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Broadcast Technology Society Newsletter

The technologies to deliver information and entertainment to audiences worldwide, at home and on the go.

Inside

Newsletter Deadlines

The BTS Newsletter welcomes contributions from every member. Please forward materials you would like included to the editor at BTSeditor@ieee.org. Here are our deadlines for upcoming issues:

Issue	Due Date
Summer	April 26, 2013
Fall	July 22, 2013
Winter	October 28, 2013
Spring	January 23, 2014

Guy Bouchard

Tim Carroll

Pat Waddell

BTS Distinguished Lecturer Program Continues to Grow With New Presenters

By Rich Chernock

2012 was a successful year for the BTS Distinguished Lecturer (DL) program, with eight lectures conducted over a wide portion of the world. Lecture venues included St. Petersburg, Russia, Princeton, N.J.; San Diego, Calif.; Seoul Korea; Bilbao, Spain; Beijing, China; Montevideo, Uruguay; and Buenos Aires, Argentina. A number of lecture topics have been presented, ranging from digital radio, signal embedding techniques, multiprogram video coding, connected television and DTV technology. Evaluations by attendees continue to be overwhelmingly positive.

New Lecturers Added

The BTS DL program continues to grow by adding new lecturers and topic areas, with three new lecturers being added to program. They are Guy Bouchard, Tim Carroll and Pat Waddell, who bring expertise in the practical aspects of broadcast technology, audio processing, and audio/video encoding and transport. With these additions, the DL program offers BTS Chapters high-quality lectures on a wide array of broadcast related topics ranging from research oriented to highly practical.

DL Program Overview

The DL program has been in place since mid-2009, and was created for the purpose of providing BTS chapters with a list of quality lecturers who can give talks at local chapter meetings, and also making funding available to cover the travel expenses incurred by the

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President's Column

William Meintel, BTS President

Once again this issue of the **Newsletter** is very small. As you may recall from the last issue, I went into a lengthy discussion concerning the need for our membership to step up and provide more content; otherwise, we may need to consider whether or not to continue the **Newsletter**. I expect that my words have not yet had a chance to produce the desired result, but I would hope by the next issue to have a flood of new material for the **Newsletter**. I am counting on you, so don't let me down.

While the lack of **Newsletter** content continues to be a problem, our other BTS publication is doing quite well. Thanks to the hard work of editor Yiyan Wu and his dedicated associate editors, the **BTS Transactions** continues to be one of the top journals and always seems to have more than sufficient content.

Beyond the **Newsletter**, our other problem area has been small attendance at the Annual Broadcast Symposium (ABS), even though there has been no lack of quality presentations. However, with the hard work of Eric Wandel and his committee, a number of new ideas have been put forward to fix this problem. As previously announced, the 2013 Symposium will break tradition and be held outside the Washington, D.C. area. Next year's event will take place in San Diego, Calif., and in 2014 it will move to San Antonio, Texas. From the reports that I am hearing, this change in venue appears to have sparked some significant interest in the San Diego and Southern California area; therefore it seems at this point to have been a good decision.

The ABS chairs for 2013, David Layer and Paul Shulins, are already hard at work implementing the move, as well as following up on other ideas that came out of the review committee. As always we expect a great program, and with a renewed focus on delivering content more attuned to our target audience, the 2013 ABS should put the train back on the track. Make your plans to attend. I am sure you will not regret it.

While on the subject of symposia, I am also told that our IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB) is once again expected to do very well. It is being held this year at Brunel University in Uxbridge, West London June 4–7, 2013. Apart from the fact that they invited me to speak it should be a great program, so pop on in and maybe you will learn something.

Newsletter editor James O'Neal has written in his column about his recent participation in an amateur radio network operation. That network, "The Greater Cincinnati Amateur Radio Association 1936 Net," was originally organized to help coordinate emergency relief operations during a serious flood that occurred in 1936 and which affected several states and devastated both small towns and major cities. The gist of James' column is that this Net performed a great service while relying on some very old technology—AM modulation.

With all the talk about broadcasting being "old" technology and that the UHF television spectrum would be better utilized for wireless broadband, it is interesting to note that this "old" technology always seem to shine where there is a natural disaster.

In recent years there have been numerous cases where broadcasting has provided an essential link to people in vital need of information. At the same time, the wireless broadband networks failed due to congestion with their one-to-one architecture not supporting (and likely never able to support) the demand. This also assumes that the networks are still operating, and we have seen many cases where such networks that rely on a multitude of sites have failed due to lack of power, or lack of fuel availability when they did have backup power.

On the other hand, the one-to-many broadcast technology does not have a congestion problem and the reliance for the most part on single transmitter sites makes it far easier to harden these facilities. Therefore, most broadcast stations continue to operate for the duration of the disaster. It is also noted that a number of different broadcast outlets in a market with multiple transmission sites further ensures that some will be able to continue operation even if others fail. Although this would reduce the number of sources, the one-to-many architecture still can reach most of the people in the market with vital emergency information.

The thing to be learned from this is that extreme caution needs to be exercised when making a decision to reduce the number of broadcast facilities to accommodate additional wireless broadband. Sometimes the "old" technology survives because it is the best tool for the job.

As society president, I always welcome your input about my column or any other issues affecting BTS.

Bill Meintel
President
wmeintel@ieee.org

From the Editor

James E. O'Neal, BTS Newsletter Editor

Just in case you didn't notice, this issue of the **Newsletter** is very significant—we're finally back on schedule. When I was appointed editor, the publication was two issues behind schedule, with one of the 2010 issues never making it to the printer. This Spring issue is also the first anniversary of the magazine's complete makeover and switch to four-color production. Getting back on schedule has not been especially easy—actually, it's been a long, hard pull and I want to thank those who have helped me to make this possible and also to thank our membership for their patience and understanding when some issues of the **Newsletter** came in late. Right now we are right where we should be in terms of production schedules and hopefully we can stay there.

Even though this is the Spring issue, as I write this—production schedules being what they are—we are not really that far into the new year. Outside temperatures coupled with long nights and short days serve as a constant reminder that it's still officially wintertime. Unless you're into winter sports in a big way, this keeps many of us inside our homes after the day's work is done. A diversion for some is amateur radio. Winter seems tailor-made for this activity, due to reduced noise levels in the HF portion of the spectrum and the fact that you don't have to venture out into the cold to participate.

I've been a licensed "ham" operator for quite some time, but due to a lot of work-related and volunteer commitments, I really haven't had much time to fire up a transmitter and get on the air. A few weeks ago, I broke my radio silence to participate in a rather special amateur radio network operation—the Greater Cincinnati Amateur Radio Association (GCARA) 1936 Net "AM Night." This happens only once a year (typically the last Thursday in December). The net is the oldest organized U.S. amateur radiotelephone networking operation, having been in existence now for nearly 80 years. The name stems from the year it was organized—1936—and also the operating frequency—1936 kHz (or kilocycles back then). In case you're not familiar with ham radio nets, these are organized and scheduled on-air "meetings" in which a group of radio operators with similar interests "check in" with a designated coordinator. Sometimes there's a bit of chatter, but in the case of the "GCARA 1936 Net AM Night," the information passed was just the operator's station call sign, first name, and a mention of transmitting/receiving gear and antenna type used.

There's a lot of history associated with the "GCARA 1936 Net"—it was organized to help coordinate emergency relief operations during a really horrific flood that affected several states and devastated both small towns and major cities. I should point out that this occurred during the Great Depression when resources were very meager, even on a federal government level. There had been no grants for communications gear for emergency relief workers. Even if there had been money available, two-radio emergency radio gear was in its infancy—little was available and there few people trained to operate and maintain it. This is where ham operators stepped up to the plate and pitched in, providing communications between relief centers and emergency personnel when all other communications had failed.

Times have changed a lot in the last 80 years in terms of hardening of communications infrastructures, but last fall's Hurricane Sandy proved unquestionably that nothing is infallible. Just as with commercial broadcasting, providing assistance in times of emergencies is one of the reasons that ham radio exists. There are a number of "net" operations that operate in concert with various state and local emergency relief organizations, with operator "check-ins" in some cases done daily to assure readiness if assistance is needed.

Ham operators now take advantage of the latest developments in radio, utilizing some very cutting-edge digital modulation technology. However, participation in the GCARA 1936 Net AM Night is special, with all communications on that designated evening done with plain old amplitude modulation. Although not a requirement, operators are encouraged to use non-state-of-the-art radio gear such as 1930s amateur radio equipment, modified WWII-vintage military surplus communications gear, homebrew rigs, and former commercial AM broadcast station transmitters.

During this most recent 1936 Net, some 55 hams checked in with coordinators located in Kentucky and Ohio. In this age of ever-increasing complexity, it's still a bit amazing as to what can be done with just a few watts of RF and a modulation scheme that's been around for more than a century. Sometimes it's good to back away from complexity and try something simple; it can be very rewarding. (And I'm guessing that despite all of the spectrum grabbing that's been going on, the telecoms and the FCC aren't going to find many other uses for the current MW band of frequencies used for broadcasting—long live AM and those broadcasters who keep these stations going!.)

I mentioned earlier that I'm writing this in January, and the U.S. Presidential Inaugural ceremony is just hours away. For several days now, Washington, D.C. news outlets have been warning the hundreds of thousands of attendees that even though telcoms have bolstered their cellular service, it's still anticipated that demand will exceed supply during the presidential swearing-in and parade. At least one radio broadcaster here—WTOP—has been encouraging those planning to attend the inaugural to be sure to carry along portable radios to receive essential information and to stay in touch with the world. It's nice to know that the "ancient" and simple one-to-many broadcasting model still has a place in today's enlightened and sophisticated world.

James O'Neal, K4XAR
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BTS Distinguished Lecturer Program continued from page 1

lecturer. The program provides chapters with access to individuals who are well known educators, lecturers and authors in the fields of broadcast technology to give presentations at chapter meetings. There are currently 15 lecturers in the program, with expertise covering the diverse aspects of broadcast technology. All are considered to be experts in their respective fields and have a proven track record of providing top-notch lectures.

BTS chapters can make use of this program to enhance their chapter meetings with talks covering up-to-date topics of interest. Additionally, with suitable external publicity, these sessions can be used to promote chapter membership as well as IEEE BTS membership. Many topics may have interest areas that cross between IEEE societies enabling joint meetings and further promotion of the Broadcast Society.

Travel expenses (airfare, hotel, and meals) for the lecturer are covered by the Society through the DL program. Typically, the only costs to the chapter would be for meeting logistics (meeting room, refreshments and similar items). While there are limits ($1,250 for same continent travel and $2,500 for overseas travel), the costs of the majority of DL sessions so far have remained within these limits.

The process to set up a DL session is simple: essentially, the chapter chair finds an interesting topic and lecturer, and then contacts the DL to see if he would be agree to a session. Once the details and date have been roughly worked out, a DL application form is filled out and submitted to the DL chair and BTS administration for approval. After approval, travel arrangements and scheduling can take place. Since promotion of IEEE BTS is part of the goal, there are some requirements for announcing the meeting and reporting afterwards.

All of the process details and more information about the DL program can be found at: *http://bts.ieee.org/distinguished-lecturer-program.html.*

Meet the New Distinguished Lecturers

Guy Bouchard has served the broadcast industry since 1979, with a special interest in digital communication systems. He has been with the Canadian Broadcasting Corporation, CBC/Radio Canada, for 28 years, and during this time, has worked in analog and digital television transmission and production systems, as well as satellite and terrestrial microwave communication systems. Currently, Bouchard is a senior manager for broadcast technologies at CBC/Radio Canada, and is responsible for studying and implementing digital delivery technologies. Another of his responsibilities is the training of CBC engineers in these new technologies. He has published many papers on digital TV, satellite, and MPEG transport technology for the NAB, CCBE, IEEE, Canadian Digital Television (CDTV) and SMPTE.

Tim Carroll is an expert in the area of DTV audio and is founder and president of Linear Acoustic Inc., the company behind the award-winning Aeromax range of real-time and file-based audio loudness control systems, and the Upmax stereo/5.1 channel upmixing and downmixing technologies. Linear Acoustic is a recipient of a Technology and Engineering Emmy Award for its work on metadata and loudness. Tim is a member of IEEE, AES, SBE, SMPTE, and BKSTS, and participates in ATSC and EBU projects.

Patrick Waddell is currently the manager of standards and regulatory matters at Harmonic Inc. He is a 35-year veteran of the broadcasting industry, a SMPTE Fellow, and currently the Chair of the ATSC's TSG/S6, the specialist group on video/audio coding. He was the founding Chair of SMPTE 32NF, the technology committee on network and facilities infrastructure, Waddell represents Harmonic at a number of industry standards bodies, including the ATSC, DVB, SCTE, and SMPTE. He is the 2010 recipient of the ATSC's Bernard J. Lechner Outstanding Contributor Award. Mr. Waddell earned a BSEE degree from the University of California, Santa Barbara, and did graduate studies in technical production for live performance at San Jose State University.

Current Distinguished Lecturers and Their Topics

Richard Chernock, Chair (*rchernock@trivenidigital.com*)—Lecture #1: DTV technology: Tutorials explaining the inner workings of Digital Television (broadcast, cable, DTH and IPTV), especially in the area of MPEG-2 Transport; Lecture #2: DTV Monitoring: Monitoring and Troubleshooting Digital Television (broadcast, cable, DTH and IPTV); Lecture #3: ATSC Mobile Television; Lecture #4: ATSC 2.0 (including NRT and connected TV).

L P. Chau (*elpchau@ntu.edu.sg*)—Lecture #1: Source and Channel Rate Allocation Techniques for Digital Video Transmission Application; Lecture #2: Multi-Program Video Coding for Digital Video Broadcasting application.

Matthew Goldman (*matthew.goldman@ericsson.com*)—Lecture #1: Broadcast Television Analog Turn-Off; Lecture #2: Advances in Video Compression Technology for Contribution & Distribution; Lecture #3: MPEG-2 Technology; Lecture #4: MPEG-4 AVC Technology; Lecture #5: 3D TV Technology.

Valentino Trainotti (*vtrainotti@fi.uba.ar*)—Lecture #1: AM Low and Medium Frequency Transmitting Antennas; Lecture #2: Transmitting Antennas for FM and TV Broadcasting in VHF and UHF Bands.

Xianbin Wang (*xianbin.wang@uwo.ca*)—Lecture #1: Robust System Design for Multimedia Broadcasting Services under Distributed Transmission Network; Lecture #2: Emerging Technology and New Applications for ATSC DTV Systems.

Hsiao Chun Wu (*wu@ece.lsu.edu*)—Lecture #1: Digital Transmission and Signal Processing in Broadband Multimedia Communications; Lecture #2: Transmitter Identification for Digital Video Broadcasting.

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ATSC Activity Update

Organization completes two large projects; prepares for more

By ATSC Staff Members

The Advanced Television Systems Committee (ATSC) began the new year with the completion of two major projects it had undertaken: non-real-time program delivery and mobile emergency alerting. At the same time, groundbreaking work continues on major enhancements to the current digital television system and the next-generation digital terrestrial broadcast system.

It's About (Non-Real) Time

2012 saw completion and publication of the ATSC Non-Real-Time (NRT) Content Delivery Standard (document A/103). NRT is an important new standard that enables broadcast delivery of file-based content, which is delivered in advance of use and stored for playout at a time selected by the consumer. The service comprises of a collection of NRT content items, much like a television channel.

These NRT content items consist of a collection of program elements that the provider combines together in a single unit for presentation. The delivery of non-real-time services via the A/103 standard includes a variety of file-based content, including programs and clips, information for emergency alerts, and even commercial applications such as digital signage. The new ATSC NRT broadcast standard supports terrestrial transmission to both fixed locations and mobile DTV receivers designed to make use of the new flexibility.

Typical applications for NRT services include: push video-on-demand (VOD), news, information, sports, and weather services, personalized TV channels, music distribution, and emergency alerts.

The ATSC's new NRT standard gives broadcasters the capability to deliver all types of file-based content to consumers. Using broadcast television, programmers can send content that viewers can watch at their convenience. The development of complete end-to-end standards to enable NRT service delivery is expected to be a critical part of the future of broadcasting.

Mobile Emergency Alerting Service

Based on the ATSC A/153 mobile DTV Standard, the Mobile Emergency Alert System (M-EAS) is a new technology that provides interactive, on-demand emergency information via live television on capable mobile DTV handsets. M-EAS uses ATSC NRT datacast capabilities to deliver potentially life-saving information to mobile devices via an over-the-air broadcast television signal. It requires no cell towers, no cell phone data plan, and no Internet access. This is the only system that has the capacity to deliver on-demand emergency messages to a broad audience simultaneously. M-EAS has the potential to reach millions of people with a single digital TV broadcast. The system also requires no additional radio frequency spectrum.

Advantages and capabilities of the M-EAS system include:

- Delivery of targeted alerts by local broadcasters. These can be local, regional, or national in scope.
- A truly scalable solution that's free of bottlenecks and queues. Broadcasters can instantly and simultaneously deliver alerts to millions of users.
- Broadcast systems are reliable and have hardened infrastructure that is designed to run all day, every day, without fail—especially during emergency situations.
- Broadcasters provide a redundant solution with multiple stations in each market.

M-EAS is also content rich, enabling delivery of several different media types, including video, audio, graphics, and HTML pages.

The M-EAS system is described in a new Part 10 of A/153, the ATSC mobile DTV Standard. Changes to other parts of A/153 are required for full functionality. At press time, the M-EAS document set had been approved at the Technology Group level, with final approval by the full ATSC membership still pending.

The ATSC has formed an M-EAS implementation tam to facilitate activities which may include interoperability tests, field trials, demonstrations, and other activities.

ATSC 2.0—Next-Generation Services Today

As the number of connected TVs continues to grow, and linear television evolves into a hybrid TV model, one challenge facing broadcasters is how to make the most out of these new capabilities. One solution is to harness an emerging, powerful broadcast standard dubbed "ATSC 2.0." This new standard, currently under development, will provide broadcasters with a sophisticated toolbox for delivering media and interactive hybrid television content to connected TVs.

Technology continues to advance at a rapid pace, with more consumer devices being Internet-enabled. This in turn enables new distribution and consumption models for entertainment

programming and news/information services. Among its many attributes, ATSC 2.0 is the marriage of broadcasting and the Internet. New services will be carried in the DTV broadcast channels without interference to legacy transmission or reception equipment.

The concept of ATSC 2.0 is to take the experience of television watching to the next level by introducing a number of enhanced features based on newly developed standards and the focused application of existing standards. The emerging ATSC 2.0 standard will enable new functionality including: non-real-time transmission, advanced video compression, enhanced service guides, audience measurement, and conditional access.

The ATSC has formed an ATSC 2.0 implementation team to provide a venue for industry discussion of issues related to implementation of the emerging ATSC 2.0 Standard.

Setting the Stage for ATSC 3.0

The current DTV Standard (described in document A/53) was approved by the ATSC in 1995. Since that time, the system has been extended to include new functionalities such as the mobile DTV Standard (A/153) and non-real-time content delivery (A/103). The ATSC organization is now planning for terrestrial broadcast television's next big development—transition to an "ATSC 3.0," system. This will provide even more services to viewers, but will also require a clean break from the technologies of earlier-generation DTV systems.

Broadcasting is similar to other industries in that technology leads the way and is the impetus for major transformations. So, while working on the backwards-compatible ATSC 2.0 enhancements, the ATSC is simultaneously looking farther down the road to ATSC 3.0, a revolutionary over-the-air transmission system for the next decade.

On Sept. 6, 2011, ATSC announced formation of a new Technology Group (TG3) to develop ATSC 3.0, with the ATSC board of directors defining the TG3 scope of work as follows:

> *"The ATSC 3.0 Technology Group (called TG3) will develop voluntary technical Standards and Recommended Practices for the next-generation digital terrestrial television broadcast system. ATSC 3.0 is likely to be incompatible with current broadcast systems and therefore must provide improvements in performance, functionality and efficiency significant enough to warrant implementation of a non-backwards-compatible system. Interoperability with production systems and non-broadcast distribution systems should be considered."*

The initial work of TG3 has been focused on the development of "use cases" that define potential functions that a new DTV system could provide to consumers. These scenarios are now being used as the basis for development of the technical requirements for ATSC 3.0.

Regardless of what transmission methods and technical details ultimately become part of ATSC 3.0, it is a certainty that mobility will be a cornerstone, given the exponential growth of smartphones and tablets. At the same time, broadcasters are increasingly interested in the exciting potential of delivering Ultra-High-Definition (UHDTV) services to the home in 4K and higher resolutions.

The move to ATSC 3.0 will be an enormous step that must be managed carefully; however, it will also allow broadcasters to do more, reach more viewers, and respond faster to the evolving marketplace.

Get Involved in ATSC Activities

The mission of ATSC is to create and foster implementation of voluntary standards and recommended practices to advance terrestrial digital television broadcasting, and to facilitate interoperability with other media.

Formed in 1983, the Advanced Television Systems Committee is an international, non-profit organization developing standards for digital television. ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite and semiconductor industries.

Founding members of the organization include the Consumer Electronics Association (CEA), the Institute of Electrical and Electronics Engineers (IEEE), the National Association of Broadcasters (NAB), the National Cable and Telecommunications Association (NCTA) and the Society of Motion Picture and Television Engineers (SMPTE).

ATSC membership provides an excellent opportunity to collaboratively shape the capabilities of new technologies and services and to gain early insight into emerging standards. Membership is open to any organization having an interest directly affected by ATSC Standards development. Members have access to the flow of early information on standards development.

Membership information is available at *www.atsc.org/join*. All ATSC standards, recommended practices, and informational documents are available at no charge from the ATSC Website: *http://www.atsc.org*.

BTS AdCom Selects Five New Members

Five new members-at-large have been elected to three-year terms on the IEEE BTS Administrative Committee (AdCom). They are Shuji Hirakawa, Toshiba Corp., Japan; Robert Plummer, DirecTV; Valentin Trainotti, University of Buenos Aires, Argentina; S. Merrill Weiss, Merrill Weiss Group LLC; and Robert Weller, FCC Office of Engineering and Technology. Their terms will run from 2013 through 2016.

The BTS welcomes and extends its heartiest congratulations to these new AdCom members-at-large.

(The IEEE BTS constitution makes provision for 15 elected voting AdCom members-at-large, with elections held every year to select five new members to serve three-year terms. Members-at-large are chosen from BTS membership roles.)

BTS Distinguished Lecturer Program

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Dave Bancroft (*dave@bancroft.tv*)—Lecture #1: Reference Monitoring for Broadcast Production in the Flat Panel Era; Lecture #2: Comparing Image Characteristics of Television Cameras with Different Optical Formats and Sensor Architectures.

Gary Sgirgnoli (*gary.sgrignoli@ieee.org*)—Lecture #1: 8-VSB Fundamentals & Measurements Overview; Lecture #2: Post Transition DTV Reception Issues.

Eric Wandel (*eric@wavepointresearch.com*)—Lecture: Using NEC for Directional Pattern Design of VHF and UHF Antennas for FM and TV.

Yiyan Wu (*yiyan.wu@crc.ca*)—Lecture #1: DTV Transmission Systems; Lecture #2: SFN, Distributed Transmission and Cloud Transmission; Lecture #3: Wind Turbine Impact to UHF Band DTV Reception.

Ce Zhu (*eczhu@uestc.edu.cn*)—Lecture #1: 3DTV System with Depth-Image-Based Rendering; Lecture #2: View Synthesis and Artifact Reduction Techniques in 3D Video; Lecture #3: Advanced Video Streaming with Multiple Description Coding and Network Diversity.

Guy Bouchard (*guy_bouchard@ieee.org*)—Lecture #1: MPEG transport technology; Lecture #2: ATSC fixed and mobile transmission; Lecture #3: Satellite-Based broadcast Contribution Technology; Lecture #4: IP Over Satellite.

Tim Carroll (*tjcarroll@ieee.org*)—Lecture #1: Delivering Quality Sound: A Farewell to Loudness Issues; Lecture #2: Audio Considerations for Mobile Digital Television.

David Layer (*dlayer@nab.org*)—Lecture #1: Digital Radio; Lecture #2: Digital TV; Lecture #3: Broadcast Regulatory and Legislative Issues.

Pat Waddell (*patrick.waddell@harmonicinc.com)*—Lecture #1: Audio Loudness; Lecture #2: Video and Audio Compression; Lecture #3: MPEG-2 Systems; Lecture #4: Image Artifacts, Their Creation and Cures.

Channel Surfing Redux

A brief history of the TV remote control and a tribute to its coinventors

By Wayne C. Luplow and John I. Taylor

As the consumer electronics industry mourns the passing of the last of the coinventors of the wireless remote control for television, IEEE hits the pause button to review the colorful history behind the remote control to reflect on the impact of this innovation that has transformed the lives of generations of TV viewers and to celebrate the lives and contributions of these consumer electronic industry pioneers.

Eugene J. Polley, 2009 recipient of the IEEE Masaru Ibuka Consumer Electronics Award, died at age 96 on 20 May 2012, in Downers Grove, Illinois. His Zenith Flash-Matic was the world's first wireless TV remote introduced in 1955. IEEE Fellow Robert Adler, whose 1956 ultrasonic Zenith Space Command became the industry standard for a quarter century, died at age 93 on 15 February 2007, in Boise, Idaho.

Together, they are credited as the fathers of the modern remote control. Both had long and storied careers at Zenith Radio Corporation (now Zenith Electronics LLC, a subsidiary of LG Electronics, Inc.)—lifelong Chicagoan Polley started at Zenith in 1935, and Adler joined Zenith in 1941 after emigrating from his native Austria. While their careers took different paths, their individual contributions played major roles in the colorful history of consumer electronics in the 20th century.

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Channel surfing was actually born more than six decades ago.

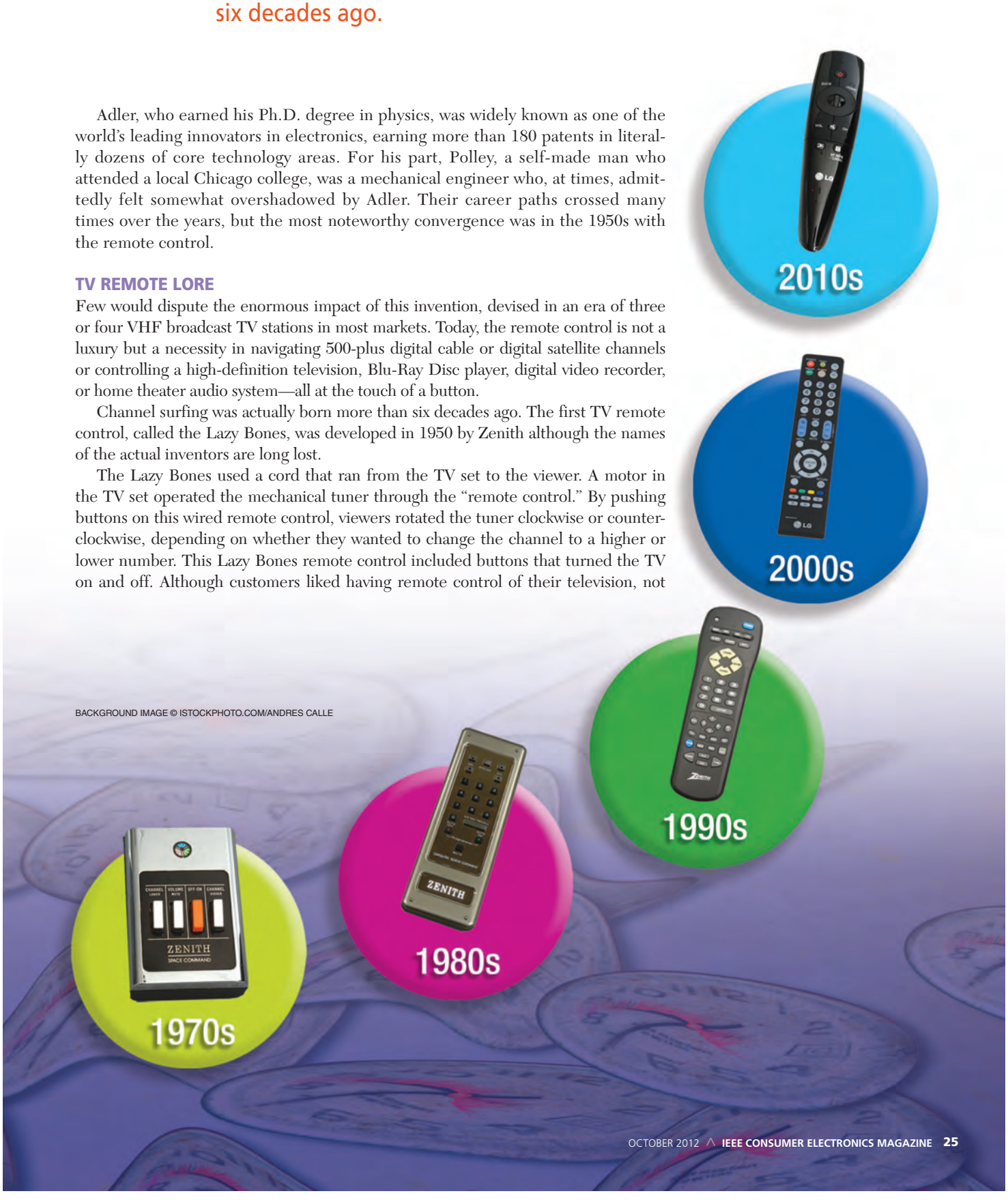
Adler, who earned his Ph.D. degree in physics, was widely known as one of the world's leading innovators in electronics, earning more than 180 patents in literally dozens of core technology areas. For his part, Polley, a self-made man who attended a local Chicago college, was a mechanical engineer who, at times, admittedly felt somewhat overshadowed by Adler. Their career paths crossed many times over the years, but the most noteworthy convergence was in the 1950s with the remote control.

TV REMOTE LORE

Few would dispute the enormous impact of this invention, devised in an era of three or four VHF broadcast TV stations in most markets. Today, the remote control is not a luxury but a necessity in navigating 500-plus digital cable or digital satellite channels or controlling a high-definition television, Blu-Ray Disc player, digital video recorder, or home theater audio system—all at the touch of a button.

Channel surfing was actually born more than six decades ago. The first TV remote control, called the Lazy Bones, was developed in 1950 by Zenith although the names of the actual inventors are long lost.

The Lazy Bones used a cord that ran from the TV set to the viewer. A motor in the TV set operated the mechanical tuner through the "remote control." By pushing buttons on this wired remote control, viewers rotated the tuner clockwise or counterclockwise, depending on whether they wanted to change the channel to a higher or lower number. This Lazy Bones remote control included buttons that turned the TV on and off. Although customers liked having remote control of their television, not



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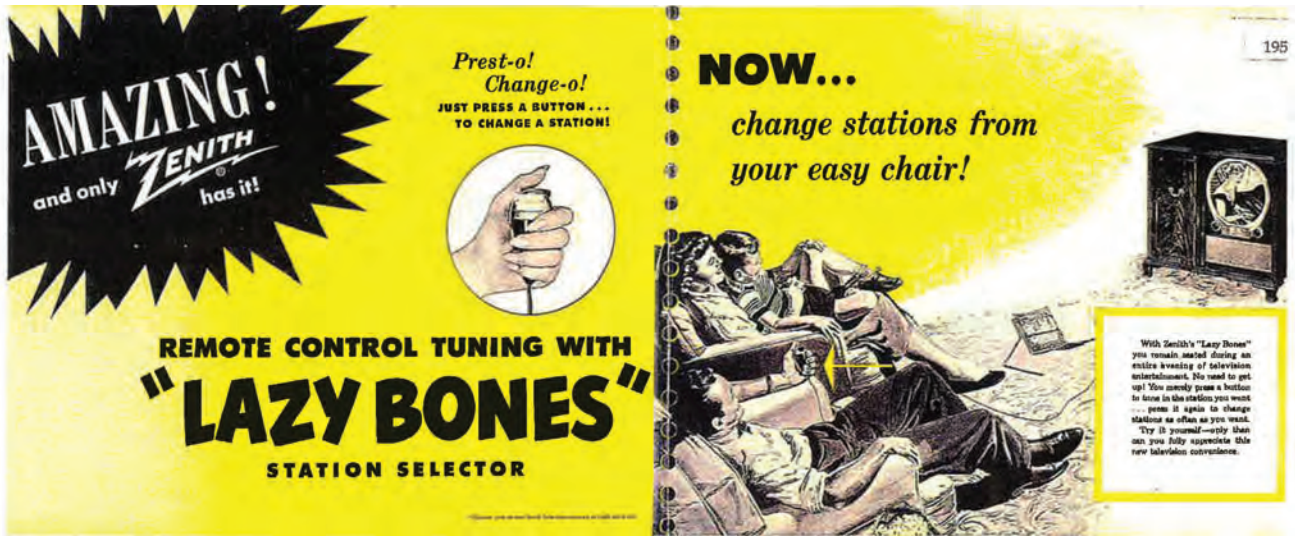


Zenith trumpeted the convenience of its "Lazy Bones" remote. (Image courtesy of Zenith.)

surprisingly they complained that people tripped over the unsightly cable that meandered across the living room floor.

Commander Eugene F. McDonald, Jr. (1886–1958), Zenith's founder-president, believed TV viewers would not tolerate commercials and was convinced that sooner or later commercial television would collapse. While developing and promoting the concept of commercial-free subscription television, McDonald yearned for a way to mute the sound of commercials.

FLASH-MATIC: THE FIRST WIRELESS TV REMOTE

Zenith engineer Polley invented the Flash-Matic, introduced in 1955. As a young Zenith engineer, he created the first wireless remote by using light to control the television.

Tinkering with spare parts lying around his laboratory, he created a souped-up flashlight fashioned to look like a raygun "so people could shoot out the commercial," Polley is quoted as saying. The viewer used the highly directional flashlight to activate the four control functions: TV on/off, audio mute, and channel change (turning the tuner dial clockwise or counterclockwise). Polley liked to tell the story of how he delivered the first prototype of the Flash-Matic TV, a blonde-cabinet black-and-white console, to McDonald's home in the spring of 1955. McDonald loved the capability to mute the sound on those annoying commercials and ordered the new remote control TV into production.

> The original Space Command remote control was expensive because an elaborate receiver in the TV set was needed to pick up and process the signals.

DEVELOPMENT CHALLENGES

Flash-Matic pioneered the concept of wireless TV remote control, yet it had limitations. It was a simple device that had no protection circuits, and if the TV sat in an area in which the sun shone directly on it, the tuner might start rotating.

McDonald directed his engineers to explore other technologies for the next generation. First thoughts pointed to radio. But because they travel through walls, radio frequency waves could inadvertently control a TV set in an adjacent apartment or room.

Using distinctive audible sound signals was discussed, but Zenith engineers believed people might not like hearing a certain sound that would become characteristic of operating the TV set through a remote control. It would also be difficult to find a sound that would not accidentally be duplicated by either household noises or by the sound coming from TV programming.

Regardless of the specific system chosen, Zenith sales people were against using batteries in the remote control. In those days, batteries were used primarily in flashlights. If the battery went dead, the sales staff said, the customer might think something was wrong with the TV. If the remote control did not emit light or show any other visible sign of functioning, people would think it was broken once the batteries died.

NEXT GENERATIONS: SPACE COMMAND

Zenith's Adler suggested using ultrasonics, i.e., high-frequency sound, beyond the range of human hearing. He was assigned to lead a team of engineers to work on the first use of ultrasonics technology in the home as a new approach for a remote control.

The transmitter used no batteries; it was built around aluminum rods that were light in weight and, when struck

at one end, emitted distinctive high-frequency sounds. The first such remote control used four rods, each approximately 2-1/2 in. long: one for channel up, one for channel down, one for toggling the sound on and off, and one for on and off.

These rods were very carefully cut to lengths that would generate four slightly different frequencies. They were excited by a trigger mechanism that stretched a spring and then released it so that a small hammer would strike the end of the aluminum rod. This became widely known in the industry as "The Clicker." Internally, Zenith people called this "The Bonger."

Remote control coinventors Bob Adler (left) with the Zenith Space Command Gene Polley with the Flash-Matic.

QUARTER CENTURY OF ULTRASONIC REMOTES

The original Space Command remote control was expensive because an elaborate receiver in the TV set, using six additional vacuum tubes, was needed to pick up and process the signals. Although adding the remote control system increased the price of the TV set by about 30%, it was a technical and commercial success and subsequently adopted in later years by other manufacturers.

The ultrasonic device was developed quickly, with the design phase beginning in late 1955. Called Zenith Space Command, the remote went into production in the fall of 1956.

In the early 1960s, solid-state circuitry (i.e., transistors) began to replace vacuum tubes. Handheld, battery-powered control units could now be designed to generate the inaudible sound electronically. In this modified form, Adler's ultrasonic remote control invention lasted through the early 1980s, a quarter century from its inception. More than 9 million ultrasonic remote control TVs were sold by the industry during the 25-year reign of this Zenith innovation.

TODAY'S INFRARED REMOTE CONTROLS

By the early 1980s, the industry moved to infrared, or IR, remote technology. The IR remote works by using a low-frequency light beam, so low that the human eye cannot see it but which can be detected by a receiver in the TV. Zenith's development of cable-compatible tuning and teletext technologies in the 1980s greatly enhanced the capability and utility for infrared TV remotes.

The first wireless TV remote, Zenith Flash-Matic, is demonstrated in this campy 1955 publicity photo. (Image courtesy of Zenith.)

GENE POLLEY

Polley's inventions, primarily in the field of television, earned 18 U.S. patents, with his best-known invention being the world's first wireless TV remote. Starting in 1955, Polley worked his way up from the stockroom to the parts department, where he produced Zenith's first catalog, and then on to his long career in the engineering department.

In his 47-year Zenith career, Polley held various engineering positions, including product engineer, mechanical engineer, head of video recording group, advanced mechanical design group, and assistant division chief for the Mechanical Engineering Group.

During World War II, as part of Zenith's commitment to the war effort, Polley worked on radar advances for the U.S. Department of Defense. He also worked on the push-button radio for automobiles and on the development of the video disk, predecessor of today's DVD.

Polley was born in Chicago on 29 November 1915. He attended the City Colleges of Chicago and Armour Institute. He retired from Zenith in 1982. In later years, adding to the lore of the remote control, Polley was quoted as saying: "We didn't envision the couch potato. The original reason for the remote control was to help people who were handicapped."

Polley was particularly proud of his 2009 Ibuka Award from the IEEE Consumer Electronics Society, as it served to validate his important contributions to the industry. Polley considered his role in the development of the remote control his most significant contribution, while Adler considered the remote control developments more pedestrian than many of his other inventions.

ROBERT ADLER

Remote control coinventor Adler was born in Vienna, Austria, on 4 December 1913. Adler's six-decade career with Zenith began in 1941 when he joined Zenith's research division after receiving his Ph.D. degree in physics from the University of Vienna in 1937. He was named associate director in 1952, vice president in 1959, and vice president and director of research in 1963.

An advertisement featuring the Zenith Flash-Matic remote. (Image courtesy of Zenith.)

He retired as research vice president in 1979 and served Zenith as a technical consultant until 1999, when Zenith merged with LG Electronics.

A prolific inventor with a seemingly never-ending thirst for knowledge, his pioneering developments spanned from the golden age of television into the high-definition era, earning him more than 180 U.S. patents. Thirty-nine of his U.S. patents were granted on inventions he made during this twilight phase of his career. In fact, the U.S. Patent and Trademark Office published his latest patent application, for advances in touch-screen technology, in early February 2007, just days before his passing.

> More than 9 million ultrasonic remote control TVs were sold by the industry during the 25-year reign of this Zenith innovation.

IEEE HONORS

In 1951, Adler became a Fellow of the IEEE, a professional honor, which is conferred by the Institute's Board of Directors on the basis of eminence and distinguished service. He was cited for his developments of transmission and detection devices for frequency-modulated signals and of electromechanical filter systems.

He received the IEEE Consumer Electronics Outstanding Achievement Award in 1970. He also received the IEEE 1974 Outstanding Technical Paper Award for his report "An Optical Video Disc Player," representing early work in what was to become the DVD. His other IEEE awards include the Edison Medal in 1980 and the Sonics and Ultrasonics Achievement Award in 1981.

Adler received the 1967 Inventor of the Year Award from George Washington University's Patent, Trademark, and Copyright Research Institute for his inventions in the field of electronic products, devices, and systems used in aircraft communications, radar, TV receivers, and FM broadcasting.

In the consumer electronics field, Adler has been widely recognized as the coinventor (with Polley) of the wireless TV remote. He received the 1958 Outstanding Technical Achievement Award of the Institute of Radio Engineers (now the IEEE) for his original work on ultrasonic remote controls for television.

CONSUMER ELECTRONICS INNOVATIONS

Among Adler's earlier work was the gated-beam tube that, at the time of its introduction, represented an entirely new concept in the field of vacuum tubes. The use of this tube greatly simplified the sound system in television receivers, markedly improving reception by screening out certain types of sound interference while lowering the cost of the sound

channel. Adler also was instrumental in originating and developing a synchronizing circuit, which permitted demonstrably greater stability in fringe areas of the television reception. This invention was in wide use for many years.

The electron beam parametric amplifier, developed in 1958 by Adler jointly with Glen Wade, then of Stanford University, was at the time the most sensitive practical amplifier for ultrahigh frequency (UHF) signals. It was used by radio astronomers in the United States and abroad and by the U.S. Air Force for long-range missile detection.

SURFACE ACOUSTIC WAVE FILTERS

Adler's original work in the field of acoustooptical interaction was instrumental in the 1966 public demonstration, by a team of Zenith engineers, of an experimental television display using ultrasonic deflection and modulation of a laser beam to produce a wall-size TV picture without a cathode ray tube.

During World War II, Adler worked on high-frequency magnetostrictive oscillators for use in armed forces communications equipment. His early work on electromechanical filters paved the way for the development of the highly compact filters widely used in aircraft receivers after the war. In the mid-1960s, he suggested the use of surface acoustic waves (SAWs) in intermediate frequency filters for color television sets, a technology that has since become universal, not only in television but also as an essential building block of cellular telephone handsets.

Adler also pioneered the use of SAW technology for touch screens. Touch screens employing principles he originated are now in widespread use in airport kiosks and in museums such as the U.S. Holocaust Memorial Museum in Washington, D.C., the Rock and Roll Hall of Fame in Cleveland, the Milwaukee Art Museum, and the San Jose Technology Museum. In the early 1990s, as a consultant to Elo TouchSystems, Dr. Adler actively contributed to the commercialization and further innovation of his SAW touch screen invention.

"Bob Adler was an unparalleled technical contributor, leader, adviser, and teacher," said Jerry K. Pearlman, retired Zenith chairman and CEO, who knew Adler for 35 years. "His gifts and passions were many, his mentoring matchless, and his ego totally nonexistent."

JOINT RECOGNITION

In recognition for their visionary work, remote control coinventors Adler and Polley jointly received Zenith's Emmy from the National Academy of Television Arts and Sciences in 1997 for "Pioneering Development of Wireless Remote Controls for Consumer Television." *Broadcasting & Cable* magazine recognized "their groundbreaking contribution to television viewing—indeed, to the use of so many electronic devices" with the Technology Leadership Award in 2006.

"Their pioneering work and subsequent numerous patents in the development and commercialization of remote control devices has been one of the most notable of all of the features and advantages the consumer electronics

George Burns hawked the Zenith Space Command remote. (Image courtesy of Zenith.)

industry, and a number of additional industries as well, have benefited from during the past half century. From TV sets to garage door openers, consumers worldwide have experienced the greatest convenience feature ever invented as a result of the great work of these two men," said Gerald McCarthy, retired president of the Zenith Sales Company.

The consumer electronics industry we know today has been built largely by engineers standing on the shoulders of giants. As coinventors of the wireless remote control for television, Adler and Polley will always be among the industry's and Zenith's shining stars, and their entrepreneurial spirit and creativity continue to serve as a model for today's young engineers.

ABOUT THE AUTHORS

Wayne C. Luplow, editor emeritus of *IEEE Transactions on Consumer Electronics* and IEEE Life Fellow, started his Zenith career in 1964. Currently vice president for the LG Electronics' Zenith R&D Lab, he had the privilege to have worked with both Adler and Polley over the years.

John I. Taylor is the third head of Zenith public relations in the company's 94-year history. He joined Zenith in 1981 and, following the merger of Zenith and LG in 1999, he has been vice president of Public Affairs and Communications for LG Electronics USA since 2000. He worked with both Polley and Adler. CE

Upcoming Events

of Interest to BTS Members

- **April 6–11, 2013** – NAB Show and Exhibition; Las Vegas, Nev.
- **May 4–7, 2013** – Audio Engineering Society 134th Convention; Rome, Italy
- **May 17–19, 2013** – Early Television Foundation Conference; Hilliard Ohio
- **June 4–7, 2013** – IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB); West London, U.K.
- **Sept 12–17, 2013** – IBC 2013 Conference and Exhibition; Amsterdam, Netherlands
- **Sept 18–20, 2013** – Radio Show; Orlando, Fla.
- **Oct 9–10, 2013** – Broadcast India; Mumbai, India
- **Oct 9–11, 2013** – IEEE BTS Annual Broadcast Symposium; San Diego, Calif.
- **Oct 17–20, 2013** – Audio Engineering Society 135th Convention; New York
- **Oct 29–30, 2013** – Society of Broadcast Engineers National Meeting; Indianapolis, Ind.
- **Oct 22–24, 2013** – Society of Motion Picture and Television Engineers Annual Technical Conference; Hollywood, Calif.

If you have information on broadcast-related events that may be of interest to other Broadcast Technology Society members, please submit them at least three months in advance to the **BTS Newsletter** editor at *BTSeditor@ieee.org*.

Book Review

Surviving Technology
By Bruce Vaughan
Published by Farmhouse Books
IBSN-13: 978-0-9829455-4-4

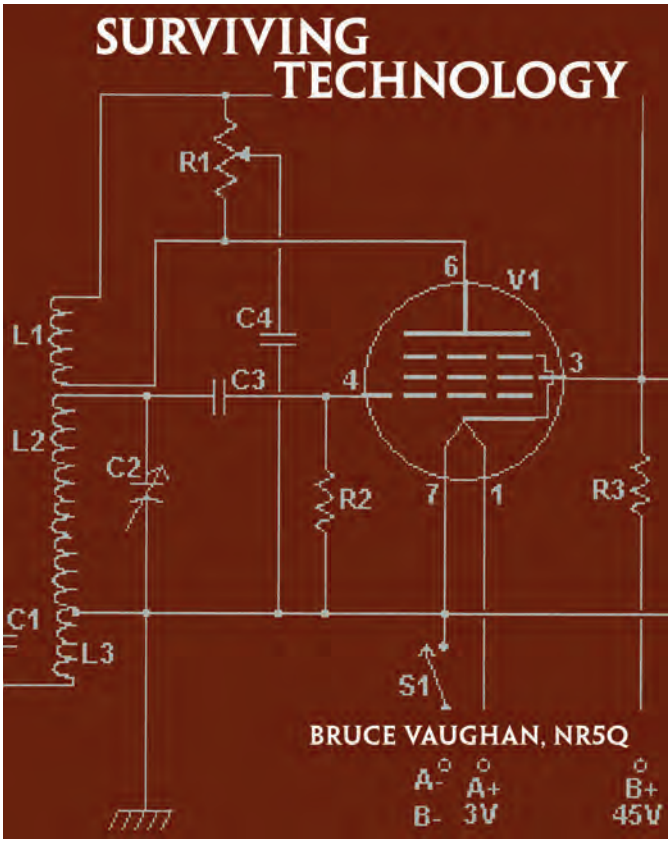
Once in a while, it's good to look at things through another set of eyes. I recently had a chance to do this with the arrival of a new book by a relatively unknown author (at least in the broadcast engineering community). The book, "Surviving Technology," is an autobiography by Bruce Vaughan, who got his start in life about the time broadcasting hit the world by storm in the early 1920s. In the book's preface, Vaughan, describes his first encounter with radio. The year was 1925 and he was three years old at the time. Young Vaughan and his mother had been invited by the wife of one of the town's movers and shakers to experience the marvel of radio. The event made an indelible impression on Vaughan, influencing his life from then on. Sometime thereafter, Vaughan became earwitness to broadcasts emanating from the University of Arkansas's station, KUOA. (*This was the station that Loy Barton constructed as part of his thesis assignment in the school's engineering department and was mentioned in the article "The Evolution of the Transmitter Power Supply" which appeared in the Spring 2011 issue of the* ***BTS Newsletter***).

A few years later in the early 1930s, Vaughan, an Arkansas farm boy, got to visit the studio/transmitter of KBIX in the booming metropolis of Muskogee, Okla. This too had a profound influence on his future:

"As I sat watching the young man read the news I thought of the words traveling out from the radio station in all directions—for maybe fifty miles or more. As he talked I noticed that he kept glancing at the meters on one rack and I could see them move in cadence with his voice. This was strictly big time radio…. I must have admired the gear for at least five minutes—I don't think I ever saw anything so beautiful."

Vaughan was smitten and knew that he was going to follow a career in radio. Interestingly, he did not pursue broadcast engineering. World politics were to greatly influence the next phase of his life. By the time the decade of the 1930s ended, Vaughan had obtained his amateur radio license and was contemplating studies at the University of Arkansas and a career after graduation. However, during his second year of college the United States became enmeshed in World War II and Vaughan volunteered his services in the war effort. He wound up maintaining military communications gear in the European Theatre.

When peacetime eventually came, Vaughan made the decision not to continue his college career, but rather to enter the radio service business. And in this reviewer's opinion, this is what makes his story all that more interesting. In broadcasting, little consideration is usually given to the receiving side of things; yet, there is no broadcasting business unless there are receivers available to do something with the RF energy that we radiate out into space. While many accounts have been written about the art and science of broadcasting and broadcast engineering, very little has been penned by someone who worked



on the complementary side of the industry. Mr. Vaughan spent several decades in the radio and television service business and "Surviving Technology" chronicles a good bit of this career.

Vaughan worked during the first "Golden Age" of consumer electronics, observing the birth of the microgroove record, the coming of age of magnetic recording, the startup of television broadcasting, the move to color TV, and more. Unfortunately, the era of cheap "throwaway appliances" has pushed radio and television repair in the same direction as buggy whip manufacturing, with very, very few practitioners of either trade left standing. Mr. Vaughan's documentation of his own experiences in this field are unique and something to be savored.

A Very Early Television Adopter

Of particular note is his interest in the then-nascent television broadcasting business. He records this in a chapter called "The Lull Before the Storm."

Arkansas didn't get its first TV station until the spring of 1953 (this was a kilowatt U in Little Rock that lasted less than a year; the state's first V didn't arrive until the end of that year). However, Vaughan was tantalized by an account he read in 1948 in a Sunday edition of the state's largest newspaper which spotlighted an individual in a small Arkansas town who had a television receiver (by all indications, the first and, at the time, the only one in the state), who claimed to have viewed transmissions from a station in Boston, Mass.

Vaughan was fascinated by this revelation and made the nearly 100 mile trip to the small town where this "miracle of rare device" had occurred. He met with the set's owner—another radio repairman—and got to inspect the set, a prewar model, but observed no television reception. (In 1948,

the closest stations on the air were located in St. Louis and Dallas, each about 275 miles distant.)

In his conversation with the set owner, he learned of another Arkansas radio repairman who had acquired a set and that that a closer station (WKY-TV) in Oklahoma City would be taking to the air sometime in 1949; this was *only* about 200 miles away. On the return trip to his home base, and acting on a great leap of faith, Vaughan made a side trip to a radio parts wholesaler in Ft. Smith and purchased the sole television set available there—a 7-inch Hallicrafters, thus becoming owner of the third receiver in the state. By the time the Oklahoma station premiered in mid-1949, Vaughan was ready with a 50-foot tower and cut-to-channel Yagi antenna. It took several evenings before propagation conditions cooperated, but he finally achieved the coveted television reception—probably the first regular (but not too regular) reception logged in the state.

Shortly afterwards, a write-up of his television experiences appeared in the local newspaper and Vaughan was approached by a well-to-do businessman who desired to be "first" in everything. TV set ownership now topped his list. Even though Vaughan tried to dissuade him, the person persisted and Vaughan obtained a receiver for him, thus achieving the first retail sale of a television set in the state (and setting the stage for what was to come in the next decade).

Vaughan records much about his service business years across several chapters of the book—which again is interesting reading for those of us whose careers have been centered on the other side of the broadcasting equation. (I particularly enjoyed his experiences about his tour of a television receiver manufacturing operation and pitches by the company about planned products. Ever hear of a "color convertible" television set?)

Regeneration 'Obsession'

As Vaughan held an amateur radio operator's license for much of his life, a goodly portion of the book is devoted to his ham radio experiences. He was also extremely interested in regenerative radio receiver design. (His book is dedicated Major Edwin H. Armstrong, originator of the super regene circuit.) Vaughan describes this interest as an "obsession," which was so strong that he spent much of his spare time after retirement in trying to construct the "ultimate" super regenerator. He finally decided that he got it "right" with his 60th iteration, and at the time of the writing of his book, was working on receivers number 61 and 62 to see if his results were repeatable. A complete set of schematics and other data is included for readers who might want to experiment with their own receivers.

Surviving Technology is clearly much more than the first-hand account of a radio serviceman; it provides an insight into Vaughan's philosophy of life and the communications technology that evolved during his lifetime. In addition to radio and television, Vaughan also examines the evolution of telephone systems in Northwest Arkansas and even offers some insight into the production of electrical power in the pre-Rural Electrification Association days, noting that all families connected to the lines of the private electricity supplier serving his small community kept kerosene lamps at the ready, as the utility company only supplied electricity between 6:00 a.m. and 11:00 p.m.

Bruce Vaughan adjusts his 1936 replica transmitter.

Vaughan's writing style is quite clear and concise and the publication of **Surviving Technology** was nothing new to him, with this book being his fifth such published work. His writing credits also include the authoring numerous articles for amateur radio magazines. **Surviving Technology** is printed on high-quality heavy stock, which allows the many photographs he incorporated to be shown off to advantage. (In addition to electronics and writing, Vaughan also mastered photography during his career, being the first Arkansan to be made a Fellow member of the Photographic Society of America. Many of the photographs in this book were taken by Vaughan.) I can recommend his book to anyone who might wish to take a little time out from computers, streaming, digital compression, 8-VSB, Ultra High Definition, and the like, and experience, through Vaughan's words and pictures, a time when technology—and life—was much simpler.

Unfortunately, not long after receiving a copy of **Surviving Technology** for review, I learned that Bruce Vaughan had passed away on Jan. 6, 2013 at the age of 91. At the time of his death, he was working on a fifth book which was tentatively titled "Screw the Grimm Reaper."

Surviving Technology is available at the family Website, *http://nr5q.com/?page_id=37,* and also through the **Electric Radio** magazine Website, *http://www.ermag.com/index.cfm?v_link=product_detail&v_key=611*.

Reviewed by James E. O'Neal

Chapter Reports

DL DTV Seminar Highlights BTS Spanish Chapter Activities

The IEEE BTS Spanish Chapter participated in a Distinguished Lecturer seminar on digital terrestrial television on Sept. 17, 2012. The program was conducted by BTS Distinguished Lecturer, Dr. Richard Chernock and took place in Bilbao at the Faculty of Engineering facility of the University of the Basque Country (UPV/EHU).

Dr. Chernock conducted his presentation in two parts with the first session providing information about new technical advances in the field of terrestrial television and an update on the potential impact of HEVC (High Efficiency Video Coding Techniques) on future networks and services.

The second session focused on "connected television," with Dr. Chernock describing potential scenarios involving the convergence of broadband technology and broadcast systems. He emphasized the future benefits that might accrue, and also the potential threats posed, from such a convergence process.

The event attracted 24 participants from both industry and academia. Several members of the audience were students from the University of the Basque Country department of communication engineering Masters and PhD degree programs. Some of the school's professors who desired to keep up to date about the latest trends in digital television also attended. More than 30 percent of the audience came from corporate research and development centers from such companies as the Tecnalia Corporation and IK4-Vicomtech.

Information submitted by Pablu Angueira, Spanish BTS Chapter chair.

Dr. Richard Chernock provided the latest information on digital television to BTS Spanish Chapter members and their guests.

IEEE Russia Northwest BT/CE/COM Chapter Receives Digital Radio Update

ST. PETERSBURG, RUSSIA

David Layer, NAB senior director on advanced engineering, delivered a presentation on digital radio for the IEEE Russia Northwest Broadcast Technology, Consumer Electronics, and Communications (BT/CE/COM) joint chapter luncheon meeting here on Feb. 27, 2012. His lecture, "Digital Radio—Looking Back, Looking Forward," attracted more than 30 attendees and was presented at the MART Joint-Stock Company facility.

Taking into account preliminary requests of participants who wished to discuss not only issues of digital radio, but also a wide scope of modern broadcast technologies, Layer prepared a detailed presentation in two parts. The first provided a general overview of new trends in broadcast technologies including digital TV, while the second offered a detailed description of digital radio systems. Layer briefly introduced main activities of IEEE Broadcast Technology Society and National Association of Broadcasters and then described the current status of terrestrial broadcasting in the United States and

Distinguished Lecturer David Layer (center of photograph and seated behind laptop computer) delivered a presentation on digital radio at a joint BT/CE/COM luncheon meeting in St. Petersburg, Russia.

explored DTV topics including the FCC's "broadband plan," which could allocate the upper UHF TV spectrum to wireless broadband services; U.S. mobile DTV services; connected TV (television with Internet connectivity); and relevant ATSC activities.

Attendees at the lecture included members of the Chapter and other colleagues from the industry, from St. Petersburg TV Center, the Russian TV and Radio Network, and Russian Ministry of Communications. The MART Joint-Stock Company is part of the TIRA Corporation, the successor of the oldest Russian radio engineering company, which was founded in 1911. Following Layer's presentation, attendees visited the company's museum which traces the history of Russian broadcasting from the first transmitters and antennas manufactured at the beginning of the 20th century up through modern digital transmitters.

Information submitted by Dimitry Tkachenko.

Richard Chernock Addresses Buenos Aires BTS Chapter

BTS Distinguished Lecturer, Richard Chernock, provided the program for a special December meeting of the Buenos Aires IEEE BTS chapter. The meeting and presentation took place on the evening of Dec. 4, 2012 at the Centro Cultural Borges in Buenos Aires, with some 70 persons in attendance, primarily from the broadcast engineering community.

Two presentations were made on digital television, with the first explaining its "inner workings" as applicable in the areas of broadcast, cable, direct-to-home and IPTV). Dr. Chernock focused his presentation on MPEG-2 Transport, timing and evolution, explaining that the core of the broadcast DTV system is based on MPEG-2 transport, with enhancements and constraints added by the higher layer standards, along with metadata (PSI and SI) allowing the various elements to be discovered and connected.

Dr. Chernock provided an in-depth refresher course in the basic transport technologies used for DTV, with emphasis on how the different elements actually work together. He discussed MPEG-2 transport, explaining how the digital data is actually encapsulated and carried in the emission transport stream. He also provided information on the use of signaling metadata (PSI and SI) to allow the receiver to discover, connect and decode the right information flows in order to recreate the television program. He explained the role of timing in the overall DTV operation and discussed how the system is designed to evolve with the availability of better codecs and other system elements.

Dr. Chernock's primary aim in providing this refresher material was to provide broadcaster with basic understanding of how all of the system elements work together.

Part Two

Dr. Chernock's second presentation concerned "connected" television and its relationship to broadcasters. He stated that Internet-connected television sets are rapidly growing in popularity, and that connecting a television to the Internet allows viewers to experience a range of new capabilities, including access to different forms of content, information services, creating an overall enhancement of the television viewing experience. He stated that some of the new capabilities available might not benefit the broadcaster, specifically "over-the-top" television. The new functionality available with "connected" television sets can range from a strong relationship to a broadcaster's content on one hand, or a loose or no relationship on the other.

Dr. Chernock explained that considerable work is underway in developing ecosystems that make use of "connected" TVs, with this effort taking place in standards development and other organizations. He described the opportunities offered broadcasters by this new technology in terms of new functionality, and also addressed some of the difficulties in its implementation that are imposed by the existing delivery infrastructures.

The evening's event was very well organized, with simultaneous translation, catered food service and audio and video recording. Dr. Chernock's presentation also marked the first time that IEEE Argentina has made use of this large auditorium facility.

Information submitted by Marisabel Rodriguez.

Valentino Trenati (R) introduces BTS Distinguished Lecturer Richard Chernock.

BTS Brings 'Bridging the Gap' to Montreal Chapter

MONTREAL QUEBEC, CANADA

The Montreal Chapter hosted the BTS's new "Bridging the Gap" program Oct. 11–12, 2012, with presenters John Luff and Wes Simpson making the journey north to provide training for 16 course registrants. As an IT-based infrastructure is now part of most broadcast operations, broadcast engineers need to become familiar with these new systems and software and network engineers need to familiarize themselves with the concepts of video, compression and streaming. "Bridging the Gap" is targeted at both maintenance engineers and IT staff, and introduces core concepts and provides a discussion of real-world scenarios.

The Montreal Chapter had hosted several training sessions in past years and the time seemed right to do more in this area. The Chapter had been looking for a course designed to present IP fundamentals to broadcast engineers and "Bridging the Gap" seemed like a perfect fit. Once dates were set for the presentations, the Chapter sent invitations to attend to all Montreal IEEE members and broadcast engineers and also enlisted the Montreal SMPTE Section in spreading the word to its members. The meeting room was supplied by Concordia University and the school also provided audiovisual systems for the event.

The course drew 14 registrants from local universities, broadcast companies and industries, and two out-of-towners—Gustavo Cores from Venevision in Venezuela, and Joseph Sweeney, the director of engineering at Emerson College in Boston.

During the first day of the course John Luff, a Pittsburgh. Pa.-based media technology consultant reviewed the video fundamentals, sampling and basics of baseband digital video transport, DTV basics, compression basics, and causes of latency and its effects. This was followed by a brief discussion of AES Audio, Audio metadata, ANC data, embedded audio and caption basics. A second presenter, Wes Simpson, handled the second day of the course, which dealt with IP perspectives and covered compression between video servers and IT storage, and provided a brief overview of subnets and switching, bridging and routing, WAN connections and VLANs. Monitoring, troubleshooting and preventative techniques were also covered.

Attendees were eligible to receive a certificate of attendance upon request, and this could be used as a training credit with the Quebec Order of Engineering or their companies.

Special thanks are extended to Concordia University for their contributions in helping this course become a reality. Thanks also go out to Dr. Reza Soleymani, a Concordia professor, and to Hesam Khoshneviss, a Concordia PhD student, for supporting our chapter in connection with this event. Thanks go too to Amy Reeder, the IEEE BTS technical community program specialist, for her assistance in organizing the event and serving as point of contact for the various groups involved.

Information for this report submitted by Manijeh Khataie.

"Bridging the Gap" instructors John Luff (L) and Wes Simpson (R).

Manijeh Khataie presents a certificate of appreciation to Wes Simpson.

Wes Simpson (standing third from right) poses with some of the course attendees.

DL Chernock Presents DTV Fundamentals to Montevideo Audience

MONTEVIDEO, URUGUAY

The IEEE Uruguay Chapter organized a seminar by Dr. Richard Chernock, a BTS Distinguished Lecturer, at the Engineering School of the Universidad de Montevideo here. The Nov. 30, 2012 seminar was presented in two different sessions, with both addressed by Dr. Chernock.

The first lecture provided an introduction to digital television technology, with a tutorial explaining the inner workings of broadcast, cable, DTH and IPTV DTV, with emphasis on MPEG-2 transport, timing and evolution. It also covered video codecs, 4K and 8K video and the Future of Broadcast TV (FOBTV).

The second lecture focused on "connected television" and its relationship to the broadcaster. Dr. Chernock discussed the current state of the worldwide connected TV environment and highlighted the opportunities offered to the broadcaster in terms of new functionality, and also touched on some of the difficulties imposed by the delivery infrastructures.

The event was organized by IEEE Uruguay Section to promote the creation of the local BTS chapter. The effort was successful judging from the number of attendees which numbered more than 40. The audience consisted of faculty members from Uruguayan universities, as well as broadcaster and telco technical staffs, the Dinatel telecommunications organization and the URSEC telecommunications regulatory body.

Information submitted by Rafael Sotelo, vice chair, IEEE Uruguay Section.

(L-R) Dr. Rafael Sotelo, Dr. Richard Chernock, and Ing. Juan Pechiar, IEEE Uruguay Section Chair.

A portion of the audience at Dr. Chernock's presentation.

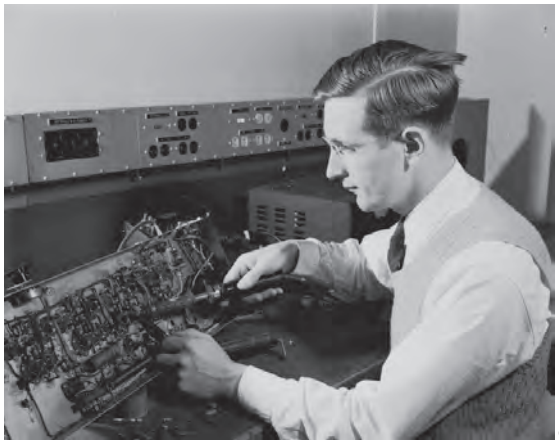
RCA Radio/Television Pioneer Wendell Morrison Dead at 97

Invented the 'Antennalyzer' antenna pattern computer

By James E. O'Neal

Word has reached the **Newsletter** that Wendell C. Morrison, a longtime IRE/IEEE member died on Oct. 18, 2012 at the age of 97. He was living in Fredericksburg, Texas at the time of his death. Morrison was a career Radio Corporation of America employee, working in several divisions of that organization, including broadcast and communications, defense electronics, and the RCA Princeton research laboratory. He was the holder of nine U.S. patents, and is perhaps best-known for his invention of the RCA "Antennalyzer," an early analog computing device for designing multi-tower AM directional arrays.

Morrison developed the Antennalyzer in the early 1940s. It was announced to the world in late 1945 and featured an article published in the Dec. 1946 Proceedings of the IRE, "The RCA Antennalyzer—An Instrument Useful in the Design of Antenna Systems." The instrument greatly simplified design of directional antenna arrays, reducing computational time from weeks or longer to a matter of minutes. It allowed users to input data via a number of controls corresponding to tower current intensities and phases, and tower spacing and angular relationship of the tower to others in the array. Resulting patterns were displayed on the screen of an attached oscilloscope. A desired pattern could be sketched on the scope screen with a grease pencil and the Antennalyzer's controls then adjusted to produce a trace corresponding to that pattern. Parameters were then read from the control settings. Even an inexperienced person could "design" a directional array with the instrument. The original Antennalyzer could accommodate up to five towers. The technology was hailed as revolutionary, with stories about it even appearing in such consumer publications as **Popular Mechanics** magazine.



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Wendell C. Morrison.

Morrison was also a member of the 1956 RCA Camden engineering team tasked with the "reverse engineering" of the newly-developed Ampex videotape recorder. During the early 1950s, RCA had been attempting independently of Ampex to develop a commercial video recorder; however, not long after the Ampex machine was unveiled at the 1956 National Association of Radio and Television Broadcasters show in Chicago, that program was scrapped. RCA entered into a technology cross-licensing arrangement with Ampex and developed their own version of the recorder. The RCA machine utilized Ampex electronic and mechanical standards, providing interchangeability of video recordings made on machines from either of the companies.

Morrison first joined the Institute of Radio Engineers as a student member in 1940, continuing his membership into the IEEE in 1963 after the IRE and American Society of Electrical Engineers merged that year to form the present-day organization. Morrison was elevated to IEEE Fellow status in 1964 and became a Life Fellow in 1981. His membership in the IEEE and IRE organizations spanned a total of 72 years.

Morrison received both bachelors and masters degrees in electrical engineering from the University of Iowa.

His career with RCA began with the company's Camden, N.J. division in 1940. Two years later he transferred to RCA's Princeton lab as a research engineer, where he worked in the areas of antenna analysis, UHF transmission, and color television terminal and test equipment. Morrison returned to the RCA Camden operation in 1952 as a staff engineer in commercial product development. In 1959, he became engineering manager of the plans and services unit of the company's communications and controls division, and later transferred to RCA's defense electronics division. In 1964, he returned to the company's broadcast and communications division as chief engineer, overseeing developments in radio/TV equipment, microwave systems, scientific instruments, two-way mobile radio, marine radio equipment and audio/visual products. Morrison retired from RCA in the early 1970s.

(The Newsletter wishes to thank Alexander Magoun, outreach historian at the IEEE History Center, for his assistance in connection with the preparation of this story.)

2013 IEEE Broadcast Symposium

9-11 October 2013 — **San Diego, CA USA**

Call for Papers

Final deadline for abstracts:
15 April 2013

Please mark your calendar to attend the **2013 IEEE Broadcast Symposium** to be held in San Diego, CA on 9-11 October 2013 (exact venue TBA). This Symposium is produced by the IEEE Broadcast Technology Society.

The Symposium Committee seeks timely and relevant technical papers relating to all aspects of broadcast technology, in particular on the following topics (new topics for 2013 shown in RED):

- Digital radio and television systems: terrestrial, cable, satellite, Internet, wireless
- Mobile DTV systems (all aspects)
- Cellular broadcast technologies
- Streaming delivery of broadcast content
- Non-real time (NRT) broadcast services
- "Second screen" technology and services
- Transmission, propagation, reception, re-distribution of broadcast signals
- AM, FM, and TV transmitter and antenna systems
- Broadcast tests and measurements including: co-site interference practices; prediction, measurements and mitigation
- Cable, satellite interconnect w/ terrestrial broadcast
- Transport stream issues
- Translator issues
- Broadcast audio including: CALM act
- Regulatory issues
- Ancillary services
- Unlicensed device operation in TV white spaces
- Next-gen broadcast platforms including: ATSC 3.0, FoBTV
- Reception issues for digital TV & radio
- ATSC & other broadcast standards developments
- Broadcast spectrum issues – re-packing, sharing
- Broadcast studio design & construction including: IT requirements for broadcast, redundancy & survivability

Call for Tutorials: proposals for half-day tutorials are also solicited based on the topics listed above.

Call for Panels: proposals are solicited for panels on technology, application, business, and policy-related issues and opportunities for the broadcasting industry.

Prospective presenters are invited to submit extended abstracts of 500-1000 words by e-mail to bts@ieee.org. Please indicate that the abstract is submitted to the *2013 IEEE Broadcast Symposium,* and include the corresponding author's full name and contact information including: affiliation, address, e-mail, and phone number. **Final deadline for abstracts is 15 April 2013.**

For more information about the IEEE Broadcast Technology Society, visit our web site: bts.ieee.org.

CALL FOR PAPERS

Special Issue on
Future of Broadcast Television: *Systems, Services and Technologies*

IEEE Transactions on Broadcasting

The terrestrial broadcasting industry is facing a challenging era. New broadcasting technologies and systems, such as mobile TV, 3D/multiview TV, Ultra-High Definition TV, and Internet connected TV, are under development or ready for service. Meanwhile, spectrum regulators in many countries are repurposing broadcast spectrum to support the explosive growth of broadband wireless services. There are also suggestions that the broadcast's wireless, infinitely scalable and one-to-many architecture can relieve the often overloaded broadband wireless networks. To face these challenges, an industry consortium, Future of Broadcast Television (FOBTV, www.fobtv.org), was established in April 2012. Participants include DTV standard bodies, broadcasters, research institutions, professional associations, manufacturers, and government agencies. The goals of the FOBTV are to develop ecosystem models for terrestrial broadcasting, define the requirements for next generation terrestrial broadcast systems, foster collaboration of Digital TV development laboratories, recommend major technologies to be used as the basis for new standards, and request standardization of selected technologies by standards development organizations.

This special issue solicits innovative papers on all aspects of future broadcast TV including systems, services and new technologies. Topics of interest include, but are not limited to:

Systems, services and concepts for FOBTV
New technologies for FOBTV
Transition to next generation system
Transmission technologies
Interactive systems and services
Convergence and co-existence
Inter-operability with other media
Spectrum issues
Source and Channel coding and processing
Media transport and Emergency Alert System
Access Services for people with disabilities

Submission guidelines

All submissions will be peer-reviewed. Contributors should submit mature, unpublished work in camera-ready form following the journal's format and instructions for authors, which are available at http://www.ieee.org/organizations/society/bt/public.html. **Prospective authors should submit a PDF version of their paper to *Ms. Jennifer Barbato* at pboffice@ieee.org** and **please indicate that the submission is for the special issue on "FOBTV."**

Important dates

Deadline for authors to submit papers: *July 15, 2013*
Notification of review results: *Dec.15, 2013*
Deadline for final version of papers: *Jan. 31, 2014*
Planned publication: *Q1 or Q2/2014*

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Save The Date!

Please mark in your calendar to attend the 8th Annual IEEE Broadband Multimedia Systems and Broadcasting conference (http://www.ieee-bmsb.org/) to be held at Brunel University in Uxbridge, London, on 4th – 7th June 2013. This conference is organised by the IEEE Broadcast Technology Society.
The conference seeks timely and relevant technical papers relating to all aspects of broadcast technology, in particular on the following topics:

1. Multimedia systems and services
1.1 Mobile TV
1.2 IPTV & Internet TV
1.3 DTV and broadband multimedia systems
1.4 VoD, interactivity, datacasting
1.5 Field trials and test results
1.6 Content management
1.7 Service deployments
1.8 Future of Broadcasting

2. Multimedia devices
2.1 Display technology
2.2 Acquisition technology
2.3 Set-top box and home networking
2.4 Mobile, portable, and handheld devices
2.5 Program guides and navigation

3. Multimedia quality: Performance evaluation

3.1 Performance evaluation
3.2 Objective evaluation techniques
3.3 Subjective evaluation techniques

4. Multimedia processing
4.1 Audio technology
4.2 Video coding and processing
4.3 Content adaptation and scaling
4.4 Error resilient and concealment
4.5 Rate control
4.6 Retrieval and indexing
4.7 3-D and multi-view video
4.8 Content protection and watermarking

5. Transmission and networking
5.1 Channel modeling and simulation
5.2 Channel coding, modulation, multiplexing
5.3 Signal processing for transmission
5.4 Propagation and coverage
5.5 Congestion control
5.6 Traffic and performance monitoring
5.7 Networking and QoS

Provisional Program can be found on: http://www.ieee-bmsb.org/program.htm
Prospective authors are invited to submit extended abstracts of about 1000 words by e-mail to bts@ieee.org. Each abstract must include at least two key words chosen from the topics mentioned above.

Please indicate that the abstract is submitted to the IEEE International Symposium on Broadband Multimedia Systems and Broadcasting 2013, and include the corresponding author's full name and contact information including: Affiliation, address, e-mail and phone number.

Important dates:
Submission of extended abstracts: January 7th, 2013
Notification of acceptance: February 28th, 2013
Submission of camera-ready paper: May 1st, 2013

BTS IEEE Broadcast Technology Society

All inquiries to *john.cosmas@brunel.ac.uk*

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We have a new telephone number that's dedicated for IEEE BTS business: **732-562-6061**.

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