

IEEE life members newsletter



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Welcome, New IEEE Life Members

Aleksandar Szabo, Chair, IEEE Life Members Committee

Welcome to the more than 2,700 IEEE Members, including Fellows and Senior Members, who became Life Members, Life Senior Members, or Life Fellows on 1 January 2016. IEEE recognizes your many years of professional work as well as your membership and commitment to the organization. Congratulations to all of you!

The *IEEE Life Members Newsletter* also goes out to IEEE Members whose interests are often similar to those of Life Members, such as retirees or members approaching retirement. We hope that the articles in the newsletter will inspire you to interact with others. We encourage you to continue to be engaged with your local Section, Chapters, and Affinity Groups. If you are a member of a Life Member Affinity Group in your Section, take into account that other higher-grade members can also belong to the group and help with its activities. Great results can be achieved organizing activities in cooperation with IEEE Young Professionals Affinity Groups and Student Branches. Take the opportunity to mentor IEEE Student Branch members at universities. Discuss with students your experiences with entering the workforce and industry. Many of the Student Members are our future active members.

The changes to the IEEE Member and Geographic Activities (MGA) operations manual prepared by the Life Members Committee (LMC) in November 2015 were approved by MGA and the IEEE Foundation boards in the first quarter of 2016. The LMC, whose members are listed on page 16 of this issue, is a joint committee of IEEE acting through the MGA Board and the IEEE Foundation. The LMC provides leadership in indentifying and supporting the



IEEE Life Members Committee Chair Aleksandar Szabo

interests of Life Members, future Life Members, and retired Members in IEEE activities. The LMC is responsible to the IEEE Foundation for the management of the IEEE Life Members Fund (LMF), including stimulating and monitoring contributions and authorizing disbursement.

Life Members are encouraged to contribute to the LMF, and all donations are welcome! Many small

donations can help as much as a single large gift. To learn more, please peruse the articles in the newsletter and on the IEEE Foundation website, many of which describe supported projects throughout the world. The LMC helps to determine which projects deserve financial support from the LMF through the IEEE Foundation Grants Program.

We continue to encourage our Life Members and Members approaching Life Member status to apply for the promotion to Senior Member grade. In 35 years or more of IEEE membership and technical work, many Life Members and mature members should possess at least five years of significant performance, as required for the Senior Member grade.

The *IEEE Life Members Newsletter* is also looking for your contributions. Tell us about Life Member activities in your groups and Sections. The newsletter welcomes "Tales from the Vault" articles focusing on your personal involvement in projects that turned out to be historically significant.

Let us hear from you about Life Member activities and best practices at the local level. We will be reviewing and improving our strategic plan. You are welcome to communicate with me directly via a.szabo@ieee.org.



LMF Grants Support Various Programs Across the Globe

The IEEE Life Members Committee (LMC), a joint committee of the IEEE and the IEEE Foundation, is responsible for the administration of the IEEE Life Members Fund (LMF). Thanks to the generosity of IEEE Members, the LMF—in collaboration with the IEEE Foundation—supports activities specifically of IEEE organizational units that are of interest to Life Members and potential engineering and engineering students. The fund is supported by the generosity of IEEE Members. The LMF is pleased to announce its monetary support for the following programs.

- **Young Minds Know About Imaging, Water, Agriculture (US\$16,331):** In an effort to promote strong science, technology, engineering, and math (STEM) education and to increase the number of women entering college who are pursuing a science or technical degree, the Buenvventura Section developed a project to educate secondary and college students about the use of imaging technology to record and analyze the supply, routing, processing, and use of water in our community. A STEM workshop was held for the secondary schools in the cities of Oxnard and Venture, where 60% of the growers and farm workers live. The event engaged students with a day of hands-on experiments with imaging sensors, light technology, and elements to be imaged, such as water (clean and polluted), outdoor vegetation, and a garden under normal and stressed conditions.

A second initiative is planned, specifically for female students in the secondary and primary schools, with the theme, “Your Daughters, Engineers of Tomorrow, and Change Makers of California.” The students will be involved in parallel workshops guided by mentors and instructors composed (at a minimum) of a professional female engineer and a high school girl. Through the use of photonics, light sources, camera and optical devices, as well as digital imaging processing, the workshops will describe the spectral nature of light, the ability to emit, and the ability to see an object in different spectral range. While the students are in the workshop, parents will participate in sessions designed to reinforce the belief that their daughters are capable of attending an engineering school. Workshop leaders will talk about the careers in engineering available to their daughters in 2020–2030 and cover technology in agriculture and sustainability. Speakers will discuss the normal process involved in entering an engineering college, what schools would like to see in a young woman’s experience while she is in high school, and how to secure scholarships.

- **Power Collection, Dispersion, and Alternatives (US\$10,303):** The IEEE–University of Texas, Dallas Section will be building a model of the current power grid, which is the start of a larger educational project that will entail concepts of the integration of

communications, other forms of renewable energies, and more efficient technology to avoid wasting electricity into heat. The model will consist of a signal generator accompanied by a linear amplifier to produce a phased sinusoidal waveform, two solar panels, a small ac generator to simulate a wind generator, and an outlet for the power that will enable the user to attach different loads on the system. Using an oscilloscope, the model will demonstrate the effects of harmonics on power transmission and what happens to the transmission when loads, such as home electronics, are not filtered properly. The accompanying presentation will explain the challenges of dealing with harmonics and how a percentage of generated power is wasted just to transmit it across long distances. Additional demonstrations will highlight the challenges of incorporating dc and nonlinear power generators into the existing grid. This project is a startup of a larger educational project. Once a model is built, another project can entail more concepts of integration of communications, other forms of renewable energies, and more efficient technology.

- **STEM Outreach Using Student-Built Humanoid Robots (US\$36,430):** For this project, IEEE Members of the Eastern North Carolina Section (ENCS) are joining with The Forge Initiative, a regional 501(c)(3) nonprofit focusing on youth development and leadership through hands-on science, technology, engineering, art, and math (STEAM) education and community engagement. The ENCS Robotics and Automation (R&A) Chapter has an ongoing project developing a humanoid robot, which is currently functional and being demonstrated at public events. The humanoid robot project’s goal is to bring this technology to a wider audience—to students and the public—to increase the understanding of robotics and inspire students to further their STEM education. ENCS R&A members bring expertise in and excitement about robotics, mechatronics, and mentoring to the project. To develop the infrastructure necessary to support interest in STEM in the community, the project will engage IEEE and The Forge Downtown (TFD) members, training a cadre of secondary school students to build, maintain, and extend the humanoid robot project, work with TFD to develop outreach programs and partnerships, and develop a larger team of youth in TFD that can explain and exhibit the humanoid robots to the public at ongoing public events, while laying the groundwork for future projects.

Mentors from IEEE will work directly with middle and high school students from TFD to reproduce four models of the humanoid robot project. ENCS R&A mentors will work with the students to increase their technical knowledge of mechatronics. With

these increased skills, the students, with help from the IEEE and TFD mentors, work to put together kits provided by the IEEE Human Robot Project. These students will then have an in-depth understanding of how the humanoid robot is built, is programmed, and how it works. They also will possess the skills to perform ongoing repairs and maintenance, furthering their own skills along the way. Using this confidence and experience, these students can take the humanoid robots out into the community to share their knowledge of building the robot and demonstrating it to other students and adults. The

robots will be incorporated into community outreach activities, including events organized by the local IEEE Section and ongoing STEM-focused, hands-on demonstrations at local schools, community centers, and museums, as well as corporations visited by volunteers of TFD and IEEE. Building excitement about robotics among students and youth will help the community do its part to meet the global demand for STEM competencies. For more information on this project, see “Local Partnership Wins IEEE Foundation Grant to Support STEM Education” on page 4.

REACH Empowers Students and Keeps Your Legacy Alive

Over the course of time, engineering has influenced our world socially, economically, politically, and culturally. From the invention of the wheel to the many complex technological inventions and advancements of today, the intertwined relationship between engineering and humanity is undeniable. As an IEEE Life Member and a creative problem solver, you have experienced the effects engineering has had on humanity first hand. Have you ever wondered if the millennial generation understands the profound affect engineering has had on the human experience and the shaping of our world? The IEEE History Center’s Raising Engineering Awareness through the Conduit of History (REACH) program aims to bring such an understanding to future generations.

Through the lens of history, REACH will provide educational resources to high school history teachers that bring to life the impact engineering and technology has on humanity. The resources will include inquiry units, or lesson plans, that will aid social studies teachers with understanding the technologies as well as the context that will allow them to explore the complex relationships among engineering, technology, and society with their students. Pulling from the IEEE History Center’s resources, REACH will also include primary sources, short videos, and oral histories. The educational resources will be available, for free, to teachers from around the globe via an IEEE REACH website.

Two REACH pilots are in development; the first is on technological advances associated with early maritime navigation and how they propelled European societies to world dominance, and the second is on technologies associated with mass communication and the affect such technologies have had on social change. For example, Martin Luther effectively used the Gutenberg printing press and its movable-type technology to advance the Reformation. Another example is how the technology of social media and the Internet were utilized during the

Arab Spring. These modules will pilot in two New Jersey high schools and then roll out to other states for a second round of pilots in an effort to tweak the program for a national rollout. Once fully released, REACH will be available to any teacher, anywhere in the world.

The most important aspect of REACH is student learning. REACH will provide teachers with tools that will enable students to pinpoint, describe, and analyze historical and current examples of the interface and interrelationship of engineering, technology, and society through various cultural settings; provide an opportunity for students to make discoveries on how engineering and technology has transformed their physical world and society; more deeply understand time, space, place, and human-environment interaction; and provide an opportunity for students to examine the way in which engineering and technology influence core societal values, beliefs, and attitudes and how societal values influence engineering and technological advances. In turn, this will prepare students to be more technologically informed citizens, provide them with opportunities to further develop critical-thinking skills, build self-confidence for greater creative problem solving, and empower them to make informed decisions.

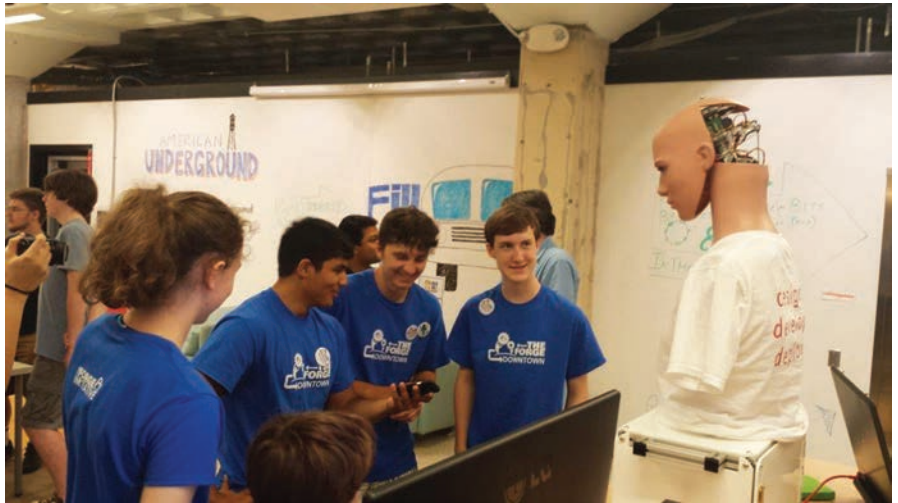
As students from a new generation obtain a deeper understanding of the intertwined relationship between engineering and humanity, REACH will also help keep your legacy as an engineer and an IEEE Life Member alive. For more information about REACH, contact Kelly McKenna, REACH program manager, at +1 732 562 2687. You may also view a promotional video about the REACH program at <https://www.youtube.com/watch?v=5vmMxJrt3F4>.

REACH is a Signature Program of the IEEE Foundation and is supported by your donations. Please support REACH today at ieeefoundation.org/donate_history.

—Kelly McKenna, REACH Program Manager,
IEEE History Center

Local Partnership Wins IEEE Foundation Grant to Support STEM Education

For nearly a century, science-fiction writers have imagined a future in which robots, indistinguishable from humans, interact and function in normal human societies. For thousands of students across North Carolina, that future is now. The Eastern North Carolina Section of the IEEE has been awarded an IEEE Foundation grant to advance science, technology, engineering, and math (STEM) education through the use of humanoid robotics. The grant, “STEM Outreach Using Student-Built Humanoid Robots,” will help fund a yearlong mentoring and outreach program designed to bring cutting-edge robotics technologies to students and families across North Carolina.



Students from The Forge Initiative interact with Ken during an outreach event. (Photo courtesy of Grayson Randall.)

Funding from the grant will support a partnership between the Eastern North Carolina Section of the IEEE and The Forge Initiative, a STEM education nonprofit based out of Cary, North Carolina. Volunteer mentors from the two organizations will work with middle and high school students to assemble and customize humanoid robots based on an existing prototype. Students will also learn to present the robots at STEM outreach events across North Carolina, providing opportunities for at least 4,000 people to interact with the robots.

The Eastern North Carolina Section Robotics and Automation Chapter, as part of a challenge to build a robot “indistinguishable from a human,” developed the existing prototype, nicknamed “Ken.” Ken made his official debut in March 2015 at the IEEE North Carolina RoboResearch Seminar and has been delighting adults and children alike ever since. According to Project Director Grayson Randall, “It is wonder-

ful to see how excited students get when engaged in spontaneous natural-language discussion with a robot. You can see their interest growing with every word. We hoped to expand this program dramatically to encourage more interest in STEM careers. We just needed the perfect partner.”

The Forge Initiative is that partner. Linda Whipker, president of The Forge Initiative, states, “Our mission is to focus on youth development and leadership through hands-on STEAM (science, technology, engineering, art, and math) education and community engagement. Working with the IEEE will allow us to add another dimension to our offerings.”

Together, the IEEE and The Forge Initiative will help the future engineers of North Carolina bring about the future of robotics. For more information, contact Grayson Randall at g.randall@ieee.org. To donate to the IEEE Foundation Grants Program, visit ieee.org/donate.

IEEE Life Members Fund 2015 Honor Roll of Donors

The IEEE Life Members Committee (LMC) gratefully recognizes the IEEE Members and other friends who have directed their donation to the IEEE Life Members Fund (LMF) of the IEEE Foundation. Those names are listed here. A full listing of donors of US\$100 or more to all of the 130+ IEEE Foundation funds appear in the IEEE Foundation’s Honor Roll of Donors, which is published in July. Your support enables the IEEE LMC to support philanthropic activities that encourage students and young electrical engineers to pursue careers in engineering, investigate the history of electrical engineering, and represent the inter-

ests of IEEE Life Members or similarly mature Members. All listings acknowledge gifts of US\$100 or more made during the calendar year 2015 specifically to the IEEE LMF of the IEEE Foundation.

The IEEE Development Office makes every effort to ensure the accuracy of the listing, including the proper acknowledgment of gifts and the correct spelling of names. Please notify us of omissions or errors by sending an e-mail to donate@ieee.org or calling +1 732 562 5446.

The IEEE LMC extends a special thank you to those donors who are not included here.

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LM: Life Member, SM: Senior Member, LSM: Life Senior Member, LF: Life Fellow, M: Member, I: Individual, ORG: Organization

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Carroll G. Dudley, LM
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Daniel Farkas, LSM
Ghaffar Farman-Farmaian,
LM
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Correction

In the June 2015 issue of the *IEEE Life Members Newsletter*, Ramasamy Uthurusamy was incorrectly listed as an IEEE Life Member. He is an IEEE Life Fellow. We apologize for the error.

Life Member Profile: Lifelong IEEE Engagement Parallels Engineering Career

Thomas H. Grim joined the IEEE as a Student Member in 1963 to take advantage of the networking and continuing education opportunities. He then became interested in the IEEE Engineering Management Society (EMS), now known as the IEEE Technology and Engineering Management Society. Grim attended an administrative committee meeting of EMS and eventually joined the committee, ultimately serving as the president of the Board of Governors and then as the IEEE Division VI director.

Grim spent 38 years working for subsidiaries of the Bell System. Wherever he went, he found IEEE opportunities to fill. He continued on the EMS Board of Governors until 2003, when he retired and joined the IEEE Central Texas Section.

“Through the years, I have seen first-hand the IEEE projects benefitting the technical community and



Tom Grim believes in contributing to organizations that have supported his career success.

supporting the next generation of electrical engineers,” Grim says. “My wife and I both believe in contributing to organizations that supported our career success, and we’ve made many friends through IEEE.”

The most interesting and valuable IEEE programs, in his view, are those that support professional development and encourage young people to pursue engineering, whether at the undergraduate or graduate level. Grim also supports outreach to build awareness about the value of engineering.

As a current Life Senior Member, Grim looks forward to taking a more active role in supporting IEEE programs. “My new job for IEEE as a member of the IEEE Life Members Committee is an opportunity to help direct funding to the good work of IEEE through the IEEE Foundation,” he adds.

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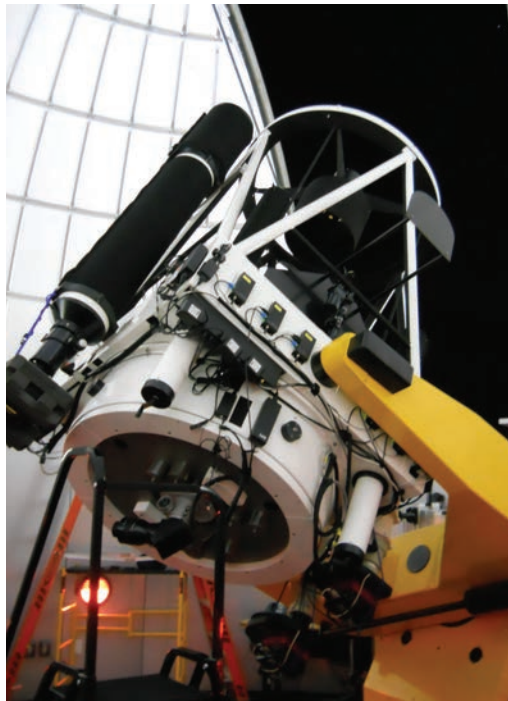


Daytona Life Member Affinity Group Visits ERAU

In February 2016, the IEEE Daytona Life Member Affinity Group members of Region 3 were guests of Embry Riddle Aeronautical University (ERAU) and Dr. Peter Erdman and experienced a fascinating trip to visit the new ERAU Science Building and Observatory. ERAU has a substantial number of degree programs in astronomy, astrophysics, and engineering physics. Faculty and students carry out research projects in both areas, some using the new 1-m telescope. The telescope control center is on the fifth floor of the science building.

Dr. Erdman showed the group a number of large photographs of various constellations that he took from home using a smaller telescope. It was impressive to see what could be accomplished with a knowledgeable researcher.

The 1-m telescope is mounted on its own foundation, separate



The 1-m telescope is mounted on its own foundation, separate from the building, to minimize vibration.

from the building, to minimize vibration. The scope is mounted on huge support beams (six stories high) that go down to this foundation. The platform for the instrument itself is visibly isolated from the building floor on which we were located. The scope is accessed by a curved stairway. When moving the telescope, the whole system turns, including the platform and stairway. This necessary mounting and control system cost approximately US\$1 million.

The tour was followed by an open house and, in spite of the cool and cloudy evening, there were a lot of visitors that came to see the observatory. A few IEEE Members stayed to utilize the smaller telescopes that were made available to the public.

—Ronald Gedney, Daytona LMAG Chair

tales from the vault

CERN 1975—Distributed Real-Time Control

Particle accelerators were early adopters of real-time computing to integrate their hundreds of sensors and controllers. In the 1960s, this meant hundreds of cables running hundreds of meters to a central computer (cable runs were some hundreds of meters). The CERN 25 GeV/c Proton Synchrotron (PS) with a 200-m diameter main ring ran like this on an IBM 1800 processor into the 1970s.

In the late 1960s when CERN planned for a 500 GeV/c accelerator—the Super Proton Synchrotron (SPS)—it became clear that this approach would not scale. The main ring would be 2,000 m in diameter, requiring thousands of cables that were thousands of meters long to connect to all the sensors and actuators. Michael Crowley-Milling began work on one of the first distributed, real-time process control systems. This became a



The February 1976 commissioning of the SPS accelerator. Here, at one of the three control room consoles, is the author's manager, Paul Faugeras, testing the fast-pulsed magnets they had built together. The author is leaning on the console.

network of a dozen NORD-10 processors in the auxiliary buildings around the ring, with others in the control room building and more in the injection and experimental areas.

The NORD-10 had 16 replicated register sets. A process was assigned to each set, and switching execution between processes would then take only one clock cycle. The big machines had 32 kB of memory, and the small ones had 16 kB. In the control room were shared disk drives, but starting up required keying in the bootstrap to load an execution image from punched paper tape. The network was a star with 38 kb/s links and systems connected to the accelerator hardware via CAMAC crates.

Device drivers were coded in assembler, but applications were written

in NODAL, an interpreted language developed by CERN. NODAL resembled BASIC but included SYSTRAN for string processing and many features for distributed processing. These included a distributed file system, immediate execution of a NODAL command on a remote system, and the dispatch of blocks of code to one or more remote systems for synchronous or asynchronous execution.

The control room consoles featured 20-in monochrome and color monitors for which CERN built the frame buffers supporting $256 \times 256 \times 8$ -bit graphics. The 64-kb chips were just becoming available. Operators navigated the applications via a tree structure using a touch sensitive display built into the desk together with a large trackball and a programmable knob that

could act as a multidetent switch or as a variable control.

The control system was completed by Christmas 1975, and it was the best present I ever had. Apart from its intended functions, we programmed the *Tower of Hanoi* (NODAL supported recursion) and the genetic programming game known as *Life*. One problem we had initially was that the 120-MVA power supply for the SPS came through the Jura mountains. During summer this was often struck by lightning, usually about 3 p.m. when we had just got the SPS up on its feet during commissioning. This repeatedly shut down the computers until battery backup was hastily installed.

—Colin Harrison, LSM
Brookfield, Connecticut

What a Croc!

I worked for BBC TV-News from January 1960 to March 1962, and one of my jobs was to send or receive 16-mm film news items across the Atlantic Ocean via the Trans-Atlantic Telephone (TAT) cable. In 1959, the BBC Research Department had created a slow-scan 16-mm film transmission system, which took 100 min to transmit 1 min of film across the Atlantic, between BBC TV-News at Alexandra Palace in North London and NBC-New York at Rockefeller Center, New York City.

It took 8 s to scan one frame of the 16-mm film, which was printed on two successive frames at the receiving end. Only every other frame was scanned. This, and various other tricks, reduced the 3–5-MHz bandwidth of the BBC 405-line black/white TV signal to match the 3-kHz bandwidth that was available via the TAT cable. I remember working until 3 a.m. one morning in the autumn of 1961 to send to NBC-New York the film coverage of President Kennedy meeting Chairman Krushchev in Vienna.

In April 1962, I was seconded to the European Broadcasting Union (EBU)

Technical Centre in Brussels, Belgium, where part of my work was to prepare for the first live transatlantic TV transmissions via the Telstar satellite in July 1962. Telstar was only available for about 22 min per orbit, but by 1965, Early Bird, followed by other geostationary satellites, became available for transatlantic TV transmissions.

Around 1967, I was coordinating the transmission to the whole of Europe and the Soviet Union of a live speech by U Thant at the United Nations in New York. In those days, the video was sent via satellite, but the audio was sent separately via a transatlantic cable circuit. That meant that the video arrived about .25 s later than the audio, so we had a tape recorder with a continuous loop of tape in record/replay mode that provided a .25-s delay for the audio. On this occasion, the transatlantic audio feed was never established. Fortunately, I had telephone contact with Joe Nichols, the engineer-in-charge of UNTV. I asked Joe if he could send U Thant's audio via the phone line, which he quickly arranged.

In the Eurovision Control Center in Brussels, my colleague and I opened the wall-box where the phone lines arrived and connected an audio cable with croc-clips to the terminals of the phone line in question. We soldered a capacitor between one croc-clip and the audio cable to block the dc voltage that was present on the phone line. The audio cable was strung across the room to the audio bays and plugged into the input of a 1:1 audio transformer, whose output was connected via the tape-record/replay machine to an input of the program audio switcher, and thereby fed to the whole of Europe and the Soviet Union via the EBU's permanent sound network.

I stuffed a yellow duster into the mouthpiece of the telephone handset, and that is how U Thant's speech was fed live to Europe and the Soviet Union. Nowadays, professional equipment is available for connecting phone calls on air, but in those days we had to improvise.

—Brian Flowers, M
Denia, Spain

Making Connections

In 1959, as a new engineer at Hazeltine Corp., I was tasked with the production of an existing product, a goniometer, for the Federal Aviation Administration (FAA). In looking up the definition of *goniometer*, it says that it is an “angle-measuring instrument,” but this was a mechanical modulator, the heart of the VHF omnidirectional range (VOR) system at that time. It was good, solid 1930s technology that consisted of a large air capacitor divided into eight sections and wired as two capacitor bridges. The two bridges were electrically in parallel but physically 90° to each other, and it was then spun by a motor. When high-power radio frequency (RF) was input, the result was sine wave modulation of the RF. The two outputs, when applied to the antenna, resulted in a signal in space of a figure eight that spun at the speed of the motor. There was

also an omnidirectional reference on a subcarrier.

The aircraft received the figure eight as a sine wave. Comparing the phase angle of this to the reference, the difference angle is the physical angle of the aircraft from north. Thus, the aircraft sees this as its angle (bearing) from the VOR station. The first VORs actually spun the antenna, and later it was all done electronically.

An input and two output baluns were required, which were connected by two wire coax. These required tuning for an impedance match, which was done with wire loops that could be twisted around. Thus, the cables were matched to the unit and labeled in, out1, and out2. We built a lot of these for the FAA and shipped them in small quantities to where they were needed.

The problem came when the Canadian Department of Transport ordered about 50 of them and wanted them all delivered to the same place. I subsequently received a call asking, “How do we connect up all of these cables?” It turned out that the shipping department had tossed all of the cables into one box. They said, “Well, nobody told us not to.” There was no way to match up a cable set to a unit.

For my sins, I was sent with a tech to Kitchner, Ontario, for two weeks, and we retuned the whole batch. The fun of getting the large crate of test equipment into Canada was only matched by the joy of getting it back into the United States. Of course, my next job was to design a serial number tag to go on the cable bundle.

—Jim Bean, SM
Northport, NY

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Submitting Articles

We welcome articles for this newsletter. In particular, we seek articles about projects that are initiated at the Section and Region level by Life Members as well as “Tales from the Vault,” which should focus on novel or interesting technical issues. The suggested length for “Tales from the Vault” submissions is 500 words.

Acronyms should be completely identified once. Reference dates (years) also should be included. Editing, including for length, may occur. If you wish to discuss a story idea before hand, you may contact Craig Causer, managing editor, by e-mail at lm-newsletter@ieee.org. The deadline to submit an article for possible inclusion in the next issue is 1 October 2016. Please include your Life grade, town, state, country, phone number, member number, and/or an e-mail address with your piece.

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