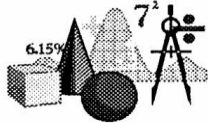




SPARKS

Daytona Section Newsletter
September 2019



SECTION MEETING

Thursday September 26th at the Halifax River Yacht Club, 6:00 PM
331 South Beach Street, Daytona Beach, Florida 32114

PRESENTATION

URBAN AIR MOBILITY

RICHARD PAT ANDERSON, PH.D.

CHAIR'S REPORT



Over the summer break from our meetings, I hope everyone had a chance to relax, recharge, and possibly give some thought to the things that IEEE brings to your career and other people's lives. We are in a world where engineering is bringing significant improvements to businesses and people. The speakers that come to the IEEE Daytona Section talk about accomplishing things that not long ago were not even imagined.

The Daytona Section received the 2019 Outstanding Section Membership Recruitment Performance award. The section, per the July report, had the highest increase in membership of any section in Region 3. Region 3 encompasses the Southeast United States and Jamaica. Most of the increase was in Student membership, and my special thanks goes out to those that work with the students in the Daytona area. Having student involvement is good for IEEE and great for the students.

I hope to see all of you, new members included, at our Thursday, September 26th meeting.

Rich

CONGRADULATIONS ARE IN ORDER



Helen Hernandez, our Section's Vice Chair, recently completed her Ph.D. in Information Systems at Nova Southeastern University, Davie, Florida. Her dissertation was a qualitative research study about the usability of medical devices in a safety critical environment. Helen has been responsible for our excellent speaker program during 2019 and has been a wonderful asset to our Section's Executive Committee.

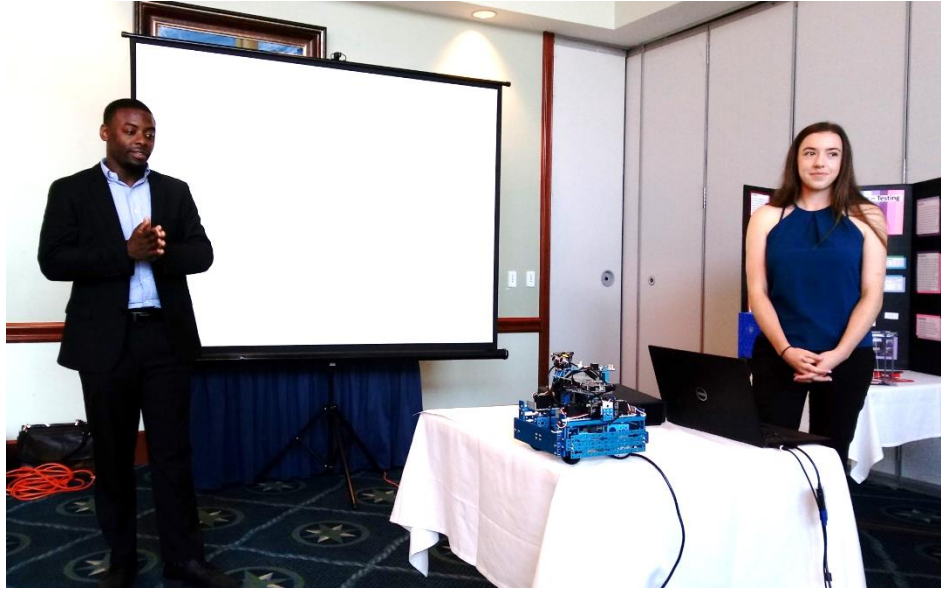
We wish Dr. Hernandez success in her professional endeavors and look forward to her continuing contributions to the Daytona Section.

APRIL'S PRESENTATIONS

April's presentation were made by students from ERAU and B-CU who described their senior projects as well as the IEEE Tamoka Science Fair Special Award winner in the Junior Division.



ERAU Student Presenters- Brian Jaury, Daniel Sommer, Michael Cain



B-CU Student Presenters- Brant McGlashon, Taylor Sharritt



IEEE Science Fair Junior Division Winner Taker White accepting her plaque from Section Chair Rich Kent

SEPTEMBER'S PRESENTATION

URBAN AIR MOBILITY

A presentation of the Age of Urban Air Mobility will be introduced by Dr. Pat Anderson with background information and lead to a description how the future of urban air mobility is expected to unfold. To follow through with this concept will require us to “think differently,” as Dr. Anderson aptly put it at a recent speaker series during Engineer’s Week at ERAU.

Urban air vehicles are envisioned to assume the role of commercial on-demand ride sharing enterprises, such as Uber or Lyft. Special emphasis will be given regarding the engineering of electrified propulsion for these new flying machines, improved safety over conventional aircraft, the capability of autonomous operations, reduction of noise, and efficient movement of its prospective passengers. Other aspects, such as market considerations, regulatory concerns and logistics for launch site configurations will be addressed as well.

OUR SPEAKER

Richard Pat Anderson, Ph.D. is a professor of Aerospace Engineering at Embry-Riddle Aeronautical University (ERAU) in Daytona Beach, where he teaches flight dynamics and control. He holds a Master of Science degree in Aerospace, Aeronautical and Astronautical Engineering from Penn State University, and a Ph.D. in Mechanical, Materials and Aerospace Engineering from the University of Central Florida. In addition, he is a certified airline transport pilot (ATP), an FAA-certified flight instructor, and an FAA-certified aircraft mechanic (A&P).

In 2012, Dr. Anderson was awarded the Carnegie Foundation's Florida University Professor of the Year. Other awards include the 2017 Lindbergh Electric Airplane Prize and the ERAU 2006 University Researcher of the Year.

Dr. Anderson is an authority on flight dynamics; automatic flight controls; electric and hybrid electric propulsion; and novel vehicle concepts include fixed wing hybrid aircraft and e/hVTOL urban mobility vehicles. Under his leadership, his team flew the first ever manned electric gas/battery hybrid aircraft.

He serves as Director of the Eagle Flight Research Center (EFRC) and his research activities include

- Hybrid and Electric Aircraft Propulsion
- Alternative aviation fuel certification and testing
- Hybrid tailsitter UAV development - Airframe/propulsion/controls
- Agricultural UAV research and development
- Manned aircraft Fly-by-Wire systems
- Aircraft Parameter Identification (PID) for simulation, math modeling and controls

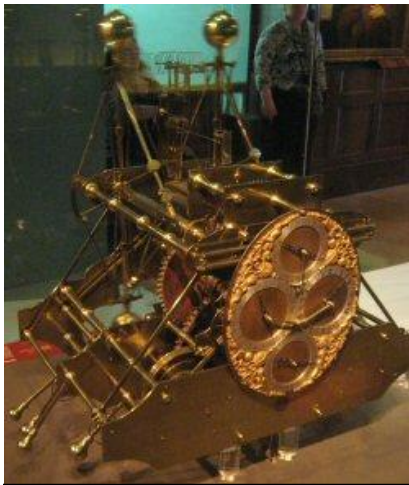
In collaboration with Argonne National Laboratory in Illinois, a facility of the U.S. Department of Energy and led by the Eagle Flight Research Center, the Embry-Riddle Hybrid Consortium founded by Dr. Anderson is working with contributing members Airbus, Boeing, GE Aviation, Textron, Rolls-Royce, Hartzell, Cape Air and more to explore the design space for turbine/electric aircraft propulsion systems that reduce noise, emissions and operating costs. The goal is to produce a commercially viable, nine-passenger hybrid turboprop by 2025, and a large hybrid-electric jet by 2035.

ANOTHER TALE FROM THE OLD PROFESSOR

Tempus in Extrema

Of all the inhabitants of this earth, only man lives by a mechanical or electrical clock. As for daily time keeping, none of the world's animalia kingdom have alarm clocks; they simply get up when the sun rises. Some animals, who work the night shift like bats become active when the sun sets. This dependence on the rising and setting of the sun is very evident during periods of total solar eclipse when birds and other animals turn in for the night. They will certainly wonder about their rotten night's sleep when the sun rises in an hour or so. Of course, if they had a clock they wouldn't be fooled by the eclipse.

Man's quest for ever more accurate time keeping reached a high level during the 18th century as an adjunct to navigation. An accurate timepiece is required to determine longitude. Latitude is easily determined by celestial observations, day or night; that is, assuming you have a visible sky. A clock of the 18th century, good enough to determine a reasonable estimate of longitude, would be a pendulum clock, which would never stand the rigors of a wave-battered ship at sea. John Harrison demonstrated his first seaworthy clock in 1736. Harrison's marine chronometer demonstration showed his clock had a drift of no more than about 2.5 seconds per day while on a sailing ship at sea.



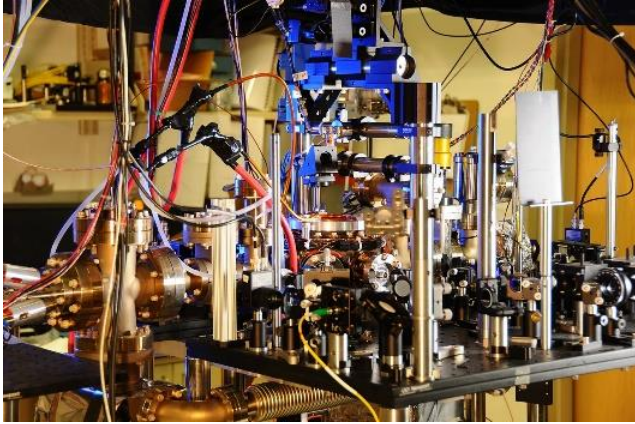
Harrison's first chronometer

In addition to navigation, there are other applications requiring accurate time keeping. With the dawn of the age of radio, the need for accurate frequency, the reciprocal of time, was elevated to parts per million or accuracies of 10^{-6} . This accuracy is needed to keep radio stations from wandering out of their assigned channel and interfering with their spectral neighbors. This led to the penultimate of time accuracy; the quartz crystal resonator. But scientific research demanded even more accurate time keeping which led to the development of atomic clocks. These clocks relied on the well-defined wavelength and hence well-defined frequency of the photons emitted from atoms when they change energy states.

Cesium and rubidium have been popular atoms to use in atomic clocks and can provide stabilities measured of a few parts in 10^{12} . To put that in a layman's perspective; either a cesium or rubidium clock would drift by no more than one second after about 31.7 thousand years. If your alarm clock was an atomic clock you wouldn't be late for work in over a million years.

One would think this level of stability is good enough for any application. But let's return to navigation. The GPS navigation system measures time delays to determine distance. To do this to sub-meter accuracy, requires time accuracy of about 1 ns. It would only take 1000 seconds or so for our cesium or rubidium clock to drift 1 ns. The European Space Agency is using a passive hydrogen maser, PHM, in its satellite navigation system, Galileo, which boasts stability of 1 part in 10^{15} .

A number of atoms have been employed in the creation of even more stable clocks. The stability record appears to be yttrium which can provide a stability of about 1 part in 10^{18} . Gadzooks!* It would take the age of the universe to gain or lose one second.



NIST's ytterbium optical lattice atomic clock

The drift of the ytterbium clock is only estimated as there is no measurement method that can verify it. This begs the question: if you can't even verify the clock drift what possible application is there for it? We might have a solution looking for a problem.

**Gadzooks: a scientific term used by physicists to describe things that are unfathomable.*

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

PE CORNER

WHY BECOME A PROFESSIONAL ENGINEER?

Chapter 471 of the Florida Statutes defines the practice of engineering and the titles associated with it. Chapter 471.003(1) states, "No person other than a duly licensed engineer shall practice engineering or use the name or title of "licensed engineer," "professional engineer," or any other title, designation, words, letters, abbreviations, or device tending to indicate that such person holds an active license as an engineer in this state." The next paragraph goes on to define what engineering activities don't require a PE license.

I have been fortunate to have the opportunity to speak with college juniors and seniors about professional licensure. The reaction I get often depends on the student's major and future goals. Most civil and structural engineering students, and some others as well, understand that they won't be able to practice their trade without a PE license.

Many, if not most, electrical engineering students plan to practice in areas, like manufacturing or circuit design for example, where a PE license isn't required. And many have not been exposed to the concept that certain areas of electrical engineering require a license, where others don't.

As a result, it can be a bit of an uphill battle to convince an electrical engineering student that sometime close to their graduation, while the material is still somewhat fresh, they should take what might be the longest and hardest exam that they have taken to date. And that they should pay more than one-hundred dollars in order to be allowed to do so.

Though nearly every junior and senior engineering student is certain what their future career path will be, few prove to be correct as their careers progress. For those that find that they need to have a PE at some later time, it is a difficult, and often impossible, task to re-learn the varied material necessary to pass the Fundamentals of Engineering and Professional Engineer exams while working full time. This may at some point restrict the engineer's career path.

Experience has shown that there are many advantages to having a PE license. Even those that don't need to have a PE to advance in their career can find it useful. When applying for a job or a promotion, having passed the FE or having a PE can help set that person apart from the pack. It can help to show an employer that this person is willing to "take it to the next level".

Interestingly, in some businesses where a PE is not strictly required for practice, licensure is listed as a "desirable" or even required to attain higher level engineering positions.

So regardless of a student's engineering major or future plans, they should be encouraged to take the first step and take FE exam around the time of graduation. This can help to set them apart from their peers. And you never know when you might need it.

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

Art Nordlinger, PE, Senior Member

DAYTONA SECTION SHIRTS



We are pleased to offer Daytona Section polo shirts for our Section members. The shirts are embroidered with the IEEE Logo and DAYTONA SECTION on the left and your name and grade, if desired, on the right. The shirt is a high quality 5 oz, 65/35 poly/cotton pique in Royal Blue with white embroidery. Available in S - 2XL in men's as well as ladies' sizes. Price is \$30, including tax, for S-XL size's, 2XL size is \$3 additional.

For more information or to order shirts contact: Allan Jusko 386-671-3706 or a.jusko@ieee.org.

FUTURE MEETING DATES:

The dates for the fall session are: Oct 24, and Nov 21

EDITORS NOTES

Visit our Daytona Section website: <https://ewh.ieee.org/r3/daytona/>

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SEPTEMBER 2019 MEETING

Thursday September 26th at the Halifax River Yacht Club
331 South Beach Street, Daytona Beach, Florida 32114
Just south of the Fire Station at the corner of Beach and Orange Streets

TOPIC– Urban Air Mobility

SPEAKER – Dr. Pat Anderson,
Professor of Aerospace Engineering
ERAU

AGENDA

5:30 PM Greetings & Cocktails
6:00 PM Dinner
7:00 PM Presentation

Dinner Menu

Beef Tips Dijonnaise- Sauteed Tenderloin tips with mushrooms, shallots, white wine, Dijon Mustard, Demi-glaze and cream Served over bowtie pasta

Pesto Style Chicken- Chicken Breast pan seared, served with a creamy Pesto Sauce, toasted Pine Nuts and Parmesan Cheese and served with Rice Pilaf and vegetable medley

Flounder Almondine- Sauteed Flounder, brown butter, lemon and almonds served with Rice Pilaf and Vegetable Medley

Just for September, Chefs Choice of Dessert

Members and guests \$20.00 each
Students \$5.00

IMPORTANT DINNER NOTE!

The Yacht Club is requiring us to give them a dinner count by the Tuesday afternoon before our meeting. As always, all members and guests are welcome to attend the meeting and presentations, however any dinner requests received after Tuesday afternoon may not be accepted

Please contact Allan Jusko by Tuesday September 24th at noon to give us a count for dinner or for further information

If you make reservations and are unable to attend, call prior to the event to cancel.

The Section is charged for all dinners ordered, please let us know if your plans change

Allan Jusko Editor

386-671-3706