



SPARKS

Daytona Section Newsletter
March 2023
<https://r3.ieee.org/daytona/>



UPCOMING EVENT

Note: New meeting date and time

The Daytona Section's March 2023 meeting will be held on Thursday March 30th at Embry-Riddle University and will be a joint event with the faculty and students of the Electrical, Computer, Software, & Systems Engineering Department. A presentation will be given by none other than The Old Professor himself, Dr. Al Helfrick. As usual, the topic of Dr. Helfrick's presentation and its contents are highly classified and will be presented at the secret location known as room LB367, Lehman Building at Embry Riddle University.

As part of the ECSSE Department's social portion of the meeting, free pizza will be served. Daytona Section members are encouraged to attend to get a chance to meet the faculty and students of the department.

The time of the meeting has been changed a bit as well:

- 5:15 pm: Free Pizza and social
- 5:55 pm: IEEE program---introducing the IEEE officers, including student officers.
- 6:00 pm: Dr. Helfrick's presentation

Parking at the University is not a problem at this time, the parking lot is located behind the Lehman Building just off Clyde Morris Blvd.

For questions regarding the presentation or venue, contact Allan Jusko, 386-671-3706 or a.jusko@ieee.org As always, all members and guests are welcome to attend.

WIE AFFINITY GROUP NEWS

Event "Health and Wellness 1"

Tentative Date: Tuesday, April 4, 2023, 12:30 to 1:30 PM at the Embry-Riddle Aeronautical University campus on the "Quad" (open area in front of the entrance to the College of Arts and Sciences, Building 419).

Format: 10 minute Yoga sessions in 15 minute intervals, presented by a certified Yoga instructor of the "Eagle Fitness Center" on campus. The WIE Affinity Group members will have a table and hand out WIE flyers. The group members will invite passersby and Yoga session members to perhaps join IEEE and participate in future IEEE and WIE activities.

Objective: To raise awareness of IEEE and the WIE Affinity group by staging a fun event and to be able to network with students.

Target Audience: Engineering students on and off campus. Other groups including the Bethune-Cookman University IEEE Student branch will be invited to the event.

Helen B. Hernandez, Ph.D.
Secretary/Treasurer, IEEE Daytona WIE Affinity Group

LIFE MEMBER GROUP MEETING/TOUR

On Wednesday, March 8th, the Daytona section of the IEEE, Life Members Affinity group toured the ERAU Eagle Flight Center. Life members and their guests got an informative introduction as to what research is being done.

Dr. Kyle Collins at the research center took us on a "whirlwind" tour of what is being done. One focus of the research is "Urban Air Mobility" (Jetsons!!). Can we imagine an "UBER AIR" coming to our area? We WILL have hybrid aviation and finally full electric aviation eventually.

The researchers on these projects are of course ERAU professors as well as graduate students and volunteers. They are working on vertical take-off drones. The quad propellers are driven with servo motors using PWM (Pulse Width Modulation) control. Dr. Liu, from the EE department and Dr. Currier (Mechanical Engineering) provide skilled support to the center as needed.

Another project that the team is working on is a small glider airplane (to carry a pilot!). It will be driven by a 100 HP ELECTRIC motor. This hybrid system will use a small gas engine and a generator to charge the batteries.

The tour was fast moving so my note taking was a little sparse. The below key points from the research center website lists the projects that were already mentioned as well as others.

Completed and ongoing projects at the EFRC include:

- Design, build, and testing of a 100 kW serial hybrid electric power plant.
- Design, build, and testing of an 8-rotor eVTOL handling qualities research prototype.
- Design and modification of a Diamond HK-36 motor-glider from gas to electric propulsion.
- Design, build, and flight testing of a twin rotor tail-sitter UAV.
- Design, modification, and flight of the "World's First Parallel Direct-Drive Hybrid Aircraft" for the NASA/Google-sponsored Green Flight Challenge.
- Flight testing campaigns for the Diamond DA42 Twinstar and DA42 L-360 Level 6 Flight Training Devices (FTDs).
- Development of structural health monitoring systems for rotorcraft.

- Modification of a Beechcraft King Air to enable operation as an aerial sprayer.

The link to the research center website is below.

<https://daytonabeach.erau.edu/about/labs/eagle-flight-research>

Marty Oksenhorn – Life Member Chair
Ron Gedney – Life Member Vice-Chair

ANOTHER TALE FROM THE OLD PROFESSOR

JUGGLING BITS

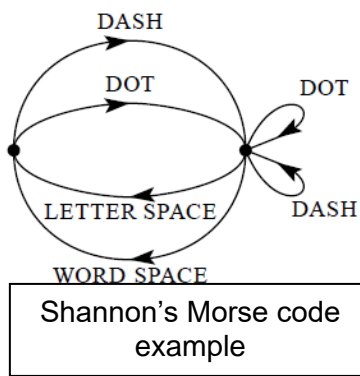
Starting in 1941 and until 1958, at Bell Labs in Murray Hill, NJ, it was not uncommon to see someone riding a unicycle down the halls juggling as he rode. At other times the same person would be seen jumping down the hallway on a pogo stick. Was the circus in town and someone from the troupe paying a visit? It would be hard to believe that the unicycle-riding juggler was a highly competent mathematician and a genius. An eccentric genius? That's fathomable. It reminds me of a certain Serbian-American inventor. The Bell Labs genius was a staff member, Claude Shannon. The Serbian-American eccentric genius was Nikola Tesla.



Claude Shannon
juggling while riding a

In his seminal 1948 paper, "A Mathematical Theory of Communication", in the Bell System Technical Journal, Claude analyzed communications in a general way using probability and uncertainty. After WWII, Bell Labs was working on digital communications such as pulse code modulation, PCM, and PPM, pulse position modulation for telephone trunk lines. The Bell System was interested in what they could do with these new digital systems compared to the tried and true analog trunk systems they used for decades. Unlike analog communications systems where the success of an error-free transaction in an undistorted channel, depends primarily on signal to noise ratio, digital systems are affected by the method of encoding. In his paper, Shannon considered the encoding of digital messaging. True, the first electrical communications system was the telegraph; a digital communications system. Shannon actually used Morse code encoding as one of the examples in his paper. Early teleprinter communications also used a digital code, mostly the 5 pulse Baudot code invented in 1870. The transmission rate of the Baudot teleprinter code was measured in bauds.

To make his analysis, Shannon introduced the term "bit" and more specifically bits per second to quantize a communications channel capacity. Shannon was the first to use the concept of a bit in a published paper. But Shannon acknowledged that a contemporary and coworker, John Tukey, who with James Cooley, invented the fast Fourier transform, FFT, had used the term bit in an internal memo a year earlier. The concept of the bit caught on and, as an example, baud is bits per second today.



Shannon's 1948 paper was long, 55 pages, complete for the time and rigorous.

It is fitting that my last Tale was about bandwidth but from a financial perspective. Claude Shannon made the connection between bandwidth and channel capacity as a function of signal to noise ratio and encoding in his 1948 paper.

Although the paper was about "communication" it was more about information theory and Shannon is often credited with being the "father of information theory".

Shannon was born in 1916 and lived in Michigan until he pursued his graduate studies at MIT in Cambridge, Mass. He received two BS degrees, one in electrical engineering and the other in mathematics from the University of Michigan in 1936. He received his PhD from MIT in

mathematics in 1940. From MIT it was off to Princeton to join the Institute for Advanced Study. Shannon was fortunate to be a part of the Institute and the numerous world-renowned scientists who were there at the time including Einstein who joined in 1933 and was associated with the Institute until his death in 1955.



In 1941, after only one year at the Advanced Study Institute, Shannon left Princeton for Bell Labs in nearby Murray Hill where he worked on cryptography and fire control systems. He remained until 1956 when he returned to MIT to teach.

Aside from his important work, Shannon loved to build whimsical projects. In 1950, he made a mechanical mouse that could escape a maze by first trying various turns and remembering the results; what we call "artificial intelligence" or AI today. It was later learned that Shannon was also a prankster. Under the maze hidden by drapes was a vacuum tube-based computer and motor-driven lead screws that controlled the mouse. The mouse had no intelligence at all. He made a robot that could solve Rubik's cube and another that played chess; for real not pranks. He also made a computer that calculated in Roman Numerals. Shannon's favorite music was Dixieland Jazz which is the genre your humble correspondent has played and enjoyed for many years.

Considering all Shannon's achievements, there is one simple equation that every communications engineer knows well; Shannon's limit $C = BW \log_2(1+SNR)$

Where C is the maximum channel capacity in bits per second. BW is the absolute bandwidth of the channel and SNR is the signal to noise power ratio; as a ratio, not decibels. This is the absolute maximum channel capacity in bits per second which requires "optimal encoding".

Shannon developed Alzheimer's disease and spent the last few years of his life in a nursing home. His phenomenal life ended in 2001 at age 84. He was an IEEE Fellow and received the IEEE Medal of Honor in 1966.

Dr. Al Helfrich, a.k.a The Old Professor

PE CORNER

LAWS AND RULES AND NEW CONTINUING EDUCATION REPORTING REQUIREMENTS

The Florida Board of Professional Engineers audits a number of licensees after each renewal cycle to verify that they have, in fact, completed the required continuing education. The most frequent area of failure is that an engineer has taken a Laws and Rules course that is not approved by the FBPE. This is more often an issue for licensees who don't reside in Florida and are licensed here.

Chapter 471.017, Florida Statutes, Renewal, regarding continuing education states, "One hour must relate to this chapter and the rules adopted under this chapter." Chapter 61G15-22.010, Florida Administrative Code, Qualifying Activities for Laws and Rules Requirements, as a result requires, "Successful completion of a course of continuing education for laws and rules of the Board which must consist of a minimum of one (1) continuing education hour in laws and rules of the Board. Chapter 61G15-22.0105 then goes on to discuss the requirements for a Rules and Laws course and provider.

Beginning soon (if it's not already available), the Department of Business and Professional Regulation's portal, MyFloridaLicense.com, will have the facility for engineers to report their continuing education, including the required one hour of Florida Laws and Rules. All professional engineers licensed in Florida will be required to enter their continuing education, as do many other professions licensed by the DBPR. When entering a Laws and Rules Course, it is my understanding that the licensee will only be able to select from a list of providers who are approved to supply these courses in Florida. This will, hopefully, reduce the incidence of licensees taking an unapproved Laws and Rules course.

It is suggested that licensees report their continuing education as they earn those hours, rather than wait until license renewal to enter the information. I also believe that you will not be able to renew your license until you have entered the required continuing education courses into the MyFloridaLicense portal. We'll see how that ends up working when renewal opens in November 2024. Note that entering your continuing education into the portal does not change the need to retain this information for two renewal cycles, as audits of continuing education compliance will continue after each renewal cycle. For now, it is suggested that you sign on to your MyFloridaLicense account to ensure that it is active and that all of the information is up to date. And when it is available, enter your continuing education.

Whether you are a PE looking to attain required CEHs, or an engineer looking to learn something new or keep current with the latest trends in the profession, IEEE has seminars that will meet your needs. Sign up now!

Art Nordlinger, PE, Senior Member

DAYTONA SECTION SOCIAL MEDIA INFORMATION

Website: <https://r3.ieee.org/daytona>

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THE FAR SIDE[®] BY GARY LARSON



"Mr. Osborne, may I be excused? My brain is full."

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