PCARA Update

Volume 24, Issue 3 Peekskill/Cortlandt Amateur Radio Association Inc. March 2023

New dimensions

We kicked off February with a presentation at the Putnam Valley Free Library entitled **"An Introduction to 3D Printing"** given by Mike N2HTT on Saturday February 4, 2023. The talk was recorded by Rob AD2CT for future publication on the PCARA YouTube channel. The session was attended by 18 members and was very informative. Thanks to Mike and Rob for their efforts!

The March PCARA **Membership Meeting** followed the exposition. Sadly, during the meeting it was shared that long-time member (since 2000) Billy Venezia WB2MKQ had passed to become a silent key. A moment of silence was held in honor and remembrance.

Following the meeting a PCARA **VE Test Session** – Laurel VEC was held courtesy of Dave KF2BD. There were four candidates in attendance which resulted in one new Technician, one new General, and two upgrades from Technician to General. Congratulations to all, with thanks to Dave and our team of VEs.

On February 18, 2023 at 9:00 a.m. at the NEW Uncle Giuseppe's Marketplace, another world famous PCARA Breakfast was held. More than a dozen members were in attendance to enjoy another fantastic event. These things are getting intense!

Please mark your calendars with the following upcoming events:

Mike N2HTT begins his presentation on "3D Printing — a Ham Radio Perspective" at Putnam Valley Library, Feb 4.

- Saturday March 4, 2023, at 10:00 a.m.: PCARA Monthly Membership Meeting and Presentation, "**Morse Code – Ancient Technology or Vital Tool?**" courtesy of Charles N2SO at the Putnam Valley Free Library.
- Saturday March 4, 2023, at 11:30 a.m.: PCARA **VE Test Session** – Laurel VEC. Candidates should contact Dave KF2BD at daveharper'at'vivaldi.net to pre-register.
- Saturday March 18, 2023, at 9:00 a.m.: PCARA **Breakfast** at the NEW Uncle Giuseppe's Marketplace in Yorktown Heights, NY. Please come and join us. I guarantee *Continued on page 2* ⇨

PCARA Breakfast on Saturday February 18 at Uncle Giuseppe's.

Contents

you will not be disappointed.

- Tuesday March 14, 2023: WECA **General Class** begins. Details can be found in this month's edition of the *PCARA Update*.
- Sunday May 7, 2023: Orange County Amateur Radio Club Hamfest at a NEW location – Black Rock Fish & Game Club in Mountainville, NY. Please visit: https://ocarcny.org for details.

Remember that our next regularly scheduled PCARA Monthly Membership Meeting is on March 4, 2023 at 10:00 a.m. at the Putnam Valley Free Library. Please join us! I look forward to seeing each of you there!

Mike N2HTT with one of his 3D Printers at the February meeting.

- 73 de Greg, KB2CQE

PCARA Board

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Net night

Peekskill/Cortlandt Amateur Radio Association holds a roundtable net on Tuesday evenings at 8:00 p.m. and a directed 'Old Goats' net on Thursday evenings at 8:00 p.m. Both events take place on the 146.67 MHz W2NYW repeater, offset -0.600, PL 156.7 Hz.

Join the roundtable to find out what members have been doing or join the Old Goats with net control Karl N2KZ for news and neighborly information.

March meeting

The monthly meeting for March will begin at 10:00 a.m. on Saturday March 4th when Charles N2SO will present "Morse Code - Ancient Technology or Vital Tool?" at the Putnam Valley Free Library, 30 Oscawana Lake Road, Putnam Valley, NY. Unlock the secrets of Morse code, learn the basics of the system, its history, and how to send and receive messages using dots and dashes. Led by experienced Morse Code operator Charles, N2SO. This will be an in-person only event (no Zoom) with the monthly club meeting following after Charles' presentation. Registration is available at: https://putnamvalleylibrary.assabetinteractive.com/calendar/morse-code/

The presentation and meeting will be followed by a V.E. Test Session, starting at 11:30 a.m. Candidates for this Laurel VEC session must contact Dave Harper KF2BD beforehand using: daveharper'at'vivaldi.net.

Posters courtesy of Putnam Valley Library and Lou KD2ITZ.

Repeater news

On Tuesday February 21, PCARA' s Roundtable net on the W2NYW repeater was interrupted by a sudden drop in the output signal on 146.67 MHz. Net control David KD2EVI co-ordinated a move to the KB2CQE repeater on 449.925 MHz UHF.

The 2 meter repeater returned to the air shortly after the net finished and is still operational at the time of writing. Bob N2CBH has observed reduced signal strength on 146.67 and will be taking action shortly.

Adventures in DXing

- N2KZ

Becoming Obsolete

My father posed a pivotal question to me back in 1988: "Karl, are computers going to be a really big thing?" I paused and then, almost reluctantly, said "Yes." Fast forward about 35 years later and history repeats itself. Now I am asking myself: "Has *my world* become obsolete too?" Alas, the answer is the same: "Yes." Has time passed me by?

After a 50+ years career, I retired at the end of 2021. I knew when to leave. The professional world I had lived in and grew up with was crumbling around me. Grand advances in technology had replaced all I knew and professed in with just two newfound devices: super-powered computer servers and endless amounts of CAT 5 and 6 cable and fiber optics. Forget everything you ever touched upon in the past. It was all moving into hampers and dumpsters heading for the curb!

The more I thought about this revelation, the more I was convinced! It couldn't be more all-encompassing if it tried! My dismay is not based on one or two items falling our of favor. The entire world has changed! Maybe **ChatGPT** could explain all of this to me. What do you think?

GE 16T5 16 inch compact TV set from 1950.

My professional life has been based upon two modern inventions: **radio** and **television**. Neither of these even existed when my Dad was born! My parents bought their very first TV back in 1950 when my father was already 32 years old. I thrived in mastering every nuance of these space age inventions. By the time the year 2021 came around both of these things were beyond obsolete!

Hurricane Sandy was a harbinger of the future. My wife and I had several requests from good friends asking for a loan of portable radios. Heaven only knows by that year (2012) television had already converted to all digital transmission and could no longer be received over-the-air by simple battery powered TVs and a rabbit ear antenna. Even then, few people had radios besides the ones in their car.

Ask anyone who doesn't have grey hair if they ever watch regular television or listen to a radio these days. Chances are you will get a shrug. Be prepared for even more forthright answers: "Does TV and radio still exist?" The prestigious BBC has just suggested that even FM radio will be completely shut off in Britain by the year 2032. Canada's CBC is considering ending all over-the-air TV and radio broadcasting in the future. Will all broadcasting be replaced by streaming?

The names of these two appliances continue to fade from everyday jargon. What is a *television* and a *radio?* Our entertainment now depends on *flat screens, streaming,* and *podcasts.* Let's amplify the irony even further: Why do they call them *pod*casts? What's a *pod*? Well, there used to be these stand-alone playback devices called *iPods*, but they haven't been made for years and years!

Taking Inventory

C'mon, Karl. Your entire world has not become obsolete! Well, I beg to differ. So little has survived throughout my lifetime! When my elders mused that *'the only thing that doesn't change is change itself'* they weren't kidding! Even trees have been replaced! Have you noticed disguised cell towers lately? They literally have trunks of steel!

Cell-phone tree [cellula arbore].

The list is endless! Tele more? Start with television, telephones, telegraphs and telegrams. No need to worry about long distance charges anymore! Vacuum tubes and replaceable electronic components are part of prehistory. Just buy a new one, OK? Remote controls are also on their way out. What you can't control with your voice you can control with your phone or have Alexa or Siri take care of it. What's a *fax machine?* Just take a picture of it and send it to me! I also remember *TV Guides* and even analog TV static after sign-off. I remember typewriters, too. Wow! You must be old!

Just the fax.

Facing pending product retirement are three items near and dear to my heart: *Pencils, pens and paper.* Everyone uses their thumbs to take notes with their smartphones or tablets now. Who carries a paper notebook? Schools are giving up teaching writing in cursive. Why do you need that skill? People just don't write anymore! Paper receipts, paper bills, boarding passes and paper tickets are pointless. Show or scan the **QRs** with your phone! Just record a voice memo to yourself! Let's take it to a great extreme: Will people even *read* anymore... or will they just listen?

While you're at it, get rid of your erasers, magic markers and notepads and those big old phone books. Please! Don't touch my books, dictionaries or encyclopedias in my office! "Why do you need them? They are all useless!" If you remember the Dewey Decimal System, you must know about index cards, Rolodexes and print catalogs from Sears or even Radio Shack!

What's a business card? Newspapers? Magazines? Highways maps and college textbooks? You must be from the 20th century!

Show me the money? *What's money?* Cashless environments will be the standard before you know it. First on line will be metal coins. Paper money, checkbooks, paper receipts are on their way out. They are just too expensive and cumbersome to deal with. I have already experienced fully automated stores. Scan your credit card to be allowed in. Pick your items and they will automatically be scanned out and charged to you. Have a nice day!

Forget about drive-thru ATMs! Other paper products are already long gone: Carbon paper, mimeographs Dittos and Rexographs, dot-matrix printers and track paper. Blackboards and white boards? All memories of your parents or grandparents. Question: Where did all the (now unnecessary) store clerks go? Is there a Heaven?

You've Got Mail

Urban archeologists will recall ancient methods of communication: rotary and touch-tone telephones, hopelessly tangled curly phone handset cords, landlines and party lines, pagers and beepers and phone answering machines. Don't forget your custom hand clickers so you can retrieve your messages from afar! You might need your Blackberry or PDA (personal digital assistant.) Hey, I still like my flip-phone. "Dad, you are such an OG!" Just be patient if you get a busy signal! Want to have some fun? Ask young people what their telephone number is! "I don't know! It's in my phone! Just friend me!"

Such an OG.

While you are at it, please toss out all your old media. You don't have any way to play them even if you wanted to! LP and 45 rpm black vinyl records, audio cassettes and 8-tracks, reel-to-reel tapes, VHS and Beta tapes, CDs, DVDs, Blu-rays, Laser video discs, DAT digital audio tapes, floppy disks, memory sticks (remember USB ports?) What's a *Dictaphone?* Blockbuster and other video rental stores are all gone. Now it's all in the cloud, Dad!

Dictaphone.

You won't find TV antennas, console TVs featuring big and heavy glass CRTs, audio systems and stereos, Walkmans, FM tuners, record players and entertainment centers. Calculators, paper tape adding machines, incandescent light bulbs and pocket watches have also joined the junk pile long ago.

Time Passes By

So many commonplace items we knew and used have slowly faded away. Our lives and methods have changed in so many ways almost universally throughout our lives. We took these things for granted but now they have disappeared. Do you remember alarm clocks and especially clock radios? Can you identify a sundial or an hourglass? Milk bottles and milk boxes to put your empties in? Manual carpet sweepers? (Amazing: you never had to recharge them. *You* pushed them around to clean up. As if!)

Before ıming, we sent handwritten messages through the mail and bought stamps at Post Offices which might have even been on a dedicated Post Road. Every house had its own mailbox where letters to you would be delivered. We didn't need electricity to make this all happen!

Run down to the Post Office.

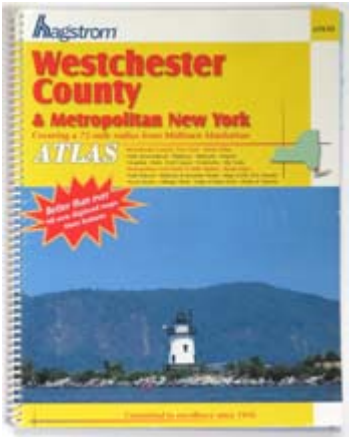
Before Amazon, we used to drive over to places called shopping malls and actually hang out there and meet people face-to-face! Out camping in the summer, some of us pumped water up from the ground with hand pumps into a bucket. Who had indoor plumbing? Ha! We also used these old-fashioned things called *outhouses*. That's a whole other story!

Ye olde Shopping Mall.

We traveled in cars that used internal combustion

engines that ran on gasoline or diesel fuel we bought at drive-up gas stations. To park our cars, you might have to pay a tax by putting coins into a parking meter — and — you had to lock your car with a metal key. Long ago, cars had no air conditioning. We had little triangular windows next to the front bench-seat that you would open to bring in some fresh air in the summer. Want to lower the big windows in your car? Use the hand crank that you spin around and around on the door. They will come right down! Easy!

To get from one place to another, we would sometimes have to write down directions someone would give us. If not, we had little spinning compasses that would stick on our windshields right below the rear-view mirror or on the dashboard. Nobody had a GPS screen back then. We also had great big spiral-bound books of road maps (see page A3 — and so on) or impossible to fold up paper maps that you would keep in your glove compartment.



Spiral-bound road atlas.

Just like you, we used to take pictures back then to remember who we saw and where we had been... but it was a little different: cameras used something called **film**. You could take up to about 36 pictures and then roll the film back into a metal canister. You then take the canister to a one-hour developing place and they would make shiny glossy paper prints of all your pictures for you. It was amazing how fast it was!

If you wanted pictures that everybody could see all at once, you could use slide film. The developer would hand you back translucent little framed square pieces of film that you could put in a slide projector that would beam your pictures onto a big screen that you probably kept in a closet when you weren't using it. It was a great show! Remember that? Polaroid cameras had our attention at least a couple of times. Those gooey sticks of picture fixing solution were unwelcome but, I guess, necessary. Write it off to another step in product development!

I hardly have to mention computers. In college in the early 1970s, we were running program sequences by loading up long boxes filled with punch cards. Later on, we advanced to 8 inch floppy disks or open-reel tape. Home computers even ran programs using audio cassette tapes. 8 inch floppies became 5¼ inch and eventually 3½ inch floppies.

Dial-up acoustic coupled modems were quite an invention. Wait until you try a 56k modem! (Wow!) You could buy them really cheap at computer fairs. Hand scanners welcomed us into the world of graphics. Parallel ports, serial ports, RS-232, DOS, and eventually Windows for Workgroups, and Millennium Version were all way-stations along the journey. "Dad, what does A-O-L stand for?"


U.S. Robotics 56 kbit/s modem.

Let's be positive: Dramatic change may actually be good. Remember when bathrooms and kitchens featured colors like mustard and avocado? Remember the Chevy Vega, AMC Hornet and the Chrysler Reliant? Good riddance! The world is changing fast! Hold on tight!

It Takes Time!

I am writing this column on a Mac from mid-2012! Talk about long term relationships! My cherished 2009 Toyota Prius is just shy of 250,000 miles. I am almost 70 years old! When will my warranty run out? I hope it will be many, many moons from now. I am in no hurry. I am guessing I will stay relevant as long as I have purpose. Just remember that today's fantastic innovations are tomorrow's discards. Don't discard me yet!

On one thing you can be sure: Want to have great longevity for all of your life? Be very good at things that other people don't want to do! Become expert with chores or devices that drive everyone else crazy. They will never fire you!

Always be positive and accept work with a smile. Working for any kind of business requires doing what you are told. Nobody wants to hear what *you* think. It's their business to run — not yours! Most important: be selfless and dedicated to your family and all it requires. Nothing is more important.

I grew up working in radio. I had a long and varied and enjoyable career in television. From my perspective, we are now in the last scene of the second act of "Radio and TV." It was fun! Can you play it again? No matter what all of this becomes... The show must go on!

A final thought: "Grandpa? What is that strange brass thing on your desk?" "It's a Morse code key. You can't take that away from me!" 73s and dit dit old man! de N2KZ — the (very) old goat.

Northern Westchester FM radio update - N2KZ

On Valentine's Day, February 14, 2023, WMNR (88.1 Monroe, CT) translator W209CJ 89.7 returned to the air at a full 38 watts of transmitter power. W209CJ is using a two-bay Shively 6812 stack mounted below a massive cellular array located behind the CVS Pharmacy at Exit 38 at Green Lane on the northbound side of the Saw Mill River Parkway.

FM translator W209CJ employs a two-bay Shively 6812 antenna. [N2KZ pic.]

This ends a long and tireless saga that began when AC power access was disconnected unannounced from its original facility June 14, 2020 leaving W209CJ Mount Kisco homeless. Relocation was difficult. WMNR had to first find a similar replacement transmitter site, carefully proceed not to disturb a resident osprey nest atop the cellular tower they chose and then have a custom made stacking cable constructed for their Shively array when the original supplied cable proved inadequate. What else could go wrong? Installation of Internet access proved difficult, as well. All the parts and pieces are now together, tested and functioning as designed. We wish General Manager Kurt Anderson and company hearty congratulations for surmounting all of these technical challenges.

60dBμ service contour for W209CJ, Mount Kisco.


Shively 6812 circular polarized antenna.

While following this story, I discovered two things. The long-time broadcast antenna manufacturer, Shively Labs, is being sold by its parent company Howell Laboratories, Inc. after over 50 years of operation. This was hard to believe! Shively has been a pivotal supplier of antennas and support materials for decades. It is hard to imagine that they will be sold or dissolved after all this time.

Secondly, I have been monitoring the 89.7 MHz FM broadcast frequency in anticipation of WMNR's eventual success. I noticed that the leviathan signal of WGBH Boston would make it through this nearly empty channel in my neighborhood more than I would ever imagine. A masterful and dominant full-powered FM, WGBH could be heard like a specter coming and going when the right wisp of the troposphere carried it my way, day after day.

WHOM 94.9 Mount Washington, New Hampshire is another notable monster signal that drifts in and out here in Northern Westchester. You'll experience the same effect by sitting on 147.555 MHz (amateur 2 meter FM - vertical polarization.) Point your beam towards Hartford, Connecticut and you just might hear the Morse code broadcasts from the ARRL's W1AW facility. It is fascinating to behold!

This effect reminded me of a similar situation I experienced back in the mid-1970s when I lived in Eastern Queens on Long Island in a garden apartment. I had a ten-element Lafayette Yagi in my attic, with double shielded 300 Ω foam cable, sitting on a rotor. Pointing the beam due north, I discovered I could sit on 88.5 MHz and often hear WFCR from Western Massachusetts near Northampton. WFCR would also come and go as it liked! Shortly thereafter, two low powered high school 10-watt FMs began sharing 88.5 — WKWZ Syosset and WPOB Plainview — and would sometimes distract my enjoyable ultra-DX reception from the far north!

I also experience grabbing high powered FM when I vacation in Central Michigan in the summer. In a location that is a thousand miles from nowhere, and major stations are sparse and few, I can often hear the robust signals of Canada's CBC Radio One Ontario service coming across Lake Huron. Most reliable is on 98.7 MHz CBCB-FM from Owen Sound with 100 kilowatts ERP. I can hear it all over Michigan's Huron County hundreds of miles away on a daily basis. Sure, it has deep fades but you can feel the power in its dominating signal.

You should experience the amazing tropo and E-skip you can hear in Michigan when the FM band is not loaded up with superpowered stations all over the dial. Keep in mind that being in the Midwest has a powerful advantage over DXing in New England. You are completely surrounded by land unlike us coasties where half of our listening area is the Atlantic Ocean! Back in the day, the analog TV E-skip in Michigan used to be like going to a carnival as a kid. The fun was endless!

- Karl Zuk, N2KZ Katonah, NY FN31eh

Mt Beacon Tech class

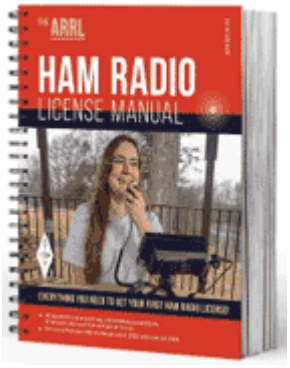
Dutchess County Department of Emergency Response and Mt. Beacon Amateur Radio Club are offering a free one evening/two-day amateur radio licensing class to be held on Friday evening April 21 and Saturday / Sunday April 22-23, 2023. Times: Friday 6:30 p.m. to 8:30 p.m.; Saturday 8:00 a.m. to 5:00 p.m.; Sunday: 8:00 a.m. to 12 noon. FCC License Exam Session starts Sunday at 1:00 p.m.

Why Amateur Radio?

- To assist your community in time of need when all else fails
- To promote good will around the world
- To have fun communicating with fellow hams!

Location: Dutchess County Department of Emergency Response, 392 Creek Road (near Dutchess Community College), Poughkeepsie, NY 12601.

Class is open to all without age limit and is for the FCC Technician Class Amateur Radio License. Pre-registration is required.



Students should obtain and study the following text before class: "ARRL Ham Radio License Manual 5th Edition", available from ARRL or Amazon.

For mandatory class pre-registration and other details, contact: Adam Nowik Jr. 845-849-3666, AE2AN'at'aol.com.

FCC License Exams on Sunday 1:00 p.m. are open to all, regardless of whether they took the class.

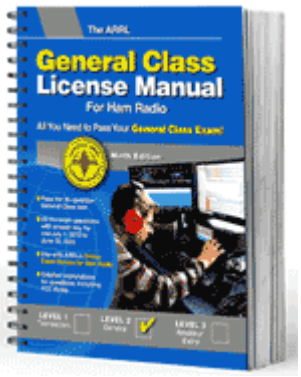
$15 FCC exam fee & upon successful test completion, a $35 FCC license fee applies for all. Test pre-registration absolutely required if not taking the class. Contact: Andrew Schmidt 845-464-2676 or W2BOS'at'arrl.net

WECA General class

Westchester Emergency Communications Association (WECA) will be conducting its annual free preparatory class for the **Amateur General** FCC exam this spring in person at the Valhalla Fire Training Center, 4 Dana Road, Valhalla NY and via Zoom.

The class will run for nine weeks starting Tuesday evening March 14th from 7:00 - 9:15 p.m. Subsequent classes will be on Tuesday evenings until Tuesday May 9, followed by a V.E. Test Session on Thursday May 11th.

This free, interactive course will be taught by a team of knowledgeable amateur radio operators from WECA. The class will review questions and answers from the General question pool and provide explanations. All are welcome to attend who wish to gain additional knowledge of amateur radio.



The required text, which should be purchased before classes begin, is the **ARRL General Class License Manual 9th Edition**.

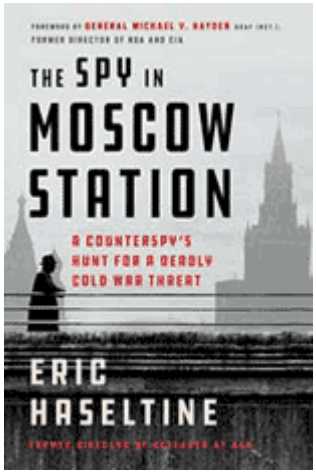
ARRL's **General Q&A 6th Edition** is also recommended, though not required. Both are available from ARRL Headquarters, Amateur Radio Dealers and Amazon. Be sure to order the **correct editions** as the General Question Pool changes at the end of June 2023.

If you would like to enroll in the course, please contact WECA Education Director Larrie Sutliff W2UL using e-mail: education'at'weca.org. Further details of amateur radio preparation classes are available from the WECA web site at:
https://www.weca.org/home#h.83hby4o33dhu

[Thanks to Dave KF2BD for these class notices.]

RF Spying

Radio amateurs have a unique view of the world and their practical experience can be put to use in unexpected ways.



A short item in January 2023 *QST* brought a book to my attention that is all about radio and the intelligence services. "**The Spy in Moscow Station**" by Eric Haseltine was first published in hardback by St. Martin's Publishing/Macmillan in 2019. A St. Martin's Griffin paperback appeared in 2021.

The book tells the story of **Charles L. Gandy K3BXO** who was first licensed at age 9. While studying at Louisiana Tech he was also chief engineer at radio station KRUS (Ruston, Louisiana). After graduating with a degree in Electrical Engineering he joined the Air Force and in 1955 was assigned as a 1st Lieutenant to the National Security Agency (NSA).

Charles L. Gandy K3BXO (SK).

In 1978 the Central Intelligence Agency (CIA) determined that there was an intelligence leak from the U.S. Embassy in Moscow, USSR. With some reluctance, the CIA requested assistance from NSA — at the time a highly secretive government organization mainly concerned with signal monitoring, cryptography and code breaking.

Charles Gandy was sent to Moscow to investigate the leak. Eric Haseltine's book explains in some detail what it was like to fly into the communist capital and how Charles Gandy examined the situation in the embassy that was allowing the KGB to extract secret information. Some of the techniques mentioned include microwave flooding, weak signals hidden under intermodulation products, waveguides, unintended radiation from electronic equipment and a mysterious VHF beam antenna hidden behind the embassy wall that was picking up burst transmissions.

Charles Gandy returned to the USA and reported his findings. Unfortunately, his recommendations for the Moscow embassy were not immediately followed up. In 1981 he made another visit to Moscow without further success. Then in 1984 his recommendation for the Embassy's equipment to be returned to the USA for thorough examination was acted on and the source of the leaks was finally discovered in a piece of common office equipment.

Author **Eric Haseltine** has had a widely varied career. Trained in economics and psychology with a Ph.D. in physiological psychology, he has designed flight simulators for Hughes Aircraft and helped found the virtual reality studio at Disney Imagineering. In the aftermath of 9/11 he was recruited to lead NSA's Research Directorate. Technical detail in the book was of such high quality that I guessed he might be another radio amateur — and I was correct, he is licensed as **AB3DI**.

Dr. Eric Haseltine, AB3DI.

"The Spy in Moscow Station" is based on previously secret information that has now been declassified. Dr. Haseltine tells an exciting story with twists and turns as different agencies of the U.S. Government wrestle with the KGB and with each other. The only thing I missed was any depiction of the mysterious equipment that played such a significant role in the investigation. The last reference below contains numerous photos and diagrams. - NM9J

References

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CQ Magazine April 2008:
https://cq-amateur-radio.com/cq_highlights/2008_cq/04_2008_cq/Apr08Highlights.html
Review by John VE6EY:
http://play.fallows.ca/wp/insights/russian-radio-hacking-since-the-cold-war/
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https://www.cryptomuseum.com/covert/bugs/selectric/

Hamcation

Ray W2CH and Marylyn KC2NKU sent the following photograph from their visit to Orlando Hamcation in Florida on Feb 10, 2023.

L to R: Ray W2CH, Marylyn KC2NKU with Josh KI6NAZ from Ham Radio Crash Course. [W2CH pic.]

Sodium ion progress

Developments in metal-ion batteries have been reported in previous issues of the *PCARA Update*.

- "Lithium laureates"– *PCUD* Nov 2019 p10 described how the Nobel Prize in Chemistry was awarded to three chemists for work which led to the modern lithium-ion battery.
- "Better batteries?" – *PCUD* Jan 2021 p11 explained how sodium-ion batteries based on Prussian Blue chemistry are being developed by Natron Energy in Santa Clara, CA.
- "More better batteries" – *PCUD* Jul 2021 pp 16-17 described further developments in sodium-ion batteries by British company Faradion.
- "Solid developments" — *PCUD* Jan 2022 p 14 explained why Tesla was switching away from lithium nickel cobalt aluminum (NCA) cells to safer lithium iron phosphate (LFP) for standard-range electric vehicles.

In April 2022, Tesla confirmed that almost half of its electric vehicles had switched to the cobalt-free lithium iron phosphate (formula: $LiFePO_4$) battery for medium range models.

Interest in lithium iron phosphate for electric vehicles is growing, with Ford announcing in mid-February that the Mustang Mach-E would have $LiFePO_4$ available in spring 2023 and the company would build its *own* $LiFePO_4$ battery plant in Marshall, MI.

Sodium-ion batteries have been chasing after the performance of lithium iron phosphate, so we'll take a look at recent advances in **sodium-ion** technology.

Why not lithium?

Lithium-ion has been the great success story of 21st century battery technology. Lithium-ion batteries are used in test equipment, handi-talkies, cameras, smart-phones, power tools, yard equipment and electric vehicles. The standard lithium-ion battery is based on a cathode made from lithium cobalt oxide (abbreviation LCO), lithium nickel cobalt manganese oxide (NCM) or lithium nickel cobalt aluminum oxide (NCA). The anode is made of graphite. These electrodes are immersed in a liquid electrolyte consisting of lithium salts such as $LiPF_6$ dissolved in an organic solvent, for example ethylene carbonate.

Lithium-ion batteries for handi-talkies, yard equipment and solar lights.

Unfortunately, there are problems associated with this success. Increased demand has raised raw material costs for lithium salts — mainly produced in Australia or Chile, and controlled by Chinese companies. The price of lithium carbonate has increased from $8,400 per metric tonne in 2020 to $67,000 per tonne in November 2022. Cobalt is a rare element, whose ore is mostly mined in the Democratic Republic of Congo, with the involvement of armed militias and child labor, followed by refining in China. The prices of cobalt and nickel have also increased in recent years.

Conventional lithium ion-batteries contain a great deal of stored energy. Overheating by drawing too much current, overcharging or other mishap such as puncturing the cell with a nail can result in thermal runaway and venting of flammable gases from the volatile electrolyte. If the battery catches fire, it can be very difficult to extinguish. Ford recently suspended production of its F-150 Lightning electric pickup after a vehicle caught fire in a holding lot near its plant in Dearborn, MI. For a scary video of what happens when lithium-ion cells are penetrated, crushed and shot, see: https://natron.energy/battery-safety/

The lithium-ion battery in this electric vehicle caught fire while charging overnight.

Is sodium catching up?

Sodium is a similar alkali metal to lithium, one row lower in the periodic table of the elements, with the advantage that it is more abundant and much cheaper than lithium. Sodium compounds have been produced in industrial quantity for 125 years by the electrolysis of brine. Metal-ion batteries can be manufactured using sodium in place of lithium — though the energy density in terms of watt-hours per kilogram is not so high. Here is a list of energy densities for various types of battery:

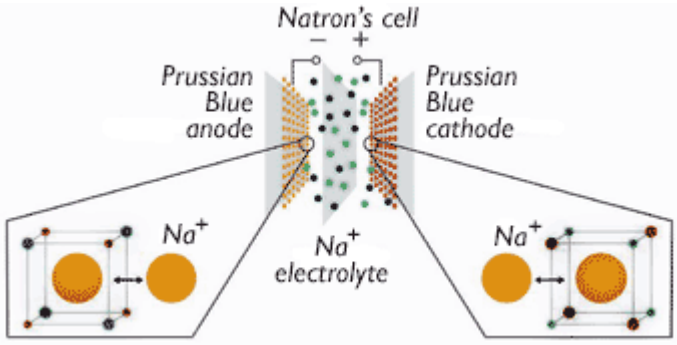
Part of the periodic table.

Chemistry	Energy density *watt-hour/kg*
Lead acid battery	25-40 W·h/kg
Nickel metal hydride battery	50-70 W·h/kg
Sodium ion battery	70-160 W·h/kg
Lithium iron phosphate	90-160 W·h/kg
Lithium ion $LiCoO_2$ (LCO)	195 W·h/kg
Lithium Ni Co Mn oxide (NCM)	205 W·h/kg
Lithium Ni Co Al oxide (NCA)	220 W·h/kg

Natron Energy

In the January 2021 *PCARA Update* we reported how Stanford University spin-off **Natron Energy** had developed an alternative to lithium-ion technology based on **Prussian Blue analogue** electrodes and a sodium-ion electrolyte. The company was founded in 2012 by Stanford PhD student Colin Wessells.

Prussian Blue is Iron^{III} ferrocyanide, a dark blue pigment used in ink and paint. Natron's Prussian Blue analogues contain (for example) copper or manganese in place of some of the iron, allowing sodium-ions to move freely in and out of each electrode's crystal structure.



Natron's sodium-ion cell has Prussian Blue analogs for anode and cathode that allow ready movement of sodium ions (Na^+) into the crystal lattice. [After Natron Energy]

Natron batteries have an energy density around 70 W·h/kg — too low for electric vehicle use but ideal for static applications such as uninterruptible power supplies and energy smoothing of wind and solar farms.

In 2020 Natron began shipping its Blue Tray™ Sodium-Ion 4000 48V DC 1U battery packs for use in rack-mounted power supplies. These batteries have none of the fire, toxic gas or thermal runaway risks associated with lithium-ion or lead-acid batteries. Natron's batteries can be installed in data centers for back-up power without the special fire-fighting precautions needed for lithium-ion.

Natron Blue Tray 4000 sodium-ion battery pack in a 1U 19-inch rack-mount configuration delivers 4kW at 48V DC.

'Blue Tray' was followed in October 2022 by the launch of Natron's "Blue Rack™" battery cabinet in 250 kW and 500 kW sizes. The 250-kW cabinet contains ten "BluePack©" battery modules, each containing 16 sodium-ion cells, for a nominal overall voltage of 480V DC. Applications include uninterruptible power supplies for data and communication centers, plus electric vehicle fast charging.

Blue Rack.

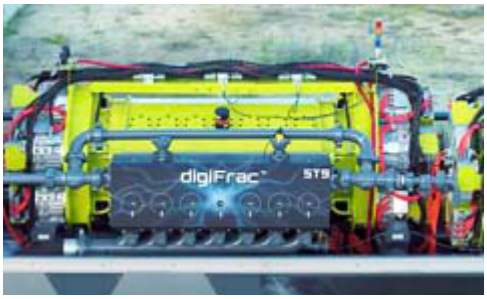
Natron Energy BluePack 48V DC module.

Natron Energy currently operates a pilot production line for sodium-ion batteries in Santa Clara, California. In May 2022, Natron announced an agreement for mass-production of its sodium-ion batteries with Clarios International, previously part of Johnson Controls. A section of Clarios' Meadowbrook manufacturing plant in Holland, MI will be repurposed from lithium-ion to begin producing sodium-ion batteries in 2023.

Clarios International's plant in Holland, MI will begin mass production of sodium-ion batteries for Natron Energy in 2023.

In October 2022 Natron announced that large-scale production of its battery grade Prussian Blue analogue had begun at Arxada AG's plant at Visp in Switzerland. Arxada was previously known as Lonza's specialty chemical division.

Several organizations have made recent investments in Natron Energy to accelerate production of sodium-ion batteries. They include United Airlines who would like to see sodium-ion batteries in airport ground equipment such as pushback tractors (tugs) and Nabors Industries Limited whose intention is to target oil drilling applications. Liberty Energy Inc also made an investment so that Natron can collaborate on uninterruptible backup power for Liberty's digiFrac™ electric fracturing pumps.



Liberty digiFrac pump has five electric motors on each side, each capable of 400 hp continuous or 550 hp peak.

Faradion

Zero-volt capable Faradion sodium-ion pouch cell. Rating: 3.1V, 30.0 Ah, 93 Wh.

In *PCARA Update* for July 2021 there was a report on U.K. Company **Faradion Ltd** — named after Michael Faraday. Sheffield-based Faradion has been researching sodium-ion batteries since 2011, claiming higher energy densities and wider operating temperatures than other designs, along with much safer transport compared to lithium-ion.

Faradion cells are based on a cathode made of sodium/nickel/manganese/magnesium/titanium oxide and a hard carbon anode. The electrolyte consists of sodium salts such as $NaPF_6$ dissolved in high-flash point organic carbonates. The company demonstrated an E-bike in 2015 with 250 watt-hour capacity.

On the last day of 2021, a subsidiary of Indian company Reliance Industries Ltd agreed to acquire 100% of Faradion for £100 million. Reliance also agreed to invest £25 million to accelerate commercial roll-out of Faradion's sodium-ion technology. Reliance is India's largest private sector company, with activities spanning hydrocarbon production, petroleum refining, petrochemicals, retail, textiles and communications.

Faradion CEO James Quinn claims that Faradion's sodium-ion cells have reached a similar performance to lithium iron phosphate (energy density 160 W·h/kg), perform well at low temperatures (-20°C) while capable of being safely shipped, fully discharged with the electrodes shorted together. The company is aiming to reach 190 W·h/kg through improvements in cell architecture. Faradion is recruiting staff for pilot-scale production of cathodes and batteries in Sheffield, while Reliance will scale up manufacture at Jamnagar, Gujarat, India — site of the world's largest oil refinery. Reliance foresees a place for sodium-ion technology in stationary power storage and slower electric vehicles such as bicycles and rickshaws.


Reliance's Jamnagar refinery, India.

In December 2022 Faradion announced that its first batteries had been installed at a site in Yarra Valley, New South Wales, Australia. 11.5 kW·h battery units supplied by Australia's Nation Energie are used to supplement solar power arrays.

Altris Energy

Altris Energy is a Swedish company spun off by Uppsala University professors in 2017. Their sodium-ion battery is based on a cathode made from "**Prussian white**", named **Fennac**, along with a hard carbon anode. The name "Fennac" is derived from the chemical symbols for iron (Fe) nitrogen (N), sodium (Na) and carbon (C). Prussian white is an analogue of Prussian Blue (Iron^{III} ferrocyanide, $Fe^{III}_4[Fe^{II}(CN)_6]_3$) in which some of the iron is replaced by sodium, with a formula such as: $Na_{1.92}Fe^{II}$ $[Fe^{II}(CN)_6]$.

As well as patenting a manufacturing method for Fennac, Altris also patented a fluorine-free non-flammable electrolyte based on sodium bis(oxalato)borate (NaBOB) dissolved in N-methyl-2-pyrrolidone and trimethyl phosphate.

When the Fennac, electrolyte and hard carbon are combined in a cell, Altris claims an energy density around 150 W·h/kg and a cell voltage of 3.2V. The cells are not subject to thermal runaway and are suitable for stationary storage and light electric vehicles.


Altris Energy's 'Fennac' cathode material.

Altris plans to begin large-scale manufacture of Fennac in Sandviken, Sweden during 2023, with an annual production of 2000 metric tonnes. It has opened an office in Guangzhou, China to promote Fennac to the Chinese market.

CATL

China's **Contemporary Amperex Technology Co. Limited** (CATL) is the world's largest lithium-ion battery manufacturer. CATL specializes in lithium-ion batter-

CATL headquarters in Ningde, China.

ies for electric vehicles and energy storage. They are viewed as world leaders in lithium iron phosphate ($LiFePO_4$) with energy densities of 160 - 200 W·h/kg. Ford is licensing technology from CATL for its new $LiFePO_4$ battery plant in Marshall, Michigan, due to come online in 2026.

CATL first sodium-ion battery.

In July 2021 CATL unveiled a sodium-ion battery for electric vehicles. CATL's first generation of sodium-ion technology is similar to Altris' design, with a modified Prussian white cathode and hard carbon anode. Energy density of 160 W·h/kg is lower than for the best $LiFePO_4$ batteries, but the CATL product performs well in cold-weather and fast-charging scenarios.

CATL has been experimenting with new technologies to achieve 200 W·h/kg and plans to start mass production of sodium-ion batteries in 2023.

Chinese scooter manufacturer Niu plans to launch its first electric two-wheeler with a sodium-ion battery in 2023 to keep costs under control.

Meanwhile, Chinese battery company HiNa Battery Technologies is operating the only commercial scale sodium-ion facility, which opened in Fuyang, central China in November 2022. HiNa's batteries boast an energy density of 145 W·h/kg.


Sodium-ion battery developed by HiNa Battery for JAC test vehicle.

On February 23rd HiNa announced that a joint venture of JAC and Volkswagen has built a test vehicle based on the Sehol E10X electric city car using HiNa's 25 kWh sodium-ion battery.

When the sodium hits the van

My guess is that sodium-ion technology may find a place in electric vehicles that make repeated trips over short distances then return to base for recharging overnight. This might be for a short commute or school-run — or for the U.S. Postal Service, last-mile deliveries and for skilled trades such as plumbers and electricians who don't need more than 100 miles of range.


Ford E-Transit 350 all-electric cargo van.

Perhaps we can look forward to inexpensive 12V sodium-ion batteries taking the place of Bioenno Power's lithium iron phosphate batteries for standby power and portable operation.

- NM9J

[Sources include *C&E News,* May 30 2022.]

V.E. Test Sessions

PCARA's most recent V.E. Test Session took place on Saturday February 4, after the monthly meeting and presentation at Putnam Valley Library. Four candidates had pre-registered with Dave KF2BD for the Laurel VEC Test Session.

- Bertram Rechtschaffer of Garrison passed Element 2 and qualified for Technician.
- Randy Wilson of Poughkeepsie passed Element 2 and Element 3, qualifying for General.
- Jasper Fox Sr KD2ZUD of Germantown, NY passed Element 3 and upgraded to General.
- Joseph Vinciguerra KE2AMC of Pawling also passed Element 3 and upgraded to General.


VE Test Session on February 4 at Putnam Valley Library.

Jasper and Joseph's upgrades were granted by FCC on February 6, 2023. Both applied for membership of PCARA – welcome! Bertram Rechtschaffer's new call sign **KE2ATK** was assigned by the FCC on February 8. Randy Wilson's new call sign **KE2AUJ** was assigned on February 16.

Thanks to the volunteer examiners who assisted at this V.E. Test Session including Laurel Team Leader Dave KF2BD — who had once again brought along his notebook and multifunction printer — plus Lou KD2ITZ, Rob AD2CT, Verle W2VJ and NM9J.

PCARA's next V.E. Test Session is scheduled for Saturday March 4, 11:30 a.m. at the Putnam Valley Library — following on from the monthly meeting scheduled for 10:00 a.m. This will be a Laurel VEC Test Ses-

sion, so candidates must once again contact Dave KF2BD beforehand using daveharper‘at’vivaldi.net.

An additional VE Test Session will be held on Wednesday March 29 at Putnam|Northern Westchester BOCES, Tech Center, 200 BOCES Drive, Yorktown Heights. This will be an ARRL VEC Test Session, candidates must contact Mike W2IG using w2igg‘at’yahoo.com.

Under ARRL’s Youth Licensing Grant program, candidates younger than 18-years old pay a reduced exam session fee of $5.00 to the ARRL VEC VE team at the time of the exam. In addition ARRL will cover the one-time $35.00 application fee for new license candidates younger than 18 for tests administered under the ARRL VEC program. The $35 FCC application fee will be reimbursed after the ARRL VEC receives the completed reimbursement form and the new license has been issued by the FCC.

Simple Shortwave - N2KZ

On a recent visit to South Korea, I discovered a little radio that brought me big smiles. Was I back in 1980 again? I bet you might like it, too. Primarily designed for sale in Asia, the Panasonic **RF-562** MW/SW/FM radio is sweet and simple. You have just three controls: volume, tuning and a band switch. That’s it! Panasonic builds them in Indonesia. If you want a very simple shortwave radio at a very affordable price look no further.

Panasonic RF-562 FM/MW/SW receiver covers FM 88-108 MHz, MW 530-1605 kHz and SW: 4.75-18 MHz.

This a perfect radio to offer a beginner or anyone who doesn’t want to fuss with lots of complicated buttons. You won’t be trying to figure out what button you pressed to stop your listening. There are no buttons to press! The RF-562 might be your answer to simple and carefree listening just like the good old days!

You’ll find yourself smiling further when you look at the retro-design slide-rule frequency dial. It says “**Big Speaker**”! Don’t think too hard on this one. Big? Compared to what? It doesn’t matter. It’s fun! It is all-analog all the way through. No DSP chips inside. No frills! Does it get better than that?

Besides the common AM and FM radio bands, it receives from 4.75 MHz all the way to 18 MHz HF shortwave in one band (whoa!) which should cover just about any international broadcaster you might want to tune into. Its dimensions in inches: 8¼" W × 4¾" H × 2½" D and it runs on two D batteries nearly forever. It claims play for 280 hours (about 11¾ days) on one set of batteries, listening to shortwave. I found it is available for about $40 US through several big-name on-line vendors in North America.

Please remember this is a really basic radio. No complicated filtering. No SSB. Touchy tuning on shortwave until you get used to it. It *does* have a nice big ferrite antenna for AM reception. You’ll like that a lot. Take a look... give it a try!

Full details can be found in Jay Allen’s comprehensive review: https://radiojayallen.com/panasonic-rf-562d-retro-design-am-fm-sw-portable-radio/

- N2KZ

The balloon goes UP

U.S. officials became aware of a large Chinese balloon as it crossed into Alaskan airspace on January 28. China described it as a civilian airship used for research purposes — mainly meteorological — that had been blown off-course. The balloon drifted over Canada and the USA until it was brought down by a U.S. Air Force F-22 off the coast of South Carolina on Saturday February 4.


Chinese balloon as seen from a U.S. Air Force U2 on Feb 3. [DoD]

The U.S. and Canada subsequently observed three more “unidentified objects” which were brought down between February 10 and 12. On February 16 President Biden said the three objects downed over North American airspace were privately-owned balloons and were not conducting surveillance. White House spokesman John Kirby said the objects were “tied to some commercial or benign purpose”.

Apart from ARRL, there has been widespread media coverage plus speculation that the object shot down over Yukon, Canada might be an amateur radio “pico-balloon” **K9YO-15**, launched on October 22, 2022 by the Northern Illinois Bottlecap Balloon Brigade (NIBBB). These “picos” are lightweight balloons, based on aluminized Mylar, carrying minimal electronics to transmit location data using WSPR or APRS.

See:

https://www.npr.org/2023/02/18/1158048921/pico-balloon-k9yo , https://www.rtl-sdr.com/ and https://www.scientificamerican.com/article/did-the-pentagon-shoot-down-a-harmless-ham-radio-balloon/

Peekskill / Cortlandt Amateur Radio Association

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Newsletter contributions are always very welcome!
Archive: http://nm9j.com/pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place every month (apart from July/August break). See http://www.pcara.org for current details.

PCARA Repeaters

W2NYW: 146.67 MHz -0.6, PL 156.7Hz
KB2CQE: 449.925MHz -5.0, PL 179.9Hz
N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Masks and Social Distancing may be required.
Sat Mar 4: Presentation "Morse Code — Ancient Technology or Vital Tool?" by Charles N2SO, 10:00 a.m. followed by monthly meeting. Putnam Valley Library, Oscawana Lake Rd., Putnam Valley NY.
Sat Mar 4: PCARA VE Test Session, 11:30 a.m., Putnam Valley Library. See below for details.
Sat Mar 18: PCARA Breakfast, 9:00 a.m., Uncle Giuseppe's, 329 Downing Dr. Yorktown Heights, NY.
Wed Mar 29: PCARA VE Test Session, 7:00 p.m. Putnam|Northern Westchester BOCES. See below.

Hamfests

Sat Mar 18: NJ Antique Radio Club Swapmeet, Parsippany PAL, 33 Baldwin Rd, Parsippany, NJ. 8:00 a.m.
Sun Mar 26: Southington ARA Flea Market, Southington High School, 720 Pleasant St., Southington CT. 8:30 a.m.

VE Test Sessions

Mar 4: PCARA 11:30 a.m. Putnam Valley Library, 30 Oscawana Lake Rd., Putnam Valley NY. Must contact VE Dave KF2BD, daveharper'at'vivaldi.net.
Mar 4, 11, 18, 25: Westchester ARC, 19 Hunts Bridge Rd, Yonkers NY. 11:00 a.m. Must contact Paul Maytan, ac2t'at'arrl.net.
Mar 4, 11, 18, 25: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE, k2ltm'at'aol.com.
Mar 17: Orange County ARC, 6:00 p.m., Munger Cottage, 40 Munger Dr., Cornwall NY. Contact: Joseph J. DeLorenzo, w2bcc'at'arrl.net
Mar 29: PCARA 7:00 p.m. Putnam|Northern Westchester BOCES, Tech Center, 200 BOCES Drive, Yorktown Heights. Must contact VE Mike W2IG, w2igg'at'yahoo.com

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