

The IEEE Instrumentation & Measurement Magazine

April 2014 Issue

Alternative Energy

From the Editor's Bench

Mike Gard

Renewable Energy and the Conclusion of the Matter

The April 2014 issue of the *Magazine* is devoted to instrumentation and measurement (I&M) issues associated with renewable, or alternative, energy R&D. The Guest Editor for this issue is Dr. Branislav Djokic, Fellow of IEEE, who works at National Research Council of Canada in Ottawa, Ontario. Branislav has secured five outstanding I&M oriented articles on renewable energy for this issue. The first four articles concern hydro, wind, solar, and marine energy; the fifth is about energy storage.

Lead authors of these articles are Mr. David Jarry-Bolduc (Hydro-Quebec, Montreal, Quebec), Dr. Marcelo Godoy Simões (Colorado School of Mines, Golden, Colorado) with his co-authors from National Renewable Energy Laboratory (NREL), Dr. Johan Enslin (Energy Production and Infrastructure Center, University of North Carolina, Charlotte, North Carolina), Dr. Frede Blaabjerg (Aalborg University, Aalborg, Denmark), and Dr. Boris Berseneff (National Institute for Solar Energy, Grenoble, France). I urge you to read Branislav's editorial carefully, for it not only explains how the topics complement one another but also illustrates the challenges increased renewable energy penetration brings to the power grid.

Although this issue's theme is renewable energy I&M, readers will find other material of interest. Veronica Scotti, coauthor with Dr. Alessandro Ferrero of the February 2013 article "Forensic Metrology," graciously accepted an invitation to prepare a legal analysis of the 2009 L'Aquila verdict. This verdict, which greatly troubled many in the scientific community, convicted a group of Italian scientists and a civil servant of manslaughter after an earthquake in the small town of L'Aquila produced hundreds of fatalities. Ms. Scotti reviewed more than 1000 pages of legal material to distill the essential elements of Italian law and the court's motivation document into a readable and informative explanation of the sentence. In Veronica's own words,

“Galileo was not sentenced again.” It is a commendable article; all who read it will find it thought provoking.

The length of February’s CERN issue made it necessary to postpone publication of columns by several of the *Magazine*’s regular authors. This issue contains a very practical illustration of pipelined A/D converter design principles by Shlomo Engelberg, and John Witzel explores simple DC motors in his popular “My Favorite Experiment” column. We thank Shlomo, John, and our other regular contributors Jim Schooley and Bruno Ando for their patience in the face of these delays. The April issue is completed by Bob Goldberg’s “New Products” column. This issue also contains Society officer reports and other Society communications arising from the October 2013 AdCom meeting and Society activities. It is all informative – you will find this issue to be good reading.

This issue is my last as Editor-in- Chief. In reality, Dr. Wendy Van Moer has been Editor-in-Chief since 1 January 2014 but, by agreement, I have been responsible for following the February and April 2014 issues as they made their way through the publication process. Dr. Van Moer’s letter of introduction to *Magazine* readers appears in the following pages. I wish her and the *Magazine* every success.

The *Magazine* has been an interesting collection of experiences. The most enjoyable editorial aspects of the last two years has been the opportunity to work with authors, the occasional but equally enjoyable opportunities to hear from readers, and the pleasure of working with two excellent Guest Editors – Pasquale Arpaia and Branislav Djokic. I hope all readers will join me in thanking the Magazine’s staff – in alphabetical order, Gary Garvin, June Sudduth, Kristy Virostek, and Caitlin Woody – who patiently worked to prepare the *Magazine*. I am grateful to the Magazine’s many authors, columnists, and reviewers; to Shlomo Engelberg, (my immediate predecessor), Kim Fowler, and Steve Dyer for their suggestions and insights; and to Frank Reyes and Ruth Dyer for paying the bills. Our counterparts at Allen Press have always been supportive and responsive. Most of all, I thank my wife Vicky for her patience and her tolerance of far too many late nights lost weekends, and working holidays when deadlines were looming.

My first editorial invoked verses from the book of Ecclesiastes. Using the language of the same book, it is now time for the conclusion of the matter. I leave you with gratitude and best wishes to all for successful futures.

President's Perspectives

Reza Zoughi

It is all about Quality

The Merriam Webster dictionary defines *Quality* as “a high level of value or excellence.” *Quality* is not easily *measured* with common methods of measurement and has no unit associated with it. However, one knows *Quality* when one comes in contact with it! I have a poster hanging on the wall in my laboratory which simply states “Things of quality have no fear of time” (author unknown). I hung the poster strategically so that as my students walk in they get a glimpse of it, and to reinforce quality in all aspects of their academic, research, and personal endeavors. We must not be afraid of quality - must embrace it, strive for it and achieve it in everything we do for our Society and its members. Quality is only achieved through diligence, hard work, perseverance and the desire to want it.

When I was appointed as the editor-in-chief of our *Transactions* (TIM), we faced a number of challenges. I knew then that if we strived to achieve quality, we would successfully address and overcome all of those challenges, and we did. Last year the AdCom approved our first-ever Strategic Plan (SP). You may find it on the Society website ([http:// www.ieee-ims.org](http://www.ieee-ims.org)) under “About IMS.” Our Vision is to “*Be the premier international professional Society in the Instrumentation and Measurement (I&M) fields.*” Our Mission is to:

- Provide the most *comprehensive* and *high-quality* services to our members and related professionals.
- Serve as the professional *incubator* for the *growth* of all (particularly younger) members.
- Be in the *forefront* of future I&M technological advances.

This working document also lays out specific Plans and Metrics for each of the standing Committees of the Society. In drafting the SP, we insisted on incorporating realistic, yet definite benchmarks to monitor and measure our progress – after all we should be able to *measure* this!

We will evaluate and scrutinize our progress and update the SP, during our annual “Society Strategic Planning Meeting.”

As a Society we have accomplished much in the past few years and continue to do so. I wish to share a few of the more critical issues we are currently working on:

- Ensure the overall well-being and success of the *I&M Magazine* to remain an effective conduit between the Society and its members.
- Engage all members, particularly our younger members and provide an effective *incubator* to help them succeed in their chosen careers.
- The Conference Committee is working on a plan to transform all of our Society-sponsored conferences to *reviewed* conferences where, instead of submitting an extended abstract, full proceedings papers will have to be submitted and reviewed for acceptance. We believe in the long-term, this critical change will add more value and quality to our conferences and will attract more high-quality papers.
- We have been proactively encouraging our industrial members to be more involved and engaged in the Society since they form the largest membership group. The Society aims provide them with more support when needed and also to benefit from their wisdom and experiences in promoting the Mission of the Society. We understand some of the limitations they face compared to our academic members. Consequently, our newly established Industry Liaison (Mr. Max Cortner) is working with others in the Membership Committee to facilitate and encourage more involvement of our industrial members.
- IMS is a diverse Society in all respects and we celebrate and emphasize activities that involve and engage *all* of our members from all backgrounds and regions. In the past few years we have organized programs to better promote involvement by our various membership constituencies through the Annual Graduate Student and Women in I&M Panel Discussions at I2MTC, facilitating involvement of members from regions 9 and 10, to name a few.
- For the past two years, we have put great emphasis on different standing committees working integrally as our Mission requires close interaction among these committees.
- We have to revise, revamp, stimulate, and engage our Technical Committees (TCs) and ensure that they serve the purpose for which they were established and that they remain active and continually engage their members. We look at TCs as a critical resource for

technical know-how, member recognition (e.g., qualified Fellow, Keithley, and other Society Award nominations), organizing conference special sessions, etc.

IEEE budgeting processes and guidelines are not always easy to understand and follow, especially in preparing the preliminary budget and understanding whether sufficient revenues can be expected to support new initiatives. However, under the leadership of our past VP Finance (Dr. R. Dyer) and the current Treasurer (Mr. F. Reyes), we have created a system of best practices in the way we perform our annual budgeting process and keep regular tabs on our expenditures and revenues.

Implementing this best practice system allows us to invest in and initiate new educational initiatives devoted to our youngest members. We are now proud to boast that the IEEE Educational Activities Board (EAB) awarded the I&M Society the 2013 IEEE Educational Activities Board Society/Council Professional Development Award “*for offering comprehensive educational initiatives in the field of instrumentation and measurement to meet the life-long learning needs of its members.*” This award was given in recognition of the I&M Society’s exceptional achievements in professional development activities and is given to societies or councils whose contributions to continuing education and professional development are outstanding as evidenced by their *quality, comprehensiveness, innovation or impact.*

We certainly have come a long way, but we still have a lot to travel, and we need your help in achieving even more. The AdCom is here to help you and facilitate processes that bring tangible, useful, and *high-quality* services to our members. Please keep in touch; you are the Society and we need to hear from you as to how we are doing and what we can do more and better. I look forward to working with the AdCom, all of our members and the IEEE to continue bringing *quality* to all aspects of our Society.

Cheers!
Reza

Letter from the Future Editor

Wendy Van Moer

Moving Forward

Let me start this letter by briefly introducing myself. My name is Wendy Van Moer and I live in a small town called Ternat in Belgium. Within a few months I will reach the age of forty (no secrets about that :-)). In my free time, I like to run and swim. I married a nuclear inspector. And, my most precious gift is my 9-year old son!

My professional career in a nut-shell? I received the M.Eng. and Ph.D. degrees in Engineering from the Vrije Universiteit Brussel (VUB), Brussels, Belgium, in 1997 and 2001, respectively. Currently, I am an Associate Professor with the Department of Electrical Measurement (ELEC), VUB, and a visiting Professor at the Department of Electronics, Mathematics and Natural Sciences, University of Gävle, Sweden. My main research interests are nonlinear measurement and modeling techniques for medical and high frequency applications.

I have been an Instrumentation and Measurement (IMS) society member since 1997. In 2006, I received the Outstanding Young Engineer Award from our society. Since 2007, I have been an Associate Editor for our *IEEE Transactions on Instrumentation and Measurement* (TIM), for which I received the 2010, 2011, and 2013 Outstanding Associate Editor Recognition. From 2010 till 2012, I was also an Associate Editor for the *IEEE Transactions on Microwave Theory and Techniques*. In 2012, I was elected as a member of the administrative committee of the IEEE IMS for a 4-year term. I served as the vice-president of publications for our society in 2013.

Now it is time to move forward and to reach for the next challenging task... editor-in-chief. From the June 2014 issue on, I will take up the torch from Mike Gard as an editor-in-chief of our *IEEE Instrumentation and Measurement Magazine* (IMM). Some things will change.... You will notice that our magazine will undergo a face-lift (these things happen with a female EIC.) New columns will be introduced, other will be discontinued. To not spoil the surprise, I will only lift a tip of the veil. There will be columns about legal metrology, basic metrology, life after a Ph.D., and many more. I would simply say, watch the June 2014 issue and find out WHAT happens when *a physician meets an engineer*. Will there be magic?

This new era would not be possible without a strong and well-balanced editorial board. My first task was to setup an editorial board which is a reflection of our readers: academics, industrialists, and advanced students. Their task is to support the EIC of the *Magazine* by providing state-of-the-art topics, the best reviewers, industrial liaisons, and much more. On the 1st of January 2014, this New Year started together with our new editorial board:

1. **EIC:** Wendy Van Moer
2. **AEIC:** Shervin Shirmohammadi
3. **President:** Reza Zoughi
4. **EIC TIM:** Alessandro Ferrero
5. **VP Publications:** Mark Yeary
6. **VP Education:** Max Cortner
7. **VP Technical Committees:** Rich Hochberg
8. **VP Conferences:** Alessandra Flammini
9. **Legal Expert:** Veronica Scotti
10. **Outstanding Young Engineer:** Simona Salicone
11. **Industrial representatives:** Charles Nader (Nokia), Lee Barford (Agilent) and Kevin Bennet (Mayo Clinic)

Hereby, I would like to take the opportunity to thank all of them for their dedication and involvement in our society! They are doing a tremendous job in making our *Magazine* move forward! See you all in June!

Groetjes,
Wendy

Feature Articles

Hydro Energy Generation and Instrumentation & Measurement: Hydropower Plant Efficiency Testing

David Jarry-Bolduc and Emmanuel Côté

To measure the turbine and generator efficiency, the mechanical energy at the input of the turbine and the electrical power at the output of the generator have to be determined. To measure water discharge (flow) entering the turbine, several techniques can be used, such as current-meter, acoustic, thermodynamic, and pressure-time methods. Each method requires a particular instrumentation and has its advantages and disadvantages depending mainly on the power plant configuration. This article provides a brief overview of hydropower plant components and discusses the instrumentation and measurement techniques for measurement of hydroelectric units' efficiency.

This summary includes text from the article.

Measurement-Based Performance Analysis of Wind Energy Systems

Marcelo G. Simões, Eduard Muljadi, Mohit Singh,
and Vahan Gevorgian

Three basic types of instrumentation are used for wind measurements: instruments providing data for the national meteorological services, instruments designed specifically for determining and identifying the wind resources, and instruments with high sampling rates used for studying gusts, turbulence, and inflow winds for determining responses of wind turbines. This paper describes how wind turbine controls are related to instrumentation and measurement. In addition to measuring wind data for site surveys, it is necessary to coordinate online instrumentation to manage utility connection requirements, such as: assessing reactive power supply, fault ride-through capability, voltage control, power quality with monitoring of flicker and harmonics, and frequency control so electrical variables are sampled at least at 600 samples/s. A proper control scheme must be implemented to control active and reactive power generation.

This summary includes text from the article.

Integration of Photovoltaic Solar Power – The Quest towards Dispatchability

Johan H. R. Enslin

Existing photovoltaic (PV) power plants impact the power grid in a negative way due to a lack of voltage regulation, energy storage, forecasting and wide-area communications, measurement, and control. Currently utility-scale distributed solar PV plants on distribution networks have nominal capacities that are compatible with distribution substation MVA ratings e.g., between 5 and 30 MW. Furthermore, PV plants in the 30 to 100 MW power range are currently integrated in transmission networks. The system impacts are discussed in this paper, and mitigation solutions are proposed using advanced power converters, energy storage systems, as well as local and remote measurements and forecasting options. Case studies are provided.

This summary includes text from the article.

Marine Energy Generation Systems and Related Monitoring and Control

Frede Blaabjerg, Hui Liu, and Poh Chiang Loh

Marine energy generation systems have gained extensive attention in the past decade because a lot of renewable energy can be harnessed from the ocean and transmitted for onshore utilization. This paper introduces the principles of marine energy capture as well as the technologies of the marine energy conversion and summarizes the development stages of several types of systems. To achieve useful and reliable energy output, corresponding monitoring and control strategies of the marine energy conversion system should include condition measurement and a series of control methods such as maximum power tracking, variable speed control, and harmonic suppression.

This summary includes text from the article.

The Significance of Energy Storage for Renewable Energy Generation and the Role of Instrumentation and Measurement

Boris Berseneff, Marion Perrin, Tuan Tran-Quoc, Pascal Brault,
Nicoles Mermilliod, Nouredine Hadjsaid, Tony Delaplagne,
Nicolas Martin, and Bruno Crouzevialle

Energy storage technologies were historically used for managing the load curve while observing the dynamic constraints of power generation. With the advent of open access and the corresponding unbundling of electric power industry segments, valorizing energy storage options under market conditions has become tricky. The major present barriers for deploying energy storage systems (ESS) are high cost, competitive economic value, efficiency, and energy density, together with energy policies. In this article, some of the main energy storage technologies are reviewed according to their main application domains. They are followed by a focus on battery energy storage. Some key elements of battery management system technologies and ESS architecture and characterization are addressed. Then some aspects of ESS protection are presented, and the key trends and indications of emerging concepts for energy storage are identified.

This summary includes text from the article.

The Sentence in the L'Aquila Earthquake Trial

Veronica Scotti

Veronica Scotti, coauthor with Dr. Alessandro Ferrero of the February 2013 article “Forensic Metrology,” graciously accepted an invitation to prepare a legal analysis of the 2009 L’Aquila verdict. This verdict, which greatly troubled many in the scientific community, convicted a group of Italian scientists and a civil servant of manslaughter after an earthquake in the small town of L’Aquila produced hundreds of fatalities. Ms. Scotti reviewed more than 1000 pages of legal material to distill the essential elements of Italian law and the court’s motivation document into a readable and informative explanation of the sentence.

This summary includes text from the Editor’s Bench.

Departments

Instrumentation Notes

A DIY Pipelined Analog to Digital Converter that Utilizes Compressive Sensing

Shlomo Engelberg, Yosef Soussana, and Shay Weiss

Reading about things is all fine and good, but the best way to understand a concept is to put it into practice. After teaching about analog to digital converters (ADCs) and digital to analog converters (DACs) in general, pipelined ADCs in particular, and discussing, experimenting with, and writing about compressive sensing, the time had come for the authors to build a sensor that utilizes *all* of these technologies. To experience as wide a variety of ADCs and DACs as possible, they chose to build a microcontroller-based, two stage, four-bit pipelined ADC. Each stage of the pipelined ADC consists of a sample and hold circuit, a two-bit flash ADC, a two-bit binary weighted DAC, a differencing circuit, and an amplifier. As discussed in this paper, the authors need the microcontroller both to aggregate the results of the flash converters and to perform the compressive part of the compressive sensing.

This summary includes text from the article.

My Favorite Experiment

John Witzel

Simple DC Motors

Because magnets are easy to come by and much more powerful than ever, the author uses this column to present some really simple experiments that are instructive and educational. Exploring the magic behind these amazing devices, the author describes the materials and procedure for building a few very simple, electric motors including a magnetohydrodynamic, homopolar, and commutated variety that readers can build with young experimenters at home, showing them how exciting and useful science can be without delving too deeply into Faraday's Laws, Lorentz forces or Maxwell's equations.

This summary includes text from the article.

Society News

Vice Presidents' Reports

Meeting of the I2MTC Board, October 10, 2013

Max Cortner

The I2MTC Board began by adopting a method and criteria for selecting future conference sites and local organizing committees. Conference bids will be received from October 1st until March 1st and a venue selection committee will select a finalist or finalists and invite them to present at the Spring I2MTC Board Meeting held in conjunction with I2MTC. The board will then select the venue for the conference four years in the future. For example, we will select the venue of the 2017 conference while meeting during the 2014 conference in Uruguay. The required content of bids was also approved, and details are available from the Board Chair. An expected regional rotation was also approved. I2MTC 2017 will be held in the Regions 1-7 or 9 (Americas), I2MTC 2018 in region 8 (Europe or Africa), and I2MTC 2019 in Region 10 (Asia). This will assure all regions have the opportunity to host Instrumentation and Measurement Society's flagship technical conference.

The Board received conference reports from the committees of the next three years. Juan Carlos Miguez, General Chair of I2MTC 2014 Uruguay, reported completing a lineup of 14 tutorials to start their conference. The technical program is taking shape with keynote speakers and special sessions on instrumentation for energy and the environment among others. The deadline for abstract submission was extended to insure a broad selection of technical papers for review. The organizing committee is complete, and plans are underway for a great conference. Bernardo Tellini, General Chair of I2MTC 2015 Pisa, provided a report that concentrated on the selection of conference hotels and a banquet venue. Several hotels within a reasonable distance of the conference center were recommended, and the committee will seek contracts. Chi-Hung

Hwang's report from I2MTC 2016 Region 10 focused on the selection of a conference venue. The recommendation from the Board was to pursue the Taipei International Convention Center which has excellent facilities if a reasonable contract can be reached and to approach the Grand Hotel as a second choice.

Dario Petri provided a review of the survey data from I2MTC 2013. Responses were quite positive overall. I2MTC 2013 was attended by 362 people. Tutorials were well attended, and 15 vendors provided exhibits to discuss the latest in instrumentation and measurement products. The Intellectual Property (IP) panel discussion, which was a new feature, was well attended and received popular acclaim in the survey results. Several of these best practices have been adapted into the I2MTC Handbook.

Our next board meeting will be after I2MTC 2014 in Uruguay, so plan to join us for the conference. Please contact J. Max Cortner for more information (max.cortner@bsci.com).

Publications Committee: Moving Forward

Wendy Van Moer

Our society's *Transactions and I&M Magazine* are continuously moving forward. The impact factor of both publications is following a rising trend year after year. Furthermore, the self-citation index of our *Transactions* indicates that other journals are citing our papers more frequently. This is clearly proof of the trust and confidence of the scientific community in our publications. We will keep on moving forward, and to do so, we are taking several strategic actions.

One method is the *rotation procedure* that was implemented for the AEIC of the *Transactions*: each year one of the associate editors is selected by the editor-in-chief as the associate-editor-in-chief. In 2013, Shervin Shirmohammadi served in this role, and did an excellent job for which we would like to thank him very much. Currently, the duties of AEIC will be taken over by Sergey Karkhovskiy. By installing this kind of rotation procedure, we make sure that a good candidate will be selected when the next EIC needs to be appointed.

We have also set up a well-balanced editorial board for our *Magazine*. The editorial board will be a clear mirror of our readers that includes academics, industry members and advanced students. Their task is to support the EIC of the *Magazine* by providing state-of-the-art topics,

the best reviewers, industrial liaisons, and much more. At the beginning of each calendar year, we will start together with our new editorial board. Something to look out for!

The fact that our society is doing a very good job has been recognized by the IEEE during the latest IEEE Society Review Committee review. In particular, our work has been mentioned in the IEEE Technical Activities newsletter (Society Sentinel) of the 25th of September 2013 and can be found at: <http://newsletters.ieee.org/volunteers/sentinel/>. Specifically, one of the best practices of our society that was mentioned was Improvements in Author Submission to Publication Time: IMS informs authors about statistics concerning submission to publication time on its website, and it updates monthly. Every day, many people are working very hard to make our publications a success: EICs, AEs, publication committee, administrative staff and reviewers. I would like to thank you all for your time and commitment!

Education Committee
Ferdinanda Ponci

The EdCom Members convened at the Fall AdCom meeting in Verona, Italy, October 10-12. This was a fruitful and very pleasant event and including much time together gathering thoughts about current activities and planning for upcoming years. The EdCom mission is to “Initiate and coordinate the educational activities of the Society to promote the I&M culture while serving our members and related professionals” and “Provide the most *comprehensive* and *high-quality educational* services to our members and related professionals.”

With this in mind, here are some recent developments and upcoming activities.

- This year our Society has received the IEEE Education Award for Societies and Councils, “for offering comprehensive educational initiatives in the field of instrumentation and measurement to meet the life-long learning needs of its members.” The award was accepted by our President Jorge Daher on 22 November 2013 in New Brunswick, NJ, USA, during the 2013 IEEE EAB Award Presentation Ceremony, in the presence of IEEE Officers and Presidents of the other IEEE societies. It is a great achievement for our Society of which we members should be rightfully proud.
- The nomination and evaluation guidelines for the IMS Graduate Fellowship and Course Development Awards are being updated to reflect the feedback of the evaluation committees. IMS conducted outreach and presented a booth at the IEEE Virtual Fair, October 21-24.

- Work is progressing for the development of the IMS IEEE TV Channel which will offer a selection of video tutorials and a collection of highlights of the education activities of the IMS.
- The EdCom is taking charge to organize panel sessions at the conferences of the Society on the theme “mutual education of industry and academia.” The first such event will be held during the first Workshop on Metrology for Aerospace, May 29-30, 2014 in Benevento, Italy.
- The I2MTC 2014 Tutorials have been selected! The 14 Tutorials were chosen for their top quality from a large pool of proposals and will be given on May 12, 2014 in four Tracks. Attendance is free for conference attendees and is offered to others at the cost of a one day tutorial fee of \$100.
- Our Distinguished Lecturer Program is thriving. Our DLs have visited many locations, including newly formed chapters in Manitoba, Argentina, Malaysia, Croatia and Bahrain! Most of the hosts are Chairs of our chapters and many visits include multiple lectures.

The outgoing EdCom takes this opportunity to thank all of the EdCom and AdCom members for the great work and to wish the new EdCom Chair, Max Cortner, our continued support for the best success!

Membership Committee
Kristen Donnell

The Membership Development Committee’s (MDCom) primary mission is to serve as the link between the IMS and our members by providing the most comprehensive and high quality services to our members and related professionals. This includes the development and encouragement of membership-related activities in the I&M fields. To better serve our chapters, MDCom has been busy re-evaluating the Chapter Funding Program and Outstanding Chapter Award, as well as creating support documentation to better facilitate communication between our chapters and the IMS Administrative Committee. The first annual Chapter Chair Summit (held in May, 2013 in conjunction with I2MTC) was instrumental in providing MDCom with insight and suggestions that have led to these updates. IMS is proud of our many active chapters and we are excited to welcome five new chapters thus far in 2013, bringing the total to 45 chapters.

Plans for the 2014 Chapter Chair Summit are already under way. As last year, the 2014 Summit will be held in conjunction with I2MTC 2014 and more details will be announced soon. For

questions about the Summit, please contact the IMS Chapter Chair Liaison, Dr. Sergio Rapuano (rapuano@unisannio.it).

MDCom (on behalf of IMS as a whole) is also working to develop a relationship with The National Conference of Standards Laboratories, International (NCLSI). Through this connection, we hope to open the door for our members to take advantage of what this group has to offer, and conversely, we also hope to support professionals involved with NCLSI through new relationships with IMS.

Student support has been and continues to be very important to MDCom. To this end, we are considering ways to improve and increase support of our student members and student branch chapters. To accomplish this, we are considering a “Strengthen the Core” program. One possibility is to provide support to our active members to help them bring more students to IMS conferences. Sending an IMS representative to visit our Student Branch Chapters may be another way we can strengthen our (IMS student) core.

Improved industrial member support is another MDCom goal that we are actively pursuing. We are working to improve industry awareness of the value of IMS and the depth of knowledge that is available within our organization. This may include creating connections with traditionally “noninstrumentation” industries that rely on instrumentation in their day-to-day operations. Another option may be to establish a presence at conferences attended by engineers and practitioners within these industries or connections with other professional organizations.

MDCom welcomes comments, ideas, and feedback from the IMS membership and we would love to hear from you. For chapter-related communications, please contact the IMS Chapter Chair Liaison, Dr. Sergio Rapuan (rapuano@unisannio.it). For general membership-related communications, please contact the Vice-President of MDCom, Dr. Kristen Donnell (kmdgfd@mst.edu).

Society Awards Alessandro Ferrero

During the Fall AdCom meeting, the Award Committee had the pleasant task of selecting the recipients of our Society Awards. As our members know, we present four awards every year. The IMS **Technical Award** is given to an individual or group of individuals for outstanding contribution or leadership in advancing instrumentation design or measurement technique.

This year we received six highly qualified nominations, and the Committee selected Dr. Robert Gao, University of Connecticut, USA, “for significantly advancing the state-of-the-art in electrical capacitance tomography instrument design.”

The Instrumentation and Measurement Society **Career Excellence Award** is awarded to recognize a lifetime career of meritorious achievement and outstanding technical contribution by an individual in the field of instrumentation and measurement. This year we received five highly qualified nominations, and the Committee selected Prof. Massimo D’Apuzzo, University of Naples Federico II, Italy, “for lifelong activity and outstanding achievement in pioneering the use of microcontrollers in electrical measurements.”

The Instrumentation and Measurement Society **Outstanding Young Engineer Award** recognizes an outstanding young IMS member, who has not reached his or her 39th birthday at nomination time, and who has distinguished him/herself through achievements which are technical, of exemplary service to the IMS, or a combination of both early in their career. This year we received four highly qualified nominations, and the Committee selected Dr. Mohammad Ghasr, Missouri University of Science and Technology, USA, “for outstanding contributions to real-time microwave imaging and nondestructive testing systems development.”

The Instrumentation and Measurement Society **Distinguished Service Award** is presented each year to an individual who has given outstanding service to the Society and to the profession. Unfortunately we did not receive any nomination, and therefore the Committee has not assigned this award. I invite IMS members to join me and all members of this Committee in congratulating the recipients of these awards and for contributing, with the excellence of their work inside the field of Instrumentation and Measurement, to the advancement of knowledge in this field and the visibility of the IEEE IMS. I would also like to thank Prof. Georg Brasseur, who chairs the Society Award Sub-Committee, for reviewing all received nominations and coordinating the selection process.

This year the Award Committee has started a new award: the **J. Barry Oakes Advancement Award** established in honor of J. Barry Oakes, former IEEE IMS Administrative Committee member and President of the IMS. The J. Barry Oakes Advancement Award will provide support for the recipient, a young person who has not reached his or her 35th birthday at nomination time, to provide a presentation during the annual I2MTC or AUTOTEST. The Committee has

started the call for nominations for this award, and we are confident that it will be assigned in 2014 for the first time.

Lastly, the IMS is also assigning the **Andy Chi Best Paper Award**, to recognize the best paper published in the *IEEE Transactions on Instrumentation and Measurement* in the previous year. The selection process for the best 2012 paper has started. For information about society awards, please contact Alessandro Ferrero <alessandro.ferrero@polimi.it>.

New Products

Robert Goldberg

Handheld Digital Storage Oscilloscope

B&K Precision announces its new 2510 Series handheld digital storage oscilloscopes. Four models make up this new line of dualchannel oscilloscopes that includes 60 MHz and 100 MHz bandwidth models in nonisolated and isolated designs. Suitable for general electronics, models 2511 and 2512 provide non-isolated 300 V CAT II rated inputs.

For industrial applications, models 2515 and 2516 provide two fully isolated 1000 V CAT II / 600 V CAT III rated inputs. With 1 GSa/s sampling rates and 2 Mpts of waveform memory, these portable scopes provide floating measurement capabilities combined with built-in digital multimeter (DMM) and recorder functions at an economical price point.

In applications such as power electronics, engineers and technicians often require measurements that are not referenced to ground. Floating traditional line-powered oscilloscopes pose a safety risk and may cause measurement errors due to the signal common being connected to the scope chassis, thus making battery-powered scopes the instrument of choice for these applications. Models 2515 and 2516 feature fully isolated channels for safe and accurate floating measurements.

All models in the 2510 Series offer 5.7" (about 14.5 cm) color displays, a built-in 6000-count DMM with dedicated terminals for current measurement, and scope/meter trend plot functions

for logging measurement values over time. Capture and record up to two voltage or time parameters from the scope, or graph any one of the DMM's measurements, which include: DC/AC voltage and current, resistance, capacitance, diode, and continuity test.

Additional features include digital filtering with adjustable limits, 32 automatic measurements, FFT and math functions, multi-language interface, and USB connectivity for remote PC control. A side panel USB host port is available for saving setups, waveform data, screenshots, or CSV files to a USB flash drive.

Weighing approximately 3.4 lbs. (about 1.54 kg) with the included rechargeable Li-ion battery, each model can provide up to four hours of continuous battery operation and comes with two high bandwidth safety-rated passive probes plus a pair of DMM test leads. Models 2515 and 2516 include a hard plastic carry case accessory for safe transport on the road.

For additional information, please visit: <http://bkprecision.com/products/oscilloscopes/2516-100-mhz-1-gsa-s-isolated-handheld-digital-storageoscilloscope.html>.

UV Laser Tool for Prototype Circuit Boards

LPKF Laser & Electronics presents the LPKF ProtoMat D104. It unites the best features of advanced LPKF ProtoMats with the high precision of the ProtoLasersystems. The highlight of this product innovation is a special UV laser.

Circuit board plotters in the LPKF ProtoMat range previously cut out circuit structures from completely coated base materials using negative milling. The ProtoMats mill insulation channels into the conductive layer, leaving the areas that will later be the conductive traces. Tool changing allows contours to be milled or vias to be drilled in circuit boards. LPKF ProtoLasers, on the other hand, are particularly useful when extremely fine structures are required.

The new LPKF ProtoMat D104 now extends the options of the ProtoMats to include machining of especially delicate materials. Thanks to the integrated UV laser-tool, the D104 enables structures down to the ultrafine conductor range to be produced. Depending on the material, structures with a pitch of 200 μm (100 μm minimum track width, 100 μm minimum space) can be applied by milling; with the laser tool, the achievable pitch is reduced to 80 μm (50 μm

minimum track width, 30 µm minimum space). Even ceramics can be structured using the laser tool.

The ProtoMat D104 is recommended for PCB prototyping, among other things, because of its extremely high precision, short machining times, high-speed milling/drilling at 100,000 RPM, 15 tool change options (automated) plus UV laser tool, non-contact tool depth setting and working depth limitation, a vision system with a measuring camera, and a maintenance-friendly housing.

More information can be found at www.lpkf.com.

Solid-State Ultra-Wideband Microwave Power Amplifiers Cover 100 MHz to 50 GHz In A Single Amplifier

Giga-tronics introduces the GT-1000B option 06 and the GT-1050B/GT-1051B Solid-State Ultra-Wideband Microwave Power Amplifiers, which cover 100 MHz to 20 GHz and 10 MHz/2 GHz to 50 GHz respectively, with high output power, low noise figure and low harmonics in a single amplifier. Designed using Broadband MMIC technology, the GT-1000B option 06 provides 5 Watts from 100 MHz to 18 GHz and the GT-1050B/GT-1051B provides ½ Watt (+27 dBm) at 40 GHz and ¼ Watt (+24 dBm) at 50 GHz with high gain and low noise figure. This ultra-wideband capability eliminates the need to switch between multiple narrow band amplifiers, resulting in improved performance and savings in time and expense.

These ultra-wideband amplifiers provide higher power from microwave signal generators and are easily placed closer to the device under test or integrated into automated test systems to overcome cable and signal switching losses. The low noise figure makes them excellent preamps for spectrum analyzers and EMC receivers.

The +/- 3.5 dB typical gain flatness performance outperforms multiple narrow band amplifiers, and the amplifiers feature high reverse isolation, excellent input and output match and the long life and high reliability of solid-state technology. Datasheets, app notes, white papers and video clips are available on the Giga-tronics website at www.gigatronics.com.

Benchtop SDSI (Software Defined Synthetic Instrument)

RADX® Technologies, Inc., in collaboration with National Instruments®, has introduced the RADX LibertyGT™ Model 1200B (“1200B”) COTS Benchtop SDSI. Designed to address high-performance, high-throughput wireless communications, RF and microwave test and measurement applications, the 1200B is a turnkey, multifunction, commercial-off-the-shelf (COTS), benchtop Software Defined Synthetic Instrument that is uniquely modular, programmable, upgradable, reconfigurable and cost-effective.

The 1200B’s modular architecture combines an extensive library of RADX COTS Realtime Measurement Science Software and Firmware modules with a powerful collection of advanced, COTS NI PXI modules and LabVIEW® system design software—all housed in an integrated, field-service-optimized benchtop enclosure equipped with a comprehensive RF Interface Unit and High-Definition touchscreen display.

With advanced RF stimulus and measurement capabilities, the LibertyGT 1200B is optimized for high-throughput, multifunction parametric testing of commercial and military digital and analog radios, avionics, smart phones, tablets, data links and other wireless communications systems with transmit and/or receive frequencies under 6 GHz and where the combination of programmability, flexibility, performance, throughput and long life cycle support and total cost of ownership is of paramount importance.

With its LabVIEW software framework, multicore Intel® Core™ i7-based embedded controller and multiple Xilinx® FPGA processing capabilities, the 1200B features an open architecture that is ideal for user and integrator programming. The 1200B includes the LibertyGT Base Measurement Science Software and Firmware Bundle, which features Spectrum Analysis, 2-Channel Digital Storage Oscilloscope, Standard Calibration/Alignment, Remote Interface and Test Procedure Set & User Programming/Scripting Module (both with IVI support).

In addition, RADX offers NRE-based customer services for developing customer specific modulation/demodulation capabilities and specific automated tests for particular radios or communications systems.

For more information, please visit www.radxtech.com or email info@radxtech.com.

Multi-Channel Digital Oscilloscope

Yokogawa has added two new instruments to its ScopeCorder family of portable multi-channel data-acquisition recorders and oscilloscopes. The new DL850E and DL850EV (Vehicle Edition) ScopeCorders incorporate a number of new features to allow engineers to measure and analyze a wealth of signals in real-time and to speed up development and fault finding in areas such as power electronics, mechatronics and transportation.

In addition to the high-speed multi-channel capabilities plus long memory and isolated input channels found in Yokogawa's established ScopeCorder family, the new DL850E instruments have the ability to carry out the real-time measurement and analysis of electrical power.

All of the products in the ScopeCorder family are equipped with a set of basic arithmetic mathematical functions such as addition, subtraction, division, multiplication, Fast Fourier Transformation and other computations, and the new DL850E versions also offer the /G5 option for real-time measurement of electrical power as well as the existing /G3 option for realtime mathematical computations and digital filtering and the /G2 option for user-defined computations.

With the /G5 electrical power option, trend calculations such as active power, power factor, integrated power and harmonics can be carried out at data update rates up to 100 kS/s, using a dedicated Digital Signal Processor (DSP) that is able to calculate and display up to 125 types of electrical power related parameters in real-time. This enables the user to display raw waveform signals such as voltages and currents along with calculated power parameters as well as the capability to trigger on any or all of them. Harmonics can be displayed as trends of each order, bar-graphs and vector diagrams. Both RMS and power analysis modes are available. Like existing products in Yokogawa's ScopeCorder family, the DL850E combines features from a high-performance digital oscilloscope and a multi-channel data-acquisition recorder. It can capture and analyze both transient events and trends over time periods from milliseconds up to 200 days.

For more information, visit: <http://tmi.yokogawa.com/us/products/oscilloscopes/scopecorders/dl850edl850ev-scopecorder/>.

Next-Generation Atomic Force Microscope

Agilent Technologies Inc. announces the availability of its 7500 atomic force microscope (AFM), a highly advanced instrument that establishes new performance, functionality and ease-of-use benchmarks for nanoscale measurement, characterization and manipulation. The Agilent 7500 achieves atomic resolution imaging with its 90 μm AFM closed-loop scanner. The Agilent 7500 is a next-generation platform designed to extend the frontier of atomic force microscopy for academia and industry by offering high resolution and unrivaled environmental and temperature control.

The 7500 AFM has an integrated environmental chamber that provides an easily accessible, sealed sample compartment totally isolated from the rest of the system. Humidity and temperature sensors in the chamber track conditions *in situ*; oxygen and reactive gases can be easily introduced into and purged from the sample chamber. An optional sample temperature controller for the 7500 allows precise control from $-30\text{ }^{\circ}\text{C}$ to $250\text{ }^{\circ}\text{C}$, with suitable resolution to match any experimental requirements.

A half-dozen AFM imaging modes are supported by the system's standard nose cone, which can easily be interchanged with specialized nose cones as needed to extend capability. The 7500 comes with the ability to do advanced imaging and electrochemistry applications.

More information can be found at www.agilent.com/find/7500.

MathWorks Connections Program Supports Oscilloscope

Pico Technology has announced that it has become a member of the MathWorks Connections Program. The PicoScope 3000 Series oscilloscopes now have an instrument driver for the InstrumentControl Toolbox™. This includes all models apart from the Mixed Signal and Differential Oscilloscopes, with drivers for other product ranges to be provided in the future.

The MathWorks Connections Program is available to third-party organizations that develop and distribute complementary, commercially available products and services based on MATLAB and Simulink. These partner offerings address technical needs across a wide range of applications and industries worldwide with software and hardware products that extend the usage of MATLAB and Simulink. These solutions seamlessly integrate with MathWorks products and ensure on-going compatibility in conjunction with new MathWorks releases.

The decision to partner with MathWorks was a result of inquiries from mutual customers in a wide range of industries regarding drivers and examples for Pico Technology products to be used with MATLAB. The provision of high-level instrument drivers will simplify the process of acquiring data from Pico Technology devices into the MATLAB workspace, allowing customers to process the data using MATLAB Toolboxes such as the Signal Processing Toolbox.

The PicoScope 3000 Series oscilloscopes have the power to perform in many applications, such as design, research, test, education, service and repair. The USB-powered oscilloscopes are small, lightweight and portable. The PicoScope 3000 Series offers a real-time sampling rate of up to 1 GS/s, a bandwidth of up to 250 MHz and large buffer memory depths of up to 128 million samples per second. PicoScope claims that this series also contains the world's first USB 3.0 oscilloscope.

MATLAB users will be able to communicate directly with Pico Technology's hardware using Instrument Control Toolbox from MathWorks and a native MATLAB instrument driver that is included at no extra charge along with the Pico Technology hardware. This allows users to control instruments directly from MATLAB, including instrument setup, data collection and any other functionality available to the device. More information can be found at www.picotech.com.

Power Supply Optimizes Battery Charging

The new SITOP PSU300B 24V DC/17A three phase power supply from Siemens Industry Sector optimizes overload protection when charging 24V lead batteries. The power supply's wide-range-input for 3 phase ac, 320 to 575 volts also make it applicable for standard, industrial applications on three-phase network connections worldwide.

At just 70mm wide, the 93 percent efficient PSU300B requires little mounting space. Plug in terminals significantly reduce the time and cost of wiring. The integrated relay contact allows for transparency into the operating states of the power supply and allows further processing of these states in the upper level control system.

For more information, visit www.usa.siemens.com/industry.

New Generation of GaN-on-Si LEDs

Plessey has announced its next generation GaN-on-Silicon mid-power LEDs. The product family doubles the efficacy of Plessey's first generation MAGIC™ (Manufactured on GaNon- Si I/C) products released in February 2013. Using standard silicon semiconductor production techniques, Plessey is able to achieve high flux output LED products at substantially lower cost. The PLW114050 is the first in a family of entry-level LED lighting products that will be released.

The PLW114050 product is available in a CCT range from 6500K to 2700K, with a Lambertian distribution in an industry standard 3020 package. With a drive current of 60mA, the PLW114050 has a typical forward voltage of 3.2V. A full datasheet is available on the Plessey website. Plessey can also supply the blue LED PLB010050 in sawn-wafer die form. Additional package options will be made available.

For more information or sample requests, please go to the Plessey website, www.plesseysemi.com.

Smart Pressure Transmitter

SOR Inc. introduces the new 815PT Smart Pressure Transmitter. The 815PT is a stick form-factor smart pressure transmitter that is compact, rugged and explosion proof rated, making it suitable for hazardous locations and hostile environments. It is the newest addition to the 800 series of pressure devices which also includes the 805PT and 805QS.

The space saving stick form-factor does not mean limited features and benefits. The 815PT has circuitry protected by a 316SS housing with 316SST and 17-4SST wetted parts and has hermetically- sealed flying leads. In addition to popular continuous outputs like 4-20mA and 1-5VDC, it is packed with powerful communications capabilities (HART, Modbus RTU). The 815PT empowers oil and gas field operators, pipeline operators and plant operators with proper control and monitoring capability to protect equipment, people and the environment. For a minimal cost, operators can improve asset management and increase process uptime with the 815PT. Like most SOR products, the 815PT is configured, built, calibrated and tested per customer specifications.

Visit www.sorinc.com for additional resource information.

Brushless DC Tachometer/Commutators Aid in Industrial Motor Speed Monitoring

ServoTek Products Inc. has announced the successful application of its TachSyn Series brushless DC tachometer/commutator within industrial motor speed monitoring applications. The high-accuracy TachSyn may be used as either a brushless DC tachometer or brushless DC motor commutator for monitoring the rotational speed of brushless industrial DC motors. They offer an economical solution to many velocityloop problems, whether brushless or standard servo.

The robust design of the ServoTek Products TachSyn transducer consists of a primary magnetic sensing device, in which output windings, field winding, and a permanent magnet are all co-located within the stator itself to maximizing reliability. The transducers are available in several unique models to commutate 4-, 6-, or 8-pole brushless DC motors. Any sized TachSyn tachometer may be specified in applications where a simple DC tachometer signal is the only requirement. Pancake-shaped TachSyn transducers are easily mounted, cantilever-style, to the back of a motor or other device, with synchro-type adjustment for phasing.

Each TachSyn transducer requires one CT-4 Series circuit board (or a customer-supplied equivalent), as well as a connecting cable with double-barreled shield to complete signal conditioning. The CT-4 circuit board provides AC field excitation for the transducer and conditioning for its output signals, which include a linear low-ripple DC tachometer voltage, and either a Hall-equivalent or sine-wave commutation signal. The circuit board may be housed up to 100 feet from the hot-running motor, leaving only the non-electronic transducer in close proximity. Standard configurations are normally in stock and may be ordered online via the company's website.

For more information about this and other ServoTek Products, visit www.servotek.com.

New Software Release Features Advanced Defect Detection Tools

Cognex Corporation has announced the release of In-Sight® Explorer 4.9 software that offers an expanded set of inspection tools and an enhanced Cognex Connect™ communications suite featuring the iQ Sensor Solution network (iQSS). This latest version of In-Sight Explorer software includes the surface flaw tool and the scene correction filter. The surface flaw tool simplifies the detection of surface defects such as scratches, discoloration, burn/black spots, label wrinkles, small dents, tears or pinholes. The new scene correction filter balances images with uneven illumination to help present the defect detection tools with evenly lit images.

Combined with previously released inspect edge and flexible flaw detection tools, In-Sight Explorer 4.9 software offers customers in the automotive, consumer products, electronics and food industries a suite of inspection tools that reduces costs and helps them protect their brand image. The Cognex Connect suite of factory communication protocols ensure that In-Sight vision systems can easily communicate with a broad range of devices on the factory floor.

The release of In-Sight Explorer 4.9 software extends this ability to the Mitsubishi L-Series PLC line by incorporating the iQSS protocol. Ensuring the security of factory floor applications is another critical requirement in the automation architecture. In-Sight Explorer 4.9 works with Cognex Directory Server (CDS) to centralize authorization and authentication control for all In-Sight vision system users, network wide, as part of the overall enterprise information security architecture. With the addition of CDS, Cognex offers the most complete software suite available for managing the security of machine vision systems. In-Sight Explorer 4.9 software is now available in both spreadsheet and EasyBuilder® platforms.

For more information or to download trial software, visit www.cognex.com/in-sight-explorer.aspx.

Fully Programmable Temperature Sensor Provides All-In-One Measurement Solution

TURCK introduces the TS530 temperature sensor, the latest addition to the company's temperature sensor line. Featuring an integrated resistance temperature detector (RTD), the TS530 combines the display, process connection and RTD all in a single part for fast and reliable performance.

Simple, push-button programming and large, highly visible LED displays ensure easy operation, while a unique rotatable display that can turn up to 340 degrees allows for flexible viewing in the field. The sensor also sends feedback to a PLC, allowing operators to easily monitor measurement performance from virtually any location.

TURCK TS530 temperature sensors feature a new design for easy mounting and installation, allowing users to mount them directly to a tank or pipe with no mounting bracket required using a 1/2NPT process connection. For reliable performance in harsh manufacturing environments,

the sensor meets IP69K protection ratings and operates in temperatures ranging from -50 to 150 °C .

For TURCK product or technical information, visit www.turck.us.