RCA TECHNICAL SYMPOSIUM

Saturday, November 19, 2022

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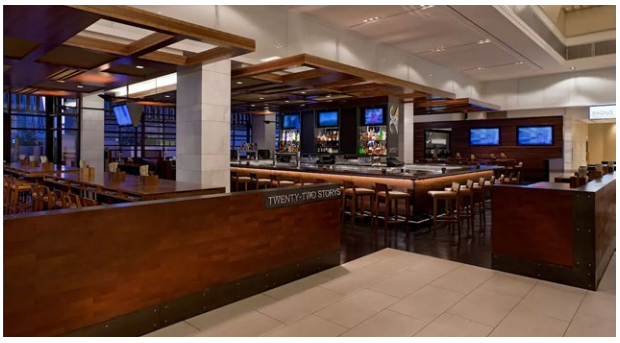
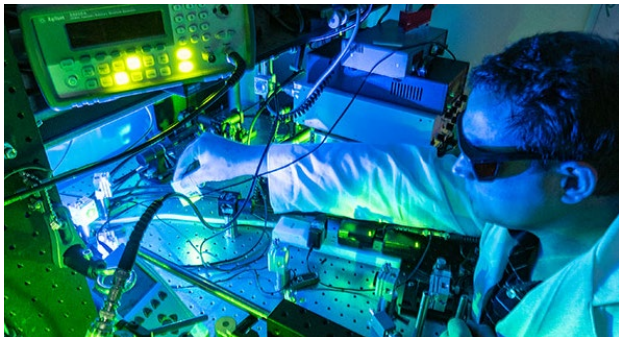
2022 TECHNICAL SYMPOSIUM AGENDA

ALL TIMES IN EASTERN DAYLIGHT SAVINGS TIME (EDT)

7:30 a.m.	Continental Breakfast for all attendees / Zoom link opens
8:00 – 8:15 a.m.	Welcome and Introductions *Presented by Prof. Jim Breakall*
8:15 – 8:55 a.m.	"From Maxwell to Nanotechnology" *Presented by Prof. Akhlesh Lakhtakia*
8:55 – 9:35 a.m.	"A Look at Current Lower Ionospheric Sensing Techniques and a Movement Towards a Unified Approach" *Presented by David Richardson*
9:35 – 10:15 a.m.	"Antennas and Arrays for Future 5G Systems" *Presented by Prof. Nima Ghalichechian*
10:15 a.m. – 10:30 a.m.	Break
10:30 – 11:10 a.m.	"Big Problems Solved for Small Satellites" *Presented by Dr. Nathan "Chip" Cohen*
11:10 – 11:50 a.m.	"The Current State of Satellite Security" *Presented by Rachel "RC" Jones*
11:50 – 1:25 p.m.	Lunch Break
1:25 – 2:05 p.m.	"RCA Youth Activities" *Presented by Carole Perry*
2:05 – 2:45 p.m.	"From High Schooler to Ramblin' Wreck: Youth in Amateur Radio from the Perspective of a Young Woman in Engineering" *Presented by Audrey McElroy*
2:45 – 3:00 p.m.	Break
3:00 – 3:40 p.m.	"Designing A Scalable 5G-Enabled Connected Intelligent Edge" *Presented by Divyam Mishra*
3:40 – 4:20 p.m.	"The High Frequency Active Auroral Research Program, "HAARP", a Brief History and Engineering Review" *Presented by Steve Floyd*
4:20 – 5:00 p.m.	"Advanced Packaging for 6G Communications" *Presented by Prof. Mahhavan Swaminathan*
5:00 – 5:10 p.m.	Wrap Up *Presented by Prof. Jim Breakall*

SCHEDULE FOR THE WEEKEND





FRIDAY, NOVEMBER 18

Morning: Tour of Georgia Tech Electrical Engineering/ Communications Lab Spaces

Afternoon: Free time. We encourage you to visit local sites such as the Martin Luther King, Jr. National Historical Park, the Georgia Aquarium, Coke World, and Antebellum Trail.

Evening: Informal happy hour in Twenty-Two Storys (lobby bar at Hyatt Regency) 7-9 p.m.

Women in Wireless networking 7-8 p.m. in the Roswell Room at the Hyatt Regency

SATURDAY, NOVEMBER 19

All Day: Technical Symposium 8:00 a.m. - 5:00 p.m.

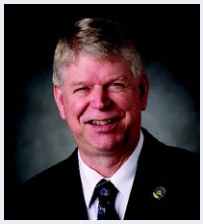
Cocktail Hour: 5:30 p.m. - 7:00 p.m.

Awards Banquet: 7:00 p.m. - 10:00 p.m.

SUNDAY, NOVEMBER 20

Free Time / Departures

TECHNICAL SYMPOSIUM HOST



Prof. Jim Breakall, WA3FET, received B.S. and M.S. degrees in Electrical Engineering from Penn State University and a Ph.D. in Electrical Engineering and Applied Physics from Case Western Reserve University, Cleveland, OH, and has over 45 years of experience in numerical electromagnetics and antennas. He was a Project Engineer at the Lawrence Livermore National Laboratory (LLNL), Livermore, CA, and an Associate Professor at the Naval Postgraduate School (NPGS), Monterey, CA. Presently he is a Full Professor of Electrical Engineering at Penn State.

Dr. Breakall began his career as a graduate student at the Arecibo Observatory in Puerto Rico working on antenna analysis and radar probing of the ionosphere. At LLNL, he and his group worked on the development of the Numerical Electromagnetics Code (NEC), the first sophisticated antenna modeling program. Other significant projects that he has worked on were the designs of the HAARP facility in Alaska, both HF facilities at Arecibo, and the Kinstar low profile AM broadcast antenna. He (electrical) and Tim Duffy (mechanical) designed the very popular Ham Radio Skyhawk Yagi antenna, and he is the inventor of the Optimized Wideband Antenna (OWA).

Dr. Breakall is also a life senior member of the IEEE Antennas and Propagation Society, IEEE Broadcast Technology Society, Eta Kappa Nu, International Union of Radio Science Commission B, IEEE Wave Propagation and Standards Committee, has been an Associate Editor for the Radio Science journal, and served as an Arecibo Observatory Users and Scientific Advising Committee Member.

He has been a frequent speaker at the Dayton Hamvention Antenna Forum and has built two major contest superstations, K3CR and KC3R, near Penn State, and WP3R, on his farm in Puerto Rico near the big Arecibo dish. He has graduated numerous graduate students and received many awards over the years.

In 2017, Dr. Breakall was awarded the prestigious Sarnoff Citation from the RCA. He was elected as a Director to the Board in 2018 and 2020 and is the Co-Chairman of the 2020 and Chairman of the 2021 Technical Symposium. He also serves on the RCA Scholarship Committee.

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ABSTRACTS & SPEAKER BIOGRAPHIES

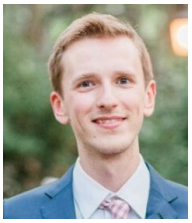
From Maxwell to Nanotechnology

Prof. Akhlesh Lakhtakia, Evan Pugh University professor and Charles Godfrey Binder professor in the Department of Engineering Science and Mechanics at The Pennsylvania State University.

James Clerk Maxwell was the first great unifier in physics: electricity and magnetism were unified with optics through his eponymous equations. Though those equations were supposed hold for bulk matter (in addition to free space), he also had a vision of the microscopic scale. Just two decades after him, electromagnetism was provided first with a microscopic basis and then a quantum-mechanical interpretation. Eleven decades later, electromagnetic phenomenon at the nanometer scale constitutes a vigorous area of research, increasingly so with multifunctional materials with nanoscale architecture.

Speaker Biography

Akhlesh Lakhtakia is Evan Pugh University professor and Charles Godfrey Binder professor in the Department of Engineering Science and Mechanics at The Pennsylvania State University. Elected a fellow of eight learned societies, he currently works on: electromagnetic fields in complex and nanomaterials, thin-film solar cells, biologically inspired design, and forensic science.



A Look at Current Lower Ionospheric Sensing Techniques and a Movement Towards a Unified Approach

David Richardson, Ph.D. candidate and NSF Graduate Research Fellow in the LF Radio Lab at Georgia Tech.

The lower ionosphere, in particular the D region (60 - 90 km), plays a crucial role in over-the-horizon communications and radar systems. Additionally, the ionosphere as a whole is heavily influenced by solar activity, so understanding the ionosphere's electrical properties can provide useful insights into phenomenon occurring within the sun. Unfortunately, direct measurements of the lower ionosphere are difficult. High altitude balloons pop at roughly 40 km, while satellites cannot reach below approximately 160 km due to increased atmospheric drag. However, very low (VLF, 3 - 30 kHz) and low (LF, 30 - 300 kHz) frequency radio waves reflect efficiently from the D region, allowing researchers to use these waves as a diagnostic tool through remote sensing techniques. The two dominant sources of VLF and LF waves, VLF transmitters and lightning, have vastly different properties and propagation characteristics. VLF transmitters are high power, narrowband, and temporally consistent sources that are located in a few key points around the globe. In contrast, lightning is broadband, and both spatially and temporally random. A network of VLF sources and receivers can in principle provide high time and space resolution of the D region. However, models exist that leverage one of these models, but not both together. My work explores recent advances in both transmitter-only and lightning-only models to work towards a unified model. In particular, I leverage modern signal processing techniques, such as tomography, to combine transmitter and lightning signals into a single model of electron density.

Speaker Biography

David Richardson is a Ph.D. candidate and NSF Graduate Research Fellow in the LF Radio Lab at Georgia Tech. He has published in the Journal of Geophysical Research: Space Physics and has presented at numerous conferences and workshops. He was recently awarded the Outstanding Student Presentation Award at AGU's 2021 Fall Meeting. His work focuses on modelling the lower ionosphere, with a particular focus on modelling D-region electron density. David uses a combination of more traditional signal processing techniques, such as tomography, as well as more data driven techniques in the form of machine learning. In his free time, David is an avid mountain biker and cyclist.

Antennas and Arrays for Future 5G Systems

Dr. Ghalichechian is an Assistant Professor at the School of Electrical and Computer Engineering Georgia Institute of Technology

Today's wireless communications systems operate mostly in the microwave bands, which have become a crowded and limited resource. Yet significantly larger bandwidth is available in the mmWave band of 30 to 300 GHz, offering the potential of huge increases in data rates for next generation devices. This talk will review the state-of-the-art in antenna and array research for future mmWave systems. Furthermore, recent research and progress made at Prof. Ghalichechian's mmWave Antennas and Arrays Laboratory at Georgia Tech is presented.

Speaker Biography

Dr. Ghalichechian is an Assistant Professor at the School of Electrical and Computer Engineering Georgia Institute of Technology. Prior to joining Georgia Tech, he was an Assistant Professor at The Ohio State University (OSU), Columbus, from 2017 to 2021. He received his Ph.D. in Electrical Engineering from University of Maryland-College Park in 2007. Prof. Ghalichechian is currently an Associate Editor of the IEEE Antennas and Wireless Propagation Letters. He is a recipient of the 2018 College of Engineering Lumley Research Award at OSU, 2019 NSF CAREER Award, 2019 US Air Force Faculty Summer Fellowship Award, and 2020 ECE Excellence in Teaching Award at OSU. His research interests include mm-Wave (30-300 GHz) antennas and arrays, 5G and beyond antenna systems, reconfigurable antennas and components, and on-chip arrays.

ABSTRACTS & SPEAKER BIOGRAPHIES

Big Problems Solved for Small Satellites

Dr. Nathan "Chip" Cohen, founder and CEO of Fractal Antenna Systems, Inc., physicist, radio astronomer, and innovator/inventor

In the coming years, a true 'artificial ionosphere' will be achieved globally with the advent of thousands of low earth orbit telecommunications satellites (LEO smallsats). This revolution is not without peril, as these tiny satellites will be difficult to track by radar; pose issues with solar panel powering; and will fill the sky with dim visual tracks that corrupt astronomical observations.

All of these have solutions that invoke novel wireless RF and components and optimization. Here I describe these solutions, which include aperture engine dual use surfaces for solar panels/antennas; metasurface patches (smallsat 'license plates') for increased radar cross section detectability; astronomical tracking optimization to avoid smallsat image contamination to celestial research data. In addition, a novel radar-based detection method is described to detect satellites which are deliberately cloaked as to avoid or thwart detection.

Speaker Biography

Dr. Nathan "Chip" Cohen is the founder and CEO of Fractal Antenna Systems, Inc. - is a physicist, radio astronomer, and innovator/inventor. Dr Cohen possesses a broad scope of knowledge across many fields, which has led him down many roads throughout his career. He is a PhD; he is a former professor of Science and Engineering; he spent time as a Quant trader on Wall Street; he studied astrophysics under Frank Drake; he is a songwriter in the music business; and is a published author. Dr Cohen is perhaps most notable for his contributions to field of electromagnetics being responsible for over one hundred technical papers and eighty-eight patents. He is the inventor of fractal antennas and fractal metamaterials, and the invisibility cloak, holding the source patents in these fields. Fractal Antenna Systems was founded on this breakthrough innovation, and Dr. Cohen has successfully directed the company for over 20 years.

The Current State of Satellite Security

Rachel "RC" Jones, Ph.D. student at University of North Dakota's Aerospace Sciences program focusing on the cybersecurity of space assets, analyst for the Advanced Technologies & Analysis Division at Savannah River National Laboratory (SRNL).

How have concerns for satellite security changed in the past decade? In an attempt to capture some of the changes in space professionals' opinions on the cybersecurity of space assets, results from a decadal survey will be compared. In addition, the presentation will discuss the history of some of the most publicized space satellite security indents and review the current regulatory bodies addressing concerns for commercial satellites (New NIST draft publication).

Speaker Biography

Rachel "RC" Jones is a Ph.D. student at the University of North Dakota's Aerospace Sciences program focusing on the cybersecurity of space assets. She is currently an analyst for the Advanced Technologies and Analysis Division at Savannah River National Laboratory (SRNL). RC has a strong background in space science and cybersecurity. Her current endeavors are founded on an extensive academic background with a BA in Political Science from LaGrange College, BS in Computer Networks and Cybersecurity from the University of Maryland Global Campus, an MSc in Space Management from the International Space University in Strasbourg, France, and a MA in Intelligence with a cyber focus from the American Military University. Previously she supported the US Air Force for six years as a civil servant. Her current research focus areas are cybersecurity of operational technologies, space studies, and emerging technologies.

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ABSTRACTS & SPEAKER BIOGRAPHIES

RCA Youth Activities

Carole Perry WB2MGP, RCA Youth Activities Chairperson

The review of events for our RCA Youth Activities included both ZOOM presentations and in person events. Several candidates were interviewed for the "Young Ham Lends a Hand" contest; and two young hams were chosen as winners for their volunteerism efforts. In February, an RCA Young Achiever was showcased for his presentation at my Youth Forum in Orlando, Florida at Hamcation.

At Hamcation the winner of the 2022 Carole Perry Educator of the Year contest was streamed in from the Netherlands as he was unable to accept the award from us in person. At the Dayton Hamvention in May, I moderated the 33rd annual Youth Forum and Instructors' Forum. I featured 7 RCA Young Achievers who gave outstanding presentations.

We continued to donate support and supplies to start up radio youth groups and to classroom teachers teaching technology via the fun of amateur radio.

Speaker Biography

Carole Perry, WB2MGP, worked as an executive secretary in an electronics manufacturing company, Rapid Circuit Inc. for 16 years. In 1980, when the company relocated, she returned to Intermediate School 72 in Staten Island, NY where she worked until her retirement in 2004, teaching "Introduction to Amateur Radio" to 6th, 7th, and 8th graders for almost 30 years. Carole wrote the curriculum for "Introduction to Amateur Radio" a very successful program which had 950 students a year coming through it.

Carole Perry is the recipient of the prestigious 1987 Dayton Ham of The Year Award, the 1987 ARRL Instructor of The Year Award, the 1991 Marconi Wireless Memorial Award, the 1993 QCWA President's Award, the 1996 Radio Club of America (RCA) Barry Goldwater Amateur Radio Award, the 2009 RCA President's Award, the 2012 RCA President's Award, and the 2015 Vivian Carr Award for Women in Radio. She is the winner of the 2016 SOAR (Sisterhood of Amateur Radio) Legacy award for Pioneering Women in Amateur Radio, and the 2016 recipient of the YASME Foundation Award for Excellence. In 2017 she was the winner of the Brooklyn College Milton Fisher Second Harvest Award for her volunteer work with young people and technology, around the world. In May 2018 Carole was inducted into the "CQ Amateur Radio Hall of Fame." In July 2018 "QST" magazine, Carole was the featured member in "Member Spotlight."

From High Schooler to Ramblin' Wreck: Youth in Amateur Radio From the Perspective of a Young Woman in Engineering

Audrey McElroy, KM4BUN, first-year Computer Engineering student at the Georgia Institute of Technology.

Amateur Radio is a practice that is wonderful and unmatched in its ability to allow self-sufficient communication around the globe and for emergency communications when all else fails, but if we want this art to continue into the foreseeable future, we must encourage the younger generations to become involved. We need to encourage more youth into the wonderful world of Amateur Radio to not only carry on the traditions and principles learned from generations past but also to forge new paths for amateur radio in our fast-paced digital world. This presentation explores activities and events made for youth that not only encourage them into the world of amateur radio but also the world of STEM. From hosting ARISS events to just inviting youth to participate in radio contests, there are many ways for schools and local amateur radio clubs to involve youth of all ages in Amateur Radio. An overview of various youth-led projects involving high-altitude balloon launches will be discussed, such as "The Study of the Effects of High Altitude Conditions on the Life Cycle, Size, and myo-3 Transcription of C.elegans"as well as projects hosted by the prominent youth-oriented organization "Youth on the Air" during their summer camps over the past two years.

Speaker Biography

Audrey McElroy is a first-year Computer Engineering student at the Georgia Institute of Technology. She is also involved in amateur radio and her Extra Class callsign is KM4BUN, earned when she was fifteen. She has combined her STEM Biotech, Physics, and advanced Calculus knowledge with Amateur Radio to develop many experiments such as decoding the ISS SSTV transmission using her own automated satellite ground tracking station as well as developing high altitude balloon experiments that have reached the edge of space, and one that orbited the globe 4.5 times, all while maintaining periodic telemetry. She is in demand as an SME on High Altitude balloons by numerous organizations. At the request of the Southeastern VHF Society, she published a white paper detailing her experimentation with buoyancy and high-altitude balloons that transmit telemetry via WSPR and APRS utilizing the HF bands. Audrey is the first recipient of the RCA Young Achievers scholarship and has had the opportunity to present her experimentation at several conferences such as the American Institute of Aeronautics and Aerospace (aiaa.org/) as well as several Amateur Radio virtual podcast events to a global audience. She has also received a scholarship from the Amateur Radio Relay League provided by Amateur Radio Digital Communications.

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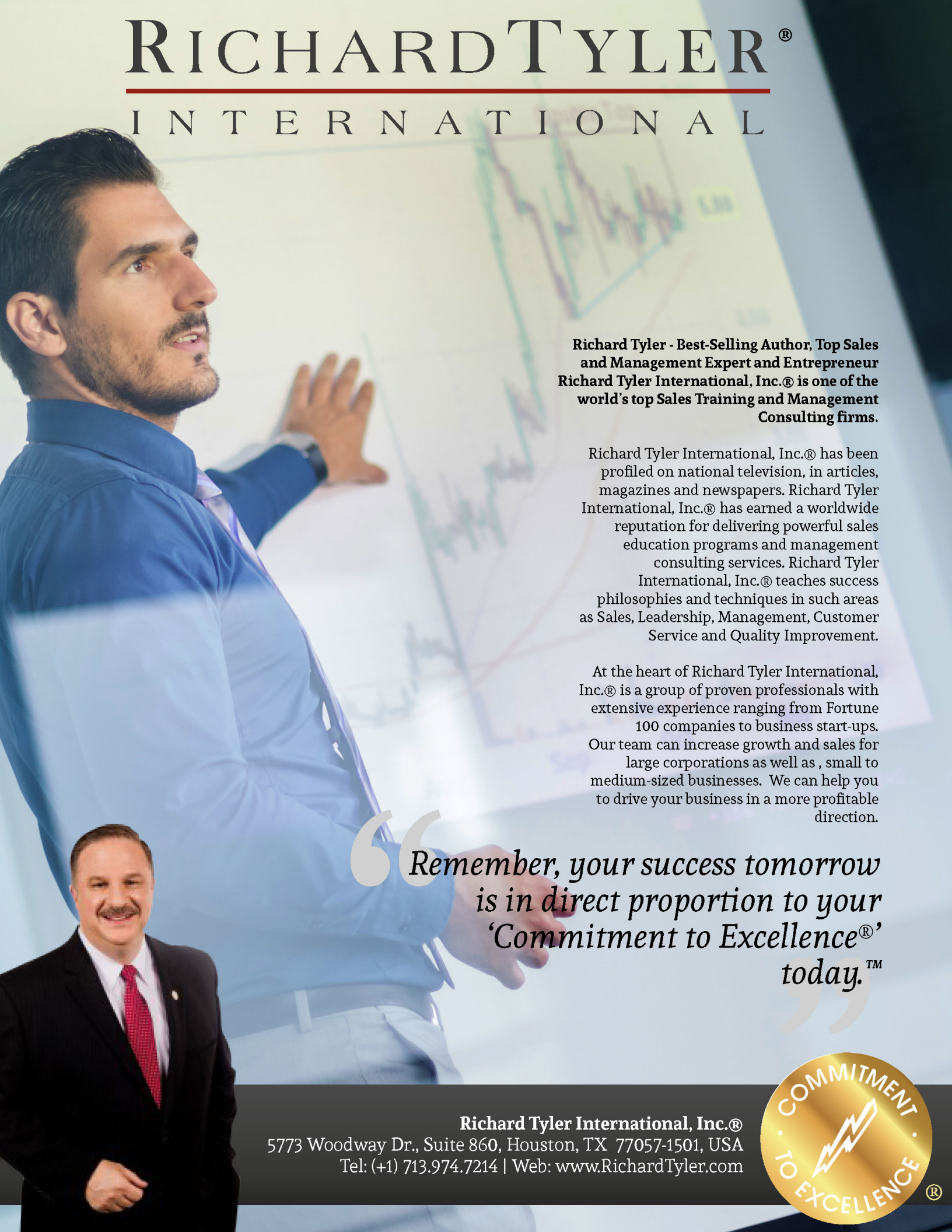

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ABSTRACTS & SPEAKER BIOGRAPHIES

Designing A Scalable 5G-Enabled Connected Intelligent Edge

Divyam Mishra, Artificial Intelligence engineer in the machine learning group for neural network hardware acceleration at Qualcomm

Two integral components that are fueling future technological innovations are Artificial Intelligence and 5G. While both technologies are being used in their own respective spaces, the proliferation of 5G capable agents such as smart phones, Internet of Things (IoT) Devices, Smart City grids, and Autonomous Vehicles will need to be burgeoned by AI-defined 5G Base Stations. This talk will go over the scalability challenges that come with distributed intelligence in the context of 5G. In the process, the talk will discuss potential solutions for designing a scalable, low-latency 5G system with a focus on augmented spectrum utilization and a new state-of-the-art method of partitioning online training of end-user facing neural networks across three tiers of compute: End-User Compute, Base Station Compute, and Cloud-centric Compute. How do we efficiently scale intelligence across different tiers of compute in the 5G ecosystem? How do we build a 5G enabled connected intelligent edge system that scales intelligence across many critical application scenarios?

Speaker Biography

Divyam Mishra has been drawn to electronics and technology from a young age ever since he became involved with his local amateur radio club. He was given opportunities from a young age to present at the Dayton Hamvention Youth Forum in 2014 and the RCA Tech Symposium in 2015. With a background in Artificial intelligence (AI), hardware & software technologies, and signal processing, he believes in fusing together the latest technologies to solve complex problems. A proven track record at premier research institutes like Georgia Tech Research Institute (GTRI), NASA Jet Propulsion Lab (JPL), and Qualcomm AI has made him eager to apply his experience and knowledge in different domains. Divyam is currently an Artificial Intelligence engineer in the machine learning group for neural network hardware acceleration at Qualcomm. He strives to continue expanding his breadth of knowledge. Divyam graduated with a Bachelor of Science in Electrical & Computer Engineering and a minor in Computer Science from Georgia Tech in spring of 2021.

The High Frequency Active Auroral Research Program, "HAARP", A Brief History and Engineering Review

Steve Floyd, Chief RF Systems Design Engineer for HAARP working at APTI/BAE Systems

The HAARP Research Station is a state-of-the-art ionospheric research project located in Alaska and was jointly funded by the U.S. Air Force, U.S. Navy, and the Defense Advanced Research Projects Agency (DARPA). Designed and built by a Washington, DC based APTI/BAE Systems team, its purpose is to analyze the Earth's ionosphere and investigate the potential for developing ionospheric enhancement technology for radio communications and surveillance. The HAARP facility was built in three stages starting in 1993, research operations began in 1996, and was completed in 2007. In 2015, the HAARP program and all assets were officially transferred to the University of Alaska Fairbanks (UAF), and it continues to operate today.

The most prominent instrument at the HAARP Research Station is the Ionospheric Research Instrument (IRI), a 180-antenna tower phased array, and 180 individual radio transmitter systems, operating in the high frequency (HF) band with an effective radiated power of 5 Gigawatts. The HAARP IRI is recognized as one of the highest-powered HF transmitting systems in the world and is used to temporarily excite a limited area of the ionosphere for scientific study. Other instruments at the facility include VHF and UHF radars, a fluxgate magnetometer, a Digi-sonde (an ionosphere sounding device), an induction magnetometer, and low light CCD camera optics systems which are all used to study the physical processes that occur in the excited ionosphere region. The HAARP facility also has its own 15-megawatt diesel engine-based power generation plant, and a modern operations center.

The HAARP program is recognized as a highly successful research project overcoming many unique and unusual radio engineering design challenges. This presentation will provide an inside view describing how the HAARP systems were designed, constructed, installed, and operated with emphasis on the unique engineering aspects of constructing this modern research facility. Examples of scientific research conducted at the facility will also be presented.

Speaker Biography

Steve Floyd is a BSEE graduate of Virginia Tech, a former student DJ and Chief Engineer at WUVT-FM in Blacksburg, VA, and obtained his MSEE (with emphasis on RF and Microwave Engineering and Radar Systems Engineering) from The Johns Hopkins University in 1991. He became a licensed Amateur Radio operator at 12 years old and is active as W4YHD. Steve began his professional career designing high power RF communications and Radar systems at E-Systems Inc., then became Chief RF Systems Design Engineer for HAARP working at APTI/BAE Systems. As Chief Engineer for the HAARP facility he was responsible for all hardware systems designs, equipment

ABSTRACTS & SPEAKER BIOGRAPHIES

installation, and site operations until 2014 when he became a part time consultant to the program. His current responsibilities are primarily involved in the design of high power SDR based Radar systems, including EW and Communications systems, at Ultra Electronics. Steve is also active in the broadcast industry, he is an SBE member of DC Chapter 37, and has a lifelong love of radio broadcasting and amateur radio.

Advanced Packaging for 6G Communications

Madhavan Swaminathan, Professor, Director, 3D Systems Packaging Research Center (PRC); John Pippin Chair in Microsystems Packaging & Electromagnetics, School of Electrical and Computer Engineering, Georgia Institute of Technology School of Materials Science and Engineering, Georgia Institute of Technology

The current buzz in the semiconductor industry is heterogeneous integration. As the industry moves forward with several applications being data driven, there is a clear trend towards the convergence of computing, communications, sensing, and control technologies. Packaging can play a significant role in enabling the convergence of these technologies.

On the communication side emerging 5G mmWave frequencies are projected to support enormous bandwidth with 1-10Gps data speeds. Active research is ongoing to increase the data speeds even more by moving to higher frequencies in the sub-THz frequency range namely, 6G. With a broad range of frequencies to support, advanced packaging solutions are required.

This presentation addresses the needs for 6G communication along with a review of the start of the art for package level integration. The progress made on glass interposer-based solutions at Georgia Tech's Packaging Research Center will be discussed along with future needs as we progress towards sub-THz frequencies.

Speaker Biography

Madhavan Swaminathan is the John Pippin Chair in Microsystems Packaging & Electromagnetics in the School of Electrical and Computer Engineering (ECE), Professor in ECE with a joint appointment in the School of Materials Science and Engineering (MSE), and Director of the 3D Systems Packaging Research Center (PRC), Georgia Tech (GT) (http://www.prc.gatech.edu). He also serves as the Site Director for the NSF Center for Advanced Electronics through Machine Learning (CAEML) and Theme Leader for Heterogeneous Integration, at the SRC/DARPA JU MP ASCENT Center. Prior to joining GT, he was with IBM working on packaging for supercomputers.

He is the author of 550+ refereed technical publications and holds 31 patents. He is the primary author and co-editor of three books and five book chapters, founder, and co-founder of two start-up companies, and founder of the IEEE Conference on Electrical Design of Advanced Packaging and Systems (EDAPS), a premier conference sponsored by the IEEE Electronics Packaging Society (EPS).

Prof. Swaminathan is an IEEE Fellow and has served as the Distinguished Lecturer for the IEEE Electromagnetic Compatibility (EMC) society.

He received his MS and PhD degrees in Electrical Engineering from Syracuse University in 1989 and 1991, respectively.

RCA Mentorship Program

A way to share your knowledge and experience, or learn from the best!

The new RCA Mentorship Program is designed to pair RCA members together, providing opportunities for young professionals to learn and emulate the experience of more seasoned RCA members. Several mentoring pairs have already been formed and more are being formed. Learn more on the RCA website.

radioclubofamerica.org/mentor-program

SHARE YOUR RCA STORY

We had a record number of new members last year help us continue this momentum by spreading the word about why you belong to the oldest, most prestigious group of wireless professionals in the world! Direct potential members to the Why RCA? page of the website to learn what sets us apart.

Signing up for RCA Membership has never been easier! Use the new online membership application to submit your information in a matter of minutes.

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Amazon has a program called Amazon Smile, through which Amazon will donate .5% of a qualified purchase to a charitable organization of your choice. To designate proceeds towards RCA, go to smile.amazon.com and use your Amazon login. You will be asked to select a charitable organization (Radio Club of America) and start shopping. It is an easy way to help the Radio Club and at the same time get a great deal on amazon.com. If you are an Amazon Prime member, you will continue to receive the benefits of your Prime membership.

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