With a steady membership increase, we are entering 2018 with more than 35,000 Life Members (LMs), including Life Fellows and Life Senior Members, which is a significant part of the total IEEE membership. Many LMs, with their knowledge and experience, contribute significantly to the activities of our organizational units.

Most LMs are at the Member grade, although many qualify to become Senior Members. I would like to encourage our LMs to apply for the upgrade to Senior Member. Your Section is there to help you along during the process. You will need only two references once you are nominated. For detailed information, visit www.ieee.org/seniormember.

If you would like to become more engaged and active, please contact your Section, Chapter(s), and/or LM Affinity Groups (LMAGs). If your Section does not currently have an LMAG, you can take the initiative and establish one. Many beneficial activities can be organized in cooperation with young professionals and students, which would help in bringing together the younger and older generations in your Section.

In the first half of 2017, LMAGs in the Nagoya, Lebanon, Delhi, and Denver Sections have been formed. Also this year, the LMAG Achievement Award (for activities in 2016) was presented to the IEEE Southeastern Michigan LMAG (Region 4) for outreach to Southeastern Michigan IEEE Members and nonmembers by highlighting the achievements of IEEE Life Fellows. Congratulations to all! If you know an IEEE LMAG that has shown outstanding leadership and initiative in organizing activities/programs to engage Life Members and/or to help further support the IEEE Life Member Fund (LMF), consider nominating it for the 2018 achievement award.

The LMF and the IEEE Foundation Fund continue to partner to support projects that are important to LMs and the IEEE. Please join me in contributing to the LMF as you renew your IEEE Life Membership for 2018. Your support enables the work of many worthy programs. The IEEE Life Members Committee (LMC) helps to select projects that deserve financial support from the LMF through the IEEE Foundation Grants Program. At Sections Congress 2017 in Sydney, Australia, we promoted the LMCs humanitarian and philanthropic activities at the exhibit pavilion together with the Foundation. To learn more about the IEEE Foundation/LMs Grants Program, visit www.ieeefoundation.org/grants.

The IEEE Life Members Newsletter is highly regarded by our LMs. It also goes out to IEEE Members whose interests are often similar to those of LMs, such as retirees or Members approaching retirement. These Members are welcome in LMAGs. The LMC created a task force to investigate mechanisms that can extend the vitality and contributions of post-career Members. Stories focused on local LM activities, history, and the programs supported by the IEEE LMF are published in this newsletter. We continue to welcome "Tales from the Vault" articles, which share your stories and involvement with technological achievements and solutions. In the
June 2017 newsletter, we ran the first of many “Ethical Dilemmas” articles, which are a joint initiative of the LMC and the IEEE Society on Social Implications of Technology. The articles are published simultaneously in IEEE Life Members Newsletter and IEEE Society on Social Implications of Technology Newsletter. We are looking for your contributions! Past issues of IEEE Life Members Newsletter are available on the LMC’s website at www.ieee.org/lmc.

This is my final article as chair of the LMC. I would like to thank all LMC members for their cooperation and LMs for their contributions. It has been an honor and a privilege to serve you—the LMs of the IEEE—during 2016 and 2017. I would like to use this opportunity to welcome Charles Turner from the U.K. and Ireland Section as the incoming chair starting on 1 January 2018. I wish him every success.

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**Region 8 LMs Celebrate 50 Years of Microelectronic Wristwatches**

In Neuchatel, Switzerland, on 5 September 2017, the 50th anniversary of the development of the microelectronic wristwatch was celebrated by the Swiss company CSEM (Centre Suisse d’Electronique et de Microtechnique) at the Microcity Offices of the Federal Polytechnic of Lausanne. The event was sponsored by the IEEE Switzerland Section and hosted by Hugo Wyss, chair of the Swiss Life Member Affinity Group (LMAG). It featured the remarkable exhibition “From Quartz to Microelectronics,” which tracked the evolution in high-precision manufacturing technology that led to the latest generation of watches coveted by consumers today.

Daniel Borel, cofounder of Logitech, was the keynote speaker and described how strong interaction with the semiconductor industry in Silicon Valley had stimulated the early growth of microelectronics in Switzerland. Now, five decades later, new industries, notably in the biology and medical fields, are being created using the momentum generated by the success of microelectronic watches.

Region 8 was represented by the chairs of the LMAGs in Benelux, France, Italy, Lebanon, Slovenia, and the U.K. and Ireland.

Charles Turner
Region 8 Life Member Coordinator

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**Southeastern Michigan LMAG Scores Achievement Award**

The IEEE Life Members Committee (LMC) is pleased to announce that the IEEE Southeastern Michigan (SEM) Life Member Affinity Group (LMAG) is the third recipient of the IEEE Life Members Affinity Group Achievement Award. The SEM LMAG was recognized for its “outreach to Southeastern Michigan IEEE Members and nonmembers by highlighting the achievements of IEEE Life Fellows.”

The SEM LMAG held a number of events throughout 2016, engaging the LMs from the Southeastern Michigan area with varying topics for its talks, which featured technical and humanitarian conferences. Events included the IEEE SEM Humanitarian Conference, which invited young professionals to participate. The SEM LMAG also organized a networking and recognition event to acknowledge the IEEE Fellows in the Sections.

Holding a wide range of activities including nontechnical and technical speakers is a great way to engage the LMs and retirees in your area. For those of you who have an LMAG in your area, you might want to consider expanding your activity topics and invitation base. Including young professionals and students is a great way to build relationships and mentor young people.

The IEEE LMC believes that keeping LMs active and engaged is a key component to the success of the IEEE in local activities. This engagement can be conducted through the local Section and/or technical Chapter but even more so through the LMAG, which holds activities directly of interest to LMs.

The IEEE Life Members Affinity Group Achievement Award is given annually to one LMAG to recognize those substantive projects or achievements that have left an undeniable imprint on the fabric of IEEE LM operations or the IEEE Life Members Fund.
IEEE Sections Congress 2017 was held 11–13 August in Sydney, Australia. Participation surpassed all prior records with 1,225 attendees and 309 of the 335 IEEE Sections represented.

The IEEE Foundation and the IEEE Life Members Committee (LMC) supported the event at the US$25,000 level. Both received positive exposure and multiple opportunities to showcase their efforts during the event. Joe Cruz, past chair of the LMC, was a representative at the Congress and was happy with “the success in the degree of participation of the many organizational units within the IEEE.”

Friday afternoon, the Humanitarian and Philanthropic Opportunities (H&P) Pavilion—our joint exhibit presence with nine other IEEE humanitarian and philanthropic programs—was ready for business. Designed to excite Members about the possibilities and inform them about the many ways to give back to the IEEE, visitors to the pavilion were encouraged to make a pledge of time, talent, and/or resources to one or more IEEE programs.

Throughout the weekend, the pavilion was full of activity and conversation. Attendees delved deep into the ten programs to decide how to become involved. The passion they exhibited was remarkable. Watching the pledges grow on the giving tree and the excitement generated by each one was both humbling and spectacular. We exceeded our goal with a total of 256 pledges. Program staff are following up with each person who visited the booth and on every pledge made to help them fulfill their commitment. Doing good brings great returns!

The LMC, IEEE Foundation, and other priority initiative representatives also led a variety of sessions, many of which can be viewed on the H&P Web page at ieee.org/doing-good. Aleksandar Szabo, chair of the LMC, presented the session “Engaging Life Members Locally.”

Congratulations and thank you to all who helped plan and execute our presence at Sections Congress 2017. It was an incredible time that generated a new level of excitement about the impact the IEEE Foundation and its programs, such as the IEEE Life Members Fund, can make, and it will pay dividends into the future.

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HISTELCON 2017, the fifth edition of the IEEE History of Electrotechnology Conference (HISTELCON) initiated by Region 8, was held in Kobe, Japan. Region 8 and Region 10 directors agreed to accept the proposal of the IEEE Japan Council on History to “lend” the 2017 conference to Region 10.

Out of the 90 participants, a large segment were IEEE Life Members (LMs) from Japan, the United States, Korea, Vietnam, Israel, Russia, Malaysia, and Bulgaria. They brought their knowledge on developments in electrotechnologies, from the electrical appliances in the Budapest Metro 120 years ago as well as the earliest Japanese telecommunication technology. A historical perspective on the development of Israeli high tech was presented along with the Japanese roots of mobile telecommunications.

Chaired by Prof. Isao Shirakawa and organized by a committee including members from Australia, Korea, France, Singapore, and Israel, this conference brought up both historical and new developments in IEEE technologies. The history of Japanese innovation was presented as well as the world’s first full-scale cellular telephone system. Younger scientists and engineers could learn from past experiences while all participants were impressed by the visit to the fourth largest computer system in the world—the K Computer.

HISTELCON 2017, with the participation of the IEEE History Committee chair and the director of IEEE History Center, again showed the importance of IEEE LMs sharing their knowledge and experience with the next generation of IEEE Members. LMs in the IEEE U.K. Section are already active in preparing HISTELCON 2019 to be held in Glasgow, Scotland, in August/September. Conferences on the history of technology are an excellent way for IEEE LMs to share their “war stories” with up-and-coming engineers.

Donor Profile: Networking Leads to Making a Difference

Jim Palmer joined the IEEE while attending the University of California, Berkeley, to network with other students interested in electrical engineering. Since joining the IEEE more than 50 years ago, Palmer has earned his Ph.D. degree from the University of Oklahoma, where he began his career as an assistant professor of electrical engineering and later served as the director of both the School of Engineering and the Systems Research Center.

“The professional contacts and conferences gave me the opportunity to meet with other professionals in the field and learn about the other aspects of the IEEE,” Palmer says regarding the value of his IEEE membership. “As a new faculty member, IEEE membership provided the opportunity to publish research work and share findings with others working in the same or related areas.”

Through networking with another IEEE Member, Palmer was introduced to the IEEE Foundation. When asked why he believes IEEE Members should support the IEEE Foundation, he replies, “The Foundation supports so many important programs that reinforce the best that the IEEE can do to provide for those in need and to broaden the scope of Member activities.”

As an annual donor to the IEEE Life Members Fund of the IEEE Foundation, Palmer sees the foundation growing and prospering through the generosity of members. He adds, “The foundation supports emerging countries, student activities, and a widening of the membership to be more inclusive and representative of the society as a whole, thus it is worthy of support from all members regardless of grade or interests.”
As readers of *IEEE Life Members Newsletter* know from past issues, Raising Engineering Awareness through the Conduit of History (REACH) is the IEEE History Center's program that provides history of technology content for pre-university teachers. It features inquiry-based curricular material—background, engaging videos, lesson plans, hands-on activities—that is made freely available on the World Wide Web. Launched at the end of 2016, the REACH site (http://reach.ieee.org/) has already won an award from the British Society for the History of Science for digital engagement with the public concerning the history of science and technology. The site now boasts five units, the most recent of which is “Unmanned Aerial Vehicles” (also known as UAVs or drones).

On 22 August 2017, IEEE History Center staff had the opportunity to appear before end users by presenting a full-day workshop at the Intrepid Sea, Air, and Space Museum, located in New York City, to 25 educators based on the REACH drone unit's compelling question, “To what extent have drones been used to benefit humanity?” The workshop was part of a week-long professional-development course: “Drones! A Catalyst for Integrating Engineering, Science, and History,” organized by the Intrepid Sea, Air, and Space Museum and supported by a grant from the IEEE Foundation. The course corresponded with a major exhibit at the Intrepid, also partly sponsored by the IEEE Foundation, called “Drones: Is the Sky the Limit?”

The course provided professional credit to teachers within New York's Department of Education and featured drones as a case study of interdisciplinary education, allowing teachers to dive deep into the examination of both drone history and the science, technology, engineering, and mathematics (STEM) aspects associated with drones. During the IEEE History Center's one-day participation, teachers explored the evolution and utilization of drones, combining the REACH social-studies approach with science and math perspectives provided during other days of the workshop. The course was designed to provide educators with a way to incorporate STEM discussions, resources, history, and skills into their classrooms and to engage students in new and unexpected ways.

Teachers were divided into groups and asked to interpret evidence from primary and secondary source documents, which were provided directly from the REACH’s UAV (Drones) Inquiry Unit. The teachers then reported back on what they learned to the larger group for further discussion. In addition, the educators shared how they would incorporate the materials into their classrooms. On the last day of the course, IEEE History Center staff returned to help Intrepid staff members evaluate the teachers’ final projects. The assignment called for each group to create both a lesson plan and a hands-on activity that would integrate engineering and the history of technology into their classrooms.

The REACH program was overwhelmingly well received by the teachers. Denise Seant-Bertrand, a second-grade teacher, shares, “I will definitely use the (REACH) site to design lessons because there are important sources that I can use with my students.” Hannah Cavallo O'Leary, a 9th–12th-grade science teacher, expressed that she
would use the REACH resources to incorporate history into her science class. Claudio Leon, a librarian at Passages Academy, highlighted the REACH resources and website by stating, "It can help students think about real-world applications for designing new technologies and the impact of such tech on humanity."

The REACH team will evaluate the final projects to determine if one or more should be adapted directly into the REACH Drone Inquiry Unit. An inquiry unit is a question-based lesson plan that, along with the other resources provided by REACH (primary source documents, secondary sources and background, hands-on activities, and short videos), enables pre-university educators to incorporate the history of technology and engineering into their classrooms.

The videos, designed to provide background while grabbing the attention of students, may be shown either in the classroom or as part of a "flipped classroom" and focus on the subject matter of one of the REACH Inquiry Units. A REACH video on drones, shown during the workshop, may be viewed at https://vimeo.com/231765929/a22dc4cc12.

You can learn more about the REACH resources from the award-winning REACH website, reach.ieee.org. Be sure to create a free account to see all that REACH has to offer.

Michael Geselowitz, Senior Director, IEEE History Center

Locating Local Life Member Activities

Are you interested in attending or volunteering at local activities for Life Members? If so, please reach out to your local Life Member Affinity Groups (LMAGs). The list of all of our LMAGs can be found at www.ieee.org/lmag.

The new LMAGs that have been formed this year include:
Denver LMAG (Region 5)
Delhi LMAG (Region 10)
Lebanon (Region 8)
Nagoya LMAG (Region 10).

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Call for Ethical Dilemmas Articles

The IEEE Life Members Committee has partnered with the IEEE Society on Social Implications of Technology (SSIT) to dual-publish articles in their respective newsletters with the theme of “life experience ethical dilemmas.” Articles will be included twice annually in the June and December issue of each newsletter.

If you have an ethical dilemma that you wish to share with IEEE Life Members and the IEEE SSIT, please submit it to Stacey Waters at s.waters@ieee.org. Articles should be brief, between 300 and 500 words, and should not include the names of any individuals and/or companies. The IEEE Legal Department requires that all articles be fully sanitized to protect the privacy of people and organizations.

Give the Gift of Membership

Want to help someone in your life find his or her professional home in the IEEE? Start their 2018 off right by giving them the gift of IEEE Membership, a gift that will impact their professional and social life for years to come! Membership in the IEEE delivers access to the industry’s technical information, offers career development tools, and provides access to IEEE’s discount programs: https://www.ieee.org/gift.

Can We Build a 10-Mb/s Ethernet Cable Modem?

It was a quiet morning at the office in the spring of 1982 at Digital Equipment Corporation (DEC) in Tewksbury, Massachusetts. The afternoon of that day, however, brought more excitement than we were prepared for. Our vice president returned from an executive management meeting from corporate headquarters in Maynard with a message to our Ethernet group, directly from Founder and Chief Executive Officer (CEO) Ken Olsen. Apparently, during recent visits with customers such as General Motors, Ford, Chrysler, and Boeing, our CEO heard a recurring theme: “Make your Ethernet networking products work on CATV-type broadband cable or we will stop buying your VAX minicomputers.” Subsequently, the message to us in engineering was, “Urgently find a way to run 10-Mb/s Ethernet carrier sense multiple access with collision detection (CSMA/CD) on the broadband cable used in factories, while sharing the cable with other communications services such as video and voice.” CSMA/CD was the medium access protocol in the standard local-area network called IEEE 802.3 that just came out (based on the 1980 DEC/Intel/Xerox Ethernet).

At the time, our engineering group was racing to be first to market with networking products that would allow our minicomputers to be networked at the highest speed ever (10 Mb/s) on a dedicated coaxial cable. All of these projects depended on challenging chip development, which we were in the middle of at the time. There were no available resources to tackle a new project, especially one that required skills very different from those possessed by most of our engineers. To make things more technically intimidating for us, the common wisdom in the industry was that it was not feasible to run 10 Mb/s CSMA/CD Ethernet on a CATV-type broadband cable while sharing the medium with other networks/services.

The challenge intrigued me, and I volunteered to take on the project. My background was not typical for a DEC engineer, as it included radio-frequency communications. I felt that I should be able to at least study the problem and reach a conclusion regarding feasibility. Management was excited to see the new project take off. Our vice president, Bernie LaCroute, would visit with me frequently in my cubicle, checking on progress. This was highly unusual, as there were three layers of management between us.

After a few months, the conclusion was that it was feasible, and soon thereafter, we partnered with M/A COM DCC in Maryland to build the product. David Roos at M/A COM helped further develop the concepts, and, in July
The HP Transistorized Oscillator 204B

One of the challenges of making a transistorized resistor–capacitor (RC) oscillator was to create it smaller than one of the first products introduced by Hewlett Packard (HP). HP had a department that made variable resistors; I replaced the tunable capacitor with a fixed capacitor balanced in a bridge configuration against a variable resistor. At first, it looked like the resistor would chatter a bit as the slider was rotated, producing a variation in the amplitude, but it was smoothed out by the amplitude feedback loop.

However, the variable resistor was linear, quite dissimilar to the design of a variable capacitor whose capacitance varied nonlinearly due to its shape. Hewlett’s original oscillator design had a fixed resistor and a variable capacitor. We needed to nonlinearize the resistor motion. I went to one of the mechanical engineers, Knut Scarpus, who said, “Why don’t you try an exponential spiral?” “What’s that?” I asked. With that, he drew an exponential spiral in contact with an opposing spiral. He showed me a gear set in a magazine mounted on fixed centers, and the action was transferred between these two exponential spirals producing the desired nonlinear output. We duplicated the exponential spirals without gear teeth, interconnected by a tuner cable of 15 or 20 strands of phosphor-bronze covered with plastic in a “figure 8” configuration. We could wrap it around, so as you moved one spiral in one direction, the other one moved oppositely. The design allowed the use of precalibrated dials with a good range of nonlinear frequency fiducials within accuracy limits.

It would have been simpler to make the oscillator with a nonlinear dial; that would have been the easy way. However, “easy” usually never leads to a great product or innovation. Furthermore, beg, borrow, or steal to accomplish your design goals; let the lawyers worry about infringement. The discussion on nonlinear rotation led me to research some articles on the subject, well before the era of Google. HP was able to design and produce the exponential spiral toothless gear solution, which enabled the HP 204B to be used by the engineer or scientist in a familiar way to tune to the desired frequency.

Due to the precision and linearity of the variable resistor, a prestamped dial could be used rather than having to hand-calibrate and engrave. To achieve the 2% accuracy, the calibration would have to be “rocked in” similar to setting up an FM-tuner in the old days. When the 204 was introduced to manufacturing, the line leader told me it was too difficult to adjust. He said, “I can’t do this.” I replied, “Look, I took the manual dexterity test, and I’m in the lowest 15th percentile. If I can do it, anybody can do it.” Shamed into running it on the production line, it became one of HP’s highest-volume products.

David S. Cochran, LF
Mountain View, CA

This Is How We Rolled

In the late 1960s, as a member of the technical staff at Space Division, Rockwell International, Saturn S-II Division, I was assigned the task of providing a transport instrumentation system to be attached to the SII Stage while being transported from the Seal Beach, California, site to a test site in Mississippi and to the launch site in Florida. The SII Stage was a cylindrically shaped vehicle 33 ft in diameter, 80 ft long, and designed to be very lightweight. The external skin structure was created to be rigid when pressurized to about 2–4 lb/in². The Stage was transported in the longitudinal direction, but it was designed to be operational in a vertical position. Due to its size, it was loaded on a wheeled transporter and then loaded onto the deck of a specially designed U.S. Navy AKD ship or an ocean-going barge.

The customer was very concerned that this fragile vehicle would be subject to structural damage during all of the loading/unloading and ocean pitching and rolling experienced during transport. The transport instrumentation system, designated as A7-3, included time, temperature, humidity, pressure, shock, and acceleration sensors.

1983, we proposed our approach to the IEEE 802.3 Standards Committee. One year later, in 1984, DEC shipped the industry’s first Ethernet 10 Mb/s cable modem, and the company’s customers were thrilled. The standard, IEEE 802.3 10BROAD36, was published in 1985. We were early by about ten years. Ten years later, once the Internet became ubiquitous, Ethernet cable modems became an essential product for broadband deployment, and new standards were developed. Today there is a network cable modem in almost every home.

Menachem Abraham, LM
Boston, MA
with a recording device attached to the transporter to create a record during most transport operations. At the end of a transport cycle, this data would be analyzed to aid in verifying the integrity of the vehicle.

The A7-3 sensors were required to be tested and certified to fall within functional limits at designated intervals. At the end of a transport cycle, all of the sensors were removed from the vehicle and sent to the local metrology laboratory that would provide this service.

During the installation and checkout of the A7-3 attached to the vehicle at various times, numerous sensors were deemed by the recording equipment to have failed; they were out of range and inoperable.

After two instances of this issue, I was contacted to get to the bottom of the problem. After verifying records to ensure that all procedures were followed, I decided that detective work was in order. After some leg work in following the sensors during the verification cycle, this is what I discovered: when the sensors were removed from the A7-3 kit, they were loaded into what I would describe as a common grocery-type shopping cart. The cart would then be pushed from the assembly area to the laboratory. After the technician completed the verification task, the sensors were reloaded into the cart and pushed back to the assembly area. The route from the assembly area to the laboratory and back was over a rough asphalt road, two railroad tracks, sidewalks, and cracked factory floors. This all occurred in a cart that was small in diameter and rolled on hard rubber wheels. If you have used one of these carts while grocery shopping, you know what kind of a ride these delicate sensors endured.

Needless to say, the solution was simple: get rid of the shopping carts! A requirement was added to the A7-3 process specification that required the sensors be transported in cushioned containers, and, if carts were used, they must be certified to offer a soft ride.

Harold S. Hanson, LM
Gardnerville, NV

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**A Late-in-Life Research Project**

After spending 45 years conducting research and development in magnetics and magnetic materials, I was selected by the IEEE in 1988 as an engineering fellow to work in the U.S. Congress. One of the major issues that year was the emergence of high-definition television (HDTV) and whether it would be analog (promoted by Japanese interests, primarily Sony) or digital (using the resources and capabilities of the American computer industry). In retrospect, that decision had a significant political component, somewhat influenced by the book, *A Japan That Can Say “No.”*

After my stint in Congress, primarily working with the late Rep. George E. Brown, Jr. (one of only two physicists in Congress at that time) and the House Science Committee, I joined the Advanced Research Project Agency (ARPA), where I was part of a consortium housed at the Massachusetts Institute of Technology, which included Polaroid, IBM, and Philips, that was brought together to develop the first progressive-scan HDTV. During this development effort, we learned a lot about how the human visual system functions, and we incorporated that knowledge into the resulting 720-line progressive-scan HDTV system that became the basic technology of today’s television set.

After leaving ARPA in 1996, at the age of 66, I changed my focus to a long-standing, totally different interest: railroads. My wife and I ran a number of fairly exotic rail excursions throughout North America using our own private rail car that we had acquired in the mid-1980s. The “Caritas” was the core of our excursion trains.

However, during work on the HDTV project, my colleagues and I had stumbled across a nearly forgotten and mostly overlooked technology that produced full-color images of exceptional purity. Developed by Gabriel Lippmann in the late 1800s (he was a colleague of the Lumière brothers of movie fame), colors are generated by interference patterns in a silver halide film rather than with dyes. Some of Lippmann’s spectacular images are on display in Geneva, Switzerland.

Fast-forward a century: digital data storage is becoming a huge business. Yet none of the commercial storage media have truly long life; life measured in centuries is essential for archival storage.

The Lippmann process, being silver-halide based, does not age. So how can it be used for data storage? My colleagues Richard Solomon, Eric Rosenthal, Don Carlin, and I have developed a Lippmann-based storage system we call WORF (Write Once, Read Only). Each tiny spot on a Lippmann plate can contain several bytes of data resulting from covariance of both color and amplitude.

In addition to its suitability for archiving, WORF data requires no energy for storage (most data farms use massive numbers of disk drives, requiring significant, constant power), and cannot be altered (making WORF especially suitable for authentication and able to detect hacking).

The feasibility of WORF has been proven, and we have a demo. We are now actively seeking manufacturing partners interested in exploiting WORF by licensing our widely patented technology. We’re inventors all in our 70s and 80s, too old to consider starting a company from scratch. Besides, the science is way too interesting.

Clark E. Johnson, LF
Madison, WI
Lunar Landing Simulation

The Grumman Aircraft Company of Bethpage, Long Island, New York, built the Lunar Module (LM) in the 1960s for an excursion to the moon. The structure included a descent engine and an array of attitude control thrusters to enable a safe landing on the lunar surface. A technical team was assembled within the Grumman organization to compute transearth-lunar and lunar descent trajectories, navigation and guidance along those paths, and LM attitude control motion stability. I participated as a technical staff member in the latter group, analyzing the stability of attitude control motion dynamics.

A comprehensive simulation of the surface landing was assembled to train the astronauts and analyze and verify that mission. It included multiple analog computers to represent the LM attitude control dynamics, a digital computer to compute LM translational descent motions, an analog/digital interface to join those two computers, and an elaborate display of the lunar landscape, projected onto a large screen, showing what was believed to be the lunar characteristics of multiple craters and jagged peaks.

Visiting astronauts would sit in a hydraulic seat, also connected to the mission computers, plying the LM descent engine controls and simultaneously viewing the extensive lunar landscape as the simulator moved toward lunar surface touchdown. For the purpose of effective training, during many hours of mission simulation, the engineering staff placed an “X” on the lunar surface display to mark a suitable landing spot for an astronaut’s guidance and visual cues. That, of course, was a navigation aide that the first astronauts, Neil Armstrong and Edwin (Buzz) Aldrin, did not have when they touched down on the lunar surface in 1969.

Haywood (Woody) Satz, LSM
Burlington, MA

Rocket Man

It was 1953, and the U.S. Navy was considering the installation of rockets aboard warships. I was serving with the Naval unit at White Sands Proving Grounds in the New Mexican desert. Our mission was to support the testing of the Talos missile, an air breather. The missile included a jet engine in a tubular airframe, fins, and a solid fuel booster.

In parallel with the missile test against a live aircraft was a test of a ship’s bulkhead, simulating the opening in the ship’s deck through which the missile would be raised just before firing. The missile was launched just in front of a steel panel, which was instrumented with load cells to measure the force of the blast of the 50-ton booster.

It was my first experience as a new technician working directly with an engineer. He seemed so confident that I asked him if he did crossword puzzles in ink, and he said that he did.

Firing day arrived, and we launched our missile with a great roar. Our carefully wired load cells all bottomed. Our electrical data was of little value. When the launch site cooled and the dust settled, we found that our steel panel had been quite dished in by the blast. The analysis of the test results turned out to be a mechanical engineering measurement of the deflection of the metal.

Charles Turner, LSM
Waterbury Center, VT

A “Short” Story

Back in 1950, I was fresh out of college and got a job with Melpar in Alexandria, Virginia. My boss, W.G. Tuller, had me work on the design of a filter for a compact airborne radio under contract with the U.S. Air Material Command. This filter was to provide exceptional selectivity by using an intermediate frequency of 2 megacycles (mc) (in those days “hertz” was not used). My job was to design a lattice-type crystal filter with a center passband of 3,900 cycles at 2 mc and a rejection of 80 db at a passband of 12,000 cycles.

The design was successful and was implemented, with an article published about it in the April 1951 issue of Electronics. To my knowledge, this was, and still is, the highest selectivity voice bandpass filter ever made, outside of present digital filters.

One embarrassing event occurred during the design. My soldering iron was well worn and finally quit. I decided to save the old cord for possible future use and cut it off at the soldering iron point, forgetting that it was still plugged in. The cut shorted out all the power to the building with a very loud bang. I was mortified at my inexcusable stupidity but was excused. The power circuit breaker was reset, and all was well thereafter.

R.W. Lowrie, LSM
Dade City, FL
Die Laughing

In the late 1990s, I worked as a quality assurance engineer for HighwayMaster, Inc., a Dallas, Texas, company that made a communications system for over-the-road trucks (18 wheelers). The electronics were enclosed in an aluminum casting measuring about 12 in × 18 in × 6 in. The casting was manufactured by a foundry near San Antonio.

We got into a squabble with the foundry over something. I forget what. We decided to pick up our die from the foundry and move it to another foundry, this one in Ft. Worth. My boss and I rented a U-Haul truck and drove down to get the die. The guys at the foundry were friendly and helpful in spite of the problems we experienced with them. We asked to be taken to our die. “Come this way,” they said, and there was our die. It was a 4-ft cube of tool steel and weighed 12,000 lb. All the employees at the foundry came out to laugh at us. We got into our little truck and headed back to Dallas, feeling very foolish.

We hired a moving company to retrieve the die.

Tom Webb, LSM
Plano, Texas

In Time for Kickoff

One day, in 1955, the prime minister of Canada, Louis St. Laurent, announced in the House of Commons that, in 1956, we would be able to see the Grey Cup football game in the east while it was being played in Calgary, Alberta. He had heard that the Bell Telephone Company and the other provincial telephone companies were building a coast-to-coast microwave route using the federally permitted 3.5–4.2-GHz band (1 GHz is 10⁹ Hz). This obviously involved the Northern Electric Company (now Nortel), which was the manufacturing arm of Bell.

At the time, the prime minister did not know that the mandate of a telephone company was to carry telephone messages. Could TV channels and telephone messages be carried together?

Discussions between Nortel and Western Electric engineers disclosed that it could be done if a special separating filter was used at the baseband level in each TV operating center in every city across Canada that received television.

Nortel would make the required number of filters but it could not test them. A new test set was required that Nortel began to make, but it would not have it ready for another year. The Western Electric Merrimack Valley Plant had one test set only, which was in constant use, and it was unavailable.

Nortel management found out that the Bell Telephone Laboratory in Murray Hill, New Jersey, had five of these test sets. A test set could be used to test and adjust filters for the insertion loss, insertion gain, or delay in the range of virtually 0–10 MHz (1 MHz is 10⁶ Hz).

Quickly, arrangements were made between the Bell Labs and Nortel management. Consequently, in mid-May 1956, I went to Bell Labs as a resident visitor to learn to use the test set and train a Nortel shop tester who would arrive a week later to test and adjust incoming filters as they arrived. Also, Nortel would start making the filters (556B filter) in Montreal and send them in bond to Bell Labs for testing. The 4–12-h shift was assigned by Bell Labs management for us to use a test set.

Immediately, I ran into trouble with the union people, who questioned why truck loads of filters were coming in to the receiving dock from Canada and being adjusted and tested by a non-union person. I told them what was happening and explained the urgency required. As a possible solution, I suggested that one of their testers could work with us on another test set to speed things up. One rack-mounted filter took about 3 h or more to adjust and test. This arrangement was accepted.

My job was to troubleshoot any electrical problems during the day. Also, I was asked by my Nortel man-
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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 2 April 2018. 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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