Michigan chapter of the Institute of Electrical and Electronic Engineers (IEEE).

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Chapter

## Spring Conference to Feature Astronaut

### Location:

Fairland Center, University of Michigan-Dearborn, Dearborn, Michigan

### Agenda:

- 5:30pm Chapter Technical Sessions, all run in parallel
- 6:30pm Vendor exhibits
- 7:15pm Dinner
- 7:30pm Awards and Announcements
- 8:00pm Keynote Address

### Registration

Early registration is \$30 for members registering before March 29, 2005. To register, go to the online registration form.

### KEYNOTE

Dr. Tony England, IEEE Fellow, Astronaut, and Associate Dean for Academic Affairs, College of Engineering, University of Michigan will speak on "The Opportunity Cost of the New NASA."

The 'New NASA' is about a lunar base and the human exploration of Mars. While the likely dollar cost of these programs will be truly astronomical, certainly exceeding \$300B in today's dollars, the opportunity cost of denied NASA investments in global-scale climate science and in marketable aerospace technologies might be the greater cost to the Nation. As a retired astronaut who experienced the Apollo, Space Shuttle, and early International Space Station programs, I will review the evolution NASA's programs, speculate about why we have the 'New NASA', explain its opportunity cost, and propose an alternative that would better use our national resources as well as lead to human visits to Mars.

Dr. England received B.S. and M.S. degrees in Earth Science from Massachusetts Institute of Technology (MIT) in 1965 and A Ph.D. in Geophysics from MIT in 1970. He is a Fellow of the IEEE and a member of the American Geophysical Union (AGU).

He served as a NASA Scientist Astronaut during the Apollo Program (1967-1972), and again during the early Shuttle Program (1979-1988). During the

Apollo Program, he completed Air Force Flight School and served as Mission Scientist for Apollo 13 and 16. During the Shuttle Program, he was assigned to flight-test for the Shuttle's entry and landing system, flew as a Mission Specialist on Spacelab 2 -- a solar astronomy and plasma physics mission, and served as Space Station Program Scientist (1986-1988). He has logged 4,000 hours as a pilot -- 2,000 in high performance aircraft -- and 8 days in Earth orbit.

He is married to the former Kathleen Ann Kreutz of Fargo, North Dakota, and has two children: Heidi Lynd and Heather Anne. He also has five grandchildren.

### Chapter I

Speaker: Dr. Gary B.

Lamont, Air Force Institute of Technology, WPAFB, OH

Topic: Next Generation Evolutionary Computation with Genetic Algorithms

Abstract: Genetic Algorithms (GAs) are stochastic optimization heuristics in which searches in solution space are carried out by

imitating the population genetics stated in Darwin's theory of evolution; "survival of the fittest." Selection, crossover and mutation operators, derived directly from natural evolution mechanisms are applied to a population of solutions, thus favoring the birth and survival of the best solutions. GAs have been successfully applied to many NP-hard combinatorial optimization problems. In order to apply GAs to a problem, a genetic representation of each individual (chromosome) that constitutes a solution of the problem has to be found. Then, one needs to create an initial population, to define an objective function to measure the fitness of each solution. and to design the genetic operators that produce a new population of solutions from a previous one. By iteratively applying the genetic operators to the current generation population. It is hoped that the fitness of the best individuals in the population converges to at least a local optima, if not the global optimum. Thus, a genetic algorithm (GA) is a robust problem-solving method based on natural selection. Hardware's speed advantage and its ability to parallelize offer more



efficient genetic algorithms computation (engines), possible meeting time-critical requirements for next generation evolutionary computation.

Bio: Gary B. Lamont is Professor of Electrical and Computer Engineering, Department of Electrical and Computer Engineering, (AFIT/ENG); Bachelor of Physics, 1961; MSEE, 1967; PhD, 1970; University of Minnesota. His research interests include: parallel and distributed computation, combinatorial optimization problems, formal methods, software engineering, digital signal processing, analog and digital control systems, intelligent and distributed control systems, computational and numerical methods, evolutionary computation, computer aided design and simulation. Dr. Lamont has authored various textbooks as well as over 150 papers on the previous topics. Also, he has chaired over 250 MS theses and 30 PhD dissertations. Dr. Lamont was an engineering systems analyst for the Honeywell Corp. for six years, 1961-1967. He is a member of ACM, IEEE (Life Senior Member), and SIAM. Tel. 937-255-3636, x4718 (DSN: 785-3636, x4718), email = Gary.Lamont@afit.edu.

## Chapter II

Speaker: Sridhar Naidu

Topic: MEMS based accelerometer products and applications.

Abstract: Accelerometers are pervasively used in various applications spanning from safety critical items such as automotive airbag systems to toys and domestic appliances. This widespread adoption was made possible by the advent of the enabling technology called "Micro-electromechanical systems" more commonly known as MEMS, which brought down the cost to produce accelerometers from \$250 to under \$2 within a decade. This phenomenal reduction in cost of production has brought accelerometers within the reach of systems which otherwise couldn't have afforded this sensing technology. This talk describes the use of micro-machined accelerometers in today's world.

Bio: Mr. Sridhar Naidu completed MS from Ohio University and started working at Ford Motor Company for 11 years as Sensors Engineer. While at Ford he worked on various types of automotive sensors. He is Cofounder of MemTech that started in 2001 and has become a public company since August 2004. Currently his interests are in MEMS based sensors and His pet project is to bring MEMS based Infrared sensor to the market.



## Chapter III, Chapter IV

Speaker: Dr. Vijay K. Arora  
(IEEE Distinguished Lecturer)

Topic: Quantum Engineering of Nanoelectronic Devices

Abstract: Quantum (digital-type) concepts are gaining prominence over and above classical (analog-type) ones in miniaturized devices where nanometer size can be less than or equal to the de Broglie wavelength of an electron in any of the three cartesian directions.



An electric field driving electrons in these devices can be extremely high. This converts random carrier motion to a streamlined one, thereby limiting the velocity to thermal velocity or Fermi velocity depending on the degeneracy of the sample. This re-organization of the carrier velocities makes familiar Ohm's law invalid, thereby enhancing the role of high-field velocity saturation in performance evaluation and characterization of nanostructures. The seminar will demonstrate that a higher mobility does not necessarily lead to a higher saturation velocity showing independence of the saturation velocity on mobility-limiting scattering mechanisms. A review of quantum-mechanical and high-field effects that have impact on the design of optoelectronic devices and other micro-circuits is presented.

Bio: Professor Vijay K. Arora obtained his Ph. D. degree from the University of Colorado. He is currently a Professor of Engineering Management and Electrical Engineering at Wilkes University. Professor Arora is on the IEEE EDS Publication Committee, the EDS Distinguished Lecturer Program and EDS representative in the IEEE-USA Technology Policy Council. His research interests are in nanotechnology and its applications. Professor Arora has authored or co-authored over 140 papers on scientific, educational, and entrepreneurial issues. Recently, he was named a Leading Educator of the World 2005.

## Chapter V

Speakers: Kevin Monaghan and John (Jian) Wei

Topic: Achieving Data Persistence for Business Objects

Abstract: Persisting business data is a common pattern for enterprise applications. In object-oriented languages, business data are typically contained in business objects, before they are persisted in a relational database. As simple as the concept may seem to be, at the implementation level, we have repeatedly come across complexities that are unnecessarily introduced by system designer from using EJB Entity Beans or similar mechanisms on other platforms.

In this presentation, we will discuss a simplified, and therefore resource-efficient, approach to persisting data in an object-oriented environment. We will demonstrate the viability of the approach on the Java platform from the perspectives of overall architecture, analysis and design, and source code. We will also provide a brief comparison of representative persistence services products available today in the market place.

Bios: Kevin Monaghan has sixteen years experience in IT in the following industries: automotive engineering, manufacturing, and assembly; finance and insurance; energy; health care; and government. During the last seven years, Kevin was an architect in global product development at a multi-billion dollar automotive manufacturer working on projects in the supplier collaboration and security services areas. Part of his responsibility was for application architecture and for the development of architectural-level components in order to speed the delivery of quality software applications. Kevin is currently a software engineering architect at a major health care company helping to institute organizational change around software engineering methodologies.



Kevin developed versions of this business object persistence using Smalltalk, Delphi and now Java.

John works as Technology Architect at a large healthcare provider. He is a PMI certified Project Management Professional (PMP) with expertise in iterative development methodology and object-oriented system architecture. John has been given numerous recognitions and rewards from client, employer, IEEE (The Institute of Electrical and Electronic Engineers), and SAE (Society of Automotive Engineers). John is an active member of the local community. He presides over the IBM Rational User Group for Southeastern Michigan (SEM) and is the Vice Chair of the IEEE Computer Chapter for IEEE SEM Region. John has a strong technical background in system integration, design patterns, and implementation strategies. He has authored many papers and is frequently invited to speak at IEEE, SAE, Rational, and local User Groups and Symposiums. He has authored many papers and is frequently invited to speak at IEEE, SAE, Rational, and local User Groups and Symposiums.

### Chapter VI

Speaker: tbd

### Chapter VII

Speaker: Dr. C.G. Michael Quah,  
Vice President and Chief Technology  
Officer

NextEnergy, Detroit, MI

Topic: NextEnergy: Programs in Alternative  
Energy

Abstract: The talk focuses on alternative energy developments at NextEnergy, a state non-profit organization, chartered to accelerate the development and use of alternative energy technologies in MI. These programs are centered around alternative fuels and combinations of conventional and alternative power sources to form microgrids for dual-use: civilian and military.

Bio:

Currently (since March 2004) Vice President and Chief Technology Officer, NextEnergy

2002 - 2004: US Army CERDEC, Fuel Cell Team Leader, and US Army RDECOM, Chair of Power and Energy IPT

1999 - 2002: VP of two companies involved in filtration and separations media and in alternative energy

1979 - 1999: E.I. du Pont de Nemours & Co., Inc in various positions in R&D, marketing, and business development and management in the U.S. and Asia.

M.S., M.Phil., Ph.D. (Chemical Engineering), Yale University  
B.A. (magna cum laude) in Chemistry and Physics, Harvard University, 1974



### Chapter IX

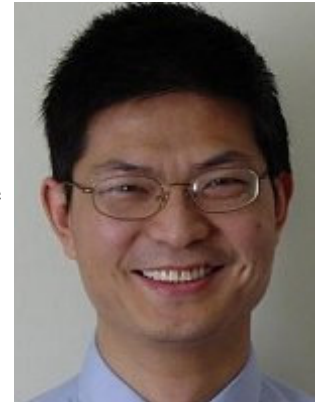
Speaker: Chris Mi, Assistant Professor,  
University of Michigan - Dearborn

Topic: Constant-Frequency Synchronous  
Generator with Brushless Exciter

Abstract: This seminar presents the modeling, control, and implementation of a novel variable-speed constant-frequency power generation system for renewable and distributed energy applications. The generation system consists of a wound rotor generator, a brushless exciter and a low-rating controlled power converter. The main generator is a doubly-fed induction machine which is operated as a synchronous generator. The advantages of the proposed system are reduced harmonic injection to power grid, wide speed operation range covering both sub-synchronous and super-synchronous speeds, self VAR support and increased reliability. It can be directly applied to wind power generators, small-scale hydroelectric generators, standalone diesel and gasoline generators, aerospace and naval power generation systems where a variable speed turbine/engine is employed. An equivalent circuit model of a doubly-fed generator was developed incorporating stator and rotor iron losses. Then the control of a standalone generation system is developed based on the mathematical model. Detailed implementation procedure is given. An experimental system and its control were implemented using embedded real time DSP controller. Measurements of the experimental system validated the system design and readiness for prototyping in a relatively large power range.

Bio: Chunting Mi (S'00-A'01-M'01-SM'03) received the B.S. E.E. and M.S.E.E. degrees from Northwestern Polytechnical University, Xi'an, Shaanxi, China, and the Ph.D degree from the University of Toronto, Toronto, ON, Canada, all in electrical engineering.

He is an Assistant Professor at the University of Michigan, Dearborn, with teaching responsibilities in the area of power electronics, electric vehicles, electric machines and electric drives. He joined General Electric Canada Inc. Peterborough, ON, Canada, as an Electrical Engineer in 2000, responsible for designing and developing large electric motors and generators. He was with the Rare-Earth Permanent Magnet Machine Institute of Northwestern Polytechnical University, Xi'an, Shaanxi, China from 1988 to 1994. He joined Xi'an Petroleum Institute, Xi'an, Shaanxi, China, as an Associate Professor and Associate Chair of the Department of Automation in 1994. He was a visiting scientist at the University of Toronto from 1996 to 1997. He has recently developed a Power Electronics and Electrical Drives Laboratory at the University of Michigan - Dearborn. His research interests are electric drives, power electronics, induction motors, brushless motors, and PM synchronous machines; renewable energy systems; electrical and hybrid vehicle powertrain design and modeling. He is the Chair of the Power Electronics and Industrial Electronics Chapter, and the Director of Educational Activities of the IEEE Southeast Michigan Section. For details please contact [chrismi@umich.edu](mailto:chrismi@umich.edu).



**Chapter X**

Speaker: Dennis Siemiet

Topic: Compatibility between Personal & Company Core Values

Abstract: The compatibility of the employee's core values with the company core values is critical to the performance of the company and the well-being of the employee. Most companies try to document the core values into a mission statement.

Hopefully the mission statement accurately defines these core values.

However, there is frequently an underlying personality and core values that are frequently not discussed and are different from what is in the mission statement. The actual core values are what impacts how critical decisions are made and the basic interaction. Each manager and employee should understand the company's actual core values, the managers values, their own personal value system and an understanding of the compatibilities between these. This presentation will discuss these interactions and how they impact the company and employees.

Bio: Dennis Siemiet is an engineering manager with over 30 years of experience in automotive and defense industries. In management and team leadership roles, Dennis has built cohesive technical teams under challenging and difficult conditions. Some examples included developing of an advanced 55 ton tracked vehicle with a 1-megawatt electric drive, networked subsystems, and 3- power bussed (24vdc automotive bus, 270vdc for high power system and an 800 volt propulsion bus). Dennis presented the findings at the First International Conference on All Electric Combat Vehicles (AECV). Defined the business plan and set up a productive automotive harness prototyping division and a system engineering team for an innovative multi-processor controlled 4-axes stabilized antenna subsystem for ground and weather mapping radar system.

Affiliation: IEEE, IEEE Management Society, SAE, and SME; Graduate of Lake Superior State University with a B.S. in Electronics and a minor in Computer Engineering

**Chapter XII**

Speaker: Farhad Bolourchi, Ph. D., Control Systems Technical Leader, Delphi Corporation - Innovation Center, Brighton

Topic: A Control System Methodology for Steer by Wire Systems

Abstract: Steer by Wire systems provide many benefits in terms of functionality, and at the same time present significant challenges too. Chief among them is to make sure that an acceptable steering feel is achieved. Various aspects of this subjective attribute will be defined mathematically. A

control system that is architected specifically to meet these challenges is presented.

Furthermore, the design is made such that it would be robust to



tire and loading variations.

Supporting vehicle data and model results are shown as needed. Bio: Farhad Bolourchi is a Staff Research Engineer with Delphi Corporation. He has been involved with Advanced Steering systems projects at Delphi for the past ten years. He has worked on Electric Power Steering, Active Front Steering, Steer by Wire, Chassis integration (brake & steering) systems, and other systems.

Dr. Borlouchi attended Alborz High School in Tehran, Iran. He received a B.S.M.E. from Northeastern University, 1980 and an M.S.M.E. from U.C. Davis, 1984. His Ph.D. research was on Adaptive Control Systems and he received that (from U.C. Davis) in 1989. He became a Senior Member of IEEE in 2003 and has recently joined the SE Controls Chapter as Vice Chairman.

**Professional Track**

Speaker: Dan Trudeau, Professional Resource Associates (PRA-USA)

Topic: I've Got My First Job... What Now?

Abstract: There is a wealth of material on finding a job, but most new professionals don't get the "inside" view of what to expect at their first job. The engineering environment, office politics, ongoing education and how to build a career. Also, how to avoid getting pigeon holed - this first job is the base for the next 30 years of work - are you prepared?

Bio: Dan Trudeau is a Senior Staffing Consultant at Professional Resource Associates in Marine City, MI. He is an integral part of PRA's success in recruiting and placing top candidates in advanced control technologies. After 6 years in the Detroit market, Dan is known as a "go to" guy for information, staff and work in embedded software and hardware for automotive electrical and computer engineers. Outside of automotive, Dan also works with clients in aerospace, test, medical and semiconductors. He regularly attends IEEE and SAE events and the Embedded Systems Conference. He is a Certified Personnel Consultant through the National Association of Personnel Services. Dan has written articles on career issues for engineers and enjoys sharing his experience in classroom and conference settings. Dan has a Bachelor's degree from Western Michigan University.



# See You at the Conference!

## IEEE-SEM to Co-Sponsor RoboFest 2005

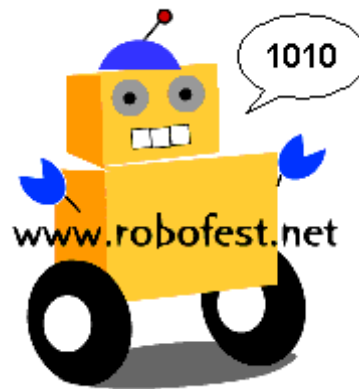
By Dr. C.J. Chung, Lawrence Technological University

We are pleased to announce that the Institute of Electrical and Electronic Engineers (IEEE) is partnering with Robofest to present all 2005 participants with Medals of Achievement. IEEE Region 4 and Southeastern Michigan Section has been a generous sponsor of Robofest and continue to support the 2005 contest with this generous commitment. All participants at the 14 Robofest Contest sites will receive medals. Other prizes will include individual and team trophies and laptop computers for the top winning teams at the World Robofest 2005 Championships. Top winners in the Exhibition, Junior Competition, and Senior Competition divisions will win laptop computers supplied by MPC Computers.

Robofest is an annual autonomous robotics contest designed to stimulate interest in math, science, engineering and technology among young people. The World Robofest 2005 Championship takes place Saturday, April 23, 2005, 8 a.m. - 3 p.m. at Lawrence Technological University in Southfield, Mich.

Student teams must qualify for the World Robofest Championships by competing at one of the following 14 sites: Hanyang University, in Ansan, Gyeonggi-do, Korea; Erle River High School in Milk River, Alberta, Canada; China; RoboTech Center in Nashua, New Hampshire; St. Matthew Lutheran Church in Houston, Texas; West Melbourne School for Science, West Mel-

bourne, Florida; and the following Mich. sites: Alpena Community College in Alpena; Washtenaw Community College in Ann Arbor; Canton Charter Academy in Canton; Macomb Intermediate School District in Clinton Township; Carman-Ainsworth Junior High in Flint; Hillside Middle School in Northville; M-TEC, the Manufacturing Technology Academy of NW Michigan in Traverse City; and Delta College in University Center. All participants at these sites will receive medals, framed certificates, and trophies for top teams.



Robofest is an annual autonomous robotics competition for students in grades 5-12. Students can participate in either the exhibition or competition portion of this educational activity. The exhibition portion provides students the freedom to exhibit any creative robotics project. Exhibition categories include, but are not limited to: robot

dancing legged robots, robots in costume and data logging capabilities. The competition challenges student teams to accomplish robotics missions with two robots they design and program. This year's challenge is "RoboRelay." Mission details, official game rules, registration and streaming video of the 2005 mission can be viewed at [www.robofest.net](http://www.robofest.net).

Prior to the qualifying regional competitions, Lawrence Technological University hosts a Warm-up competition on Saturday, March 19, 2005 from 9:00 a.m. - 2:30 p.m. It is a great opportunity for new teams, future teams, regional site hosts, volunteers, and new judges to see how the Robofest competition works. If you are interested in volunteering for the warm-up event, please sign up online. There are various positions available.

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## UMD Student Branch Visits Yazaki

On Monday, November 15th, 2004 the University of Michigan-Dearborn Student Branch of IEEE took its first tour of the school year and visited the Yazaki North America's EMC testing labs in Canton, Michigan. This is one of their many planned events of the year designed to give their members a broader view of what being an Electrical Engineer is all about. Nine students from freshmen to seniors attended the event, including Executive Committee members. Scott Lytle, an Engineer from Yazaki North America, gave the tour after-hours making it a convenient time for more students due to class schedules.

The tour started with an introduction on Electromagnetic Compatibility (EMC) and Electromagnetic Interference (EMI). The students then watched an interesting movie about the disasters caused by EMI. The tour also included a brief introduction on design aspects

to reduce electromagnetic interference (EMI) problems. Students learned that while designing a product there are many different ways to reduce EMI, however, the main design criteria that they should try and reduce the size of loops because these loops act as antennas that allow outside electromagnetic waves to interfere with the system. Afterwards, a tour of the testing areas took place and students learned how Yazaki tests its parts in order to comply with IEEE standards. Students saw different reverberation chambers including the different amplifiers and antennas used for the

multiple tests.

The students learned many important lessons during the tour including the importance of being familiar with the subject of EMC. The faults in the system caused by EMI could easily be mistaken for a fault in the system design and people can spend a lot of time trying to figure out what is wrong with the system even if there is nothing theoretically wrong. For this reason all electrical engineers need to be familiar with the subject of EMC.



A practical lesson students learned was why they should be careful when pumping gas in their cars during winter. Since our bodies get electric charges on them during winter, these electric charges can spark a flame at the nozzle of the gas pump while it is pumping gas. Before removing the gas nozzle from our vehicle, we should touch the car or another

grounded metal object to transfer the static charges off our bodies before we remove the nozzle from our cars.

IEEE plans to host many events focused on being an Electrical Engineer during this school year, including an S-PAC on April 2, 2005 focusing on career growth and development. University of Michigan - Dearborn invites anyone interested to visit their website for more information: <http://www.engin.umd.umich.edu/~ieee>

### Eliminate the Guesswork!

- \*Gain knowledge in all EMC design aspects.
- \*Put what you learn to immediate use.



Donald L. Sweeney leading a workshop

To register call Carol at 847-537-6400 or email her at [cgorowski@dlsemc.com](mailto:cgorowski@dlsemc.com). For more information click on [www.dlsemc.com](http://www.dlsemc.com).

Tired of taking classes that don't give you real world applications and hands-on opportunities to use what you learn?

Here's what students have said about DLS's new EMC seminar/workshop:

- "Lots of practical information in this course."
- "This course would be helpful for any design engineer." Shane S.
- "Good information, presented well, extremely relevant." Bryan P.
- "It satisfied my requirements - practical application & problem solving." Jack R.

This seminar/workshop is taught by EMC engineers with 75 years combined experience in real world engineering. Spend three days learning EMC requirements and design techniques and a fourth day designing a real life product. Take home the computer program designed by the instructors. As an added extra value with no additional charge, apply what you have learned in an optional 45-minute design review of your own product following the workshop.

**EMC Practical Applications  
Seminar/Workshop  
Northbrook, Illinois  
April 14-15 & 18-19, 2005**



## Events

### Mon, Apr 4th

6:00 PM

Section Conference Planning Committee Meeting  
Univ. of Michigan, Dearborn Professional Education Center Bldg  
Planning committee meeting for the Spring 2005 Section Conference and Dinner.

Contact: Mark Ciechanowski, 248-755-4477, mark.ciechanowski@ieee.org

### Mon, Apr 4th

6:00 PM

Executive Committee (XCOM) Meeting  
Univ. of Michigan, Dearborn Professional Education Center Bldg  
All are invited to attend.

6:00pm - Dinner  
6:30pm - Meeting

Contact: Suleiman Barada, 313-565-8438, 313-550-0525, sbarada@ieee.org

### Wed, Apr 6th

5:30 PM

Spring Section Conference and Dinner  
Fairlane Center, University of Michigan-Dearborn  
Dearborn, Michigan  
Keynote Speaker: Tony England, Shuttle Astronaut and Associate Dean of the College of Engineering, University of Michigan.  
See article on page 1 for more information.

### Mon, May 2nd, 6:00 PM

Executive Committee (XCOM) Meeting  
Univ. of Michigan, Dearborn Professional Education Center Bldg  
All are invited to attend.

6:00pm - Dinner  
6:30pm - Meeting

Contact: Suleiman Barada, 313-565-8438, 313-550-0525, sbarada@ieee.org

### Tuesday, May 3rd

7:30 AM

EMCFest 2005  
Canton Summit on the Park, Canton, MI

EMCFest 2005 will feature Henry W. Ott, president and principal consultant of Henry Ott Consultants, an EMC training and consulting organization in Livingston, NJ. Mr. Ott has over thirty years experience in the field of EMC.

EMC Fest '2005 sessions will cover the following:

Dipoles For Dummies (as well as the rest of us without a PhD in electromagnetics) is a simple, insightful, and intuitive discussion of how a dipole antenna operates, and how it relates to the common-mode radiation from a product. All of this is accomplished without using any mathematics or writing a single equation. Once antenna theory is understood, controlling or eliminating common-mode emission becomes a lot easier task. If you would like to understand more about antennas, but lack the time or desire to study the intimidating mathematics associated with electromagnetic field theory -- this presentation is for you. Attendees will leave with an intuitive understanding of antenna theory, and know why antenna theory is so important to Electromagnetic Compatibility (EMC) engineering. The presentation is intended for anyone who wants to learn more about antennas. No specialized technical background or prior understanding of antenna theory is required.

Partitioning and Layout of a Mixed-Signal PCB. Preventing digital logic ground currents from contaminating low-level analog signals on a mixed-signal PCB can be a difficult problem. This is especially true on boards with multiple ADCs. Many people suggest splitting the ground plane in order to isolate the digital ground from the analog ground. Although the split-plane approach can be made to work, and is sometimes necessary, it has many potential problems. The pitfalls, as well as the benefits, of splitting ground planes are examined. By understanding how and where high-frequency ground currents flow, and by using some basic principles of Electromagnetic Compatibility (EMC) we are able to develop an approach to controlling these currents while, in most cases, still maintaining a single contiguous ground plane. This presentation demonstrates that component placement, partitioning, and proper PCB topology, combined with routing discipline, are the keys to success in laying out a mixed-signal PCB. The presentation is intended for engineers, technicians and PCB designers who are involved with, or interested in, the layout of mixed-signal PCBs.

Several demonstrations and practical examples will be used to illustrate the principles and techniques being discussed.

## Advertising in *Wavelengths*

*Wavelengths* is published eight times a year and sent to more than 3,500 members. These readers are responsible for specifying and purchasing a wide range of electronics components, equipment, and services.

There is no extra charge for color. Special placements can be requested, and will be accommodated if possible. Payment must accompany insertion order. For more information, contact:

**Dr. Ramas Ramaswami, MDR**  
**ramaswamis@comcast.net**  
**734-786-8409**

## Executive Committee

### Officers

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### Chapter XI - Engineering in Medicine and Biology Society

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