



PCARA Update



Volume 19, Issue 1 Peekskill/Cortlandt Amateur Radio Association Inc. January 2018

Shack overflow

The **PCARA Annual Holiday Dinner** on December 3rd was an unparalleled success, we literally had an overflow crowd! The “Private Dining Room” at the Cortlandt Colonial Manor Restaurant that we normally occupy during the dinner was unable to hold the record attendance — the side doors of the room had to be opened and the event spilled out into the Bar area. Regardless of where folks were seated, an excellent and outstanding time was had by all. Next year we may need a bigger room!



Greg addresses both rooms at December's Holiday Dinner.

The overflow phenomenon has not been limited to dinners, it continues to be seen at the **PCARA Breakfasts** at Turco's in Yorktown Heights, NY, most recently on December 16, 2017. At this most recent breakfast gathering we were joined by Yorktown Supervisor Elect Ilan Gilbert, who was invited by Jared KD2HXZ to learn about PCARA and amateur radio. On behalf of the membership of PCARA, I wish to thank Supervisor Elect Gilbert for taking time from his busy schedule to join us. The next PCARA Breakfast is scheduled for January 20, 2018 at 9:00 a.m. at Turco's in Yorktown Heights, NY. Please join us.

Coming soon will be a selection of apparel (hats, shirts, jackets) printed or embroidered with the PCARA logo, your name and callsign. Samples of these items

will be available for inspection soon at one of our upcoming monthly meetings courtesy of Barry K2BLB and “Something for All 33 Inc.”, www.sfa33.net. Information on pricing and online ordering to follow.



Laser-engraved badge

Just a reminder that **Ham Radio University** is on Saturday January 6, 2018 at LIU Post, Hillwood Commons Student Center, 720 Northern Boulevard, Brookville, NY 11548. If members are interested in attending, see the article by Lou on page 6 where he suggests travel coordination via the PCARA Yahoo! Groups page. Road Trip!

What better way to start off the New Year, than with the **PCARA Annual Bring and Buy Auction**? You have until January 7th to get into your shack, go through your things and select a few items you no longer want or need. Bundle them up and bring them to the January 7, 2018



PCARA monthly Membership Meeting at 3:00 p.m. at New York-Presbyterian / Hudson Valley Hospital in Cortlandt Manor, NY. Watch as the excitement follows! As always, I look forward to seeing each of you there.

- 73 de Greg, KB2CQE

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Net night

Peekskill/Cortlandt Amateur Radio Association holds a weekly net on the 146.67 MHz W2NYW repeater on Thursdays at 8:00 p.m.

Adventures in DXing

- N2KZ

Goat History

The PCARA Old Goats Net has roots going back to the 1970s. The name of the net and its format all come from another Old Goats Net based in Bad Axe, Michigan. The original Old Goats Net is the daily on-air get-together of the **Lake Huron Amateur Radio Club** covering Huron, Sanilac and Tuscola counties in Central Michigan's Thumb area. If you look at a map of Michigan, you will see that the state resembles the shape of an open mitten. Bad Axe is right in the middle of the mitten's thumb!



Map of Michigan showing Bad Axe on the mitten's thumb.

The Michigan Old Goats Net meets every day except Sunday on the LHARC 2 meter repeater at 145.47 MHz using a minus 600 kHz offset and a 110.9 PL at 8:30 a.m. It broadcasts from a county-owned communications tower just north of the Huron Medical Center on South Van Dyke Road. It is quite close to the local radio station, WLEW 1340 AM

and 102.1 FM. On Sundays, the LHARC gang and many other hams meet on 75 meters on 3950 kHz LSB at 8:00 a.m. Eastern Time.

The Michigan Old Goats Net began in the early 1970s on 2 meter AM according to a local ham Bill Stocker, N8LFR. Years later, when FM became the standard on 2 meters, the net changed modes and has been on FM ever since. Only until a few years ago, most repeaters in Michigan and surrounding states did not use (or need) PL tones to localize their reach. I visit Michigan in the summer, at the height of the tropospheric DX skip season, and my five watt HT could bring up several repeaters on 145.67 MHz. I would drop my carrier and hear a succession of courtesy tones sound. They must have been emitting from all over Michigan and beyond. I still wonder where they were all located!

Over the years, amateur radio became more popular and 2 meter activity increased. When bits of conversations from as far away as Indiana began to invade the Goats Net, the need for PL tones became necessary. Old habits die slowly. Some of the Goats

took their time adding the PL tone or even getting a rig that was capable of producing a PL. There was lots of very old equipment being used out there and some only had one frequency (145.47 MHz) programmed in or locked in by crystal control. The Old Goats Net still meets to this day and is the center of a great fraternity of old friends and new around Huron County.



Karl and canine (center) with members of the Michigan Old Goats Net, in Bad Axe MI during 2015. [N2KZ pic.]

I started checking in to the Michigan Old Goats Net in the year 2000 when I was first licensed. I thought a regularly scheduled net might be a good idea for our club in Peekskill. After a couple of month's discussion with fellow PCARAns Bob, N2CBH, Malcolm, NM9J, Mike N2EAB and a few others, we decided to try a weekly PCARA net.

To our best recollection, the very first PCARA Old Goats Net aired on Thursday night, September 7, 2006 starting at 8:00 p.m. A handful of us met on the air and we called it a success. I think we skipped a week after that and returned to a regular Thursday night at 8:00 p.m. schedule starting on Thursday, September 21, 2006. Outside of some cancellations on major holidays and Thursday Thanksgivings along the way, we have been meeting weekly ever since.

In the beginning, the formats of the Michigan and Peekskill Old Goats Nets were nearly identical. After check-ins were completed, the first round was a commentary of what everyone was doing and a second round was everyone's comments. A brief third round was for 'any more comments?' and then we would sign off.

Months and years later, I gained more inspiration from Michigan and brought it home. One of the highlights of the Michigan net were weekly quizzical questions discovered by Bob Duncanson, WD8RJL, located on a farm in nearby Harbor Beach. Bob found single questions that would make everyone think and remember the good old days going back to World War II and Korea. Everyone enjoyed it immensely!

Finding good questions for my presentation every week can be quite a challenge. Question material finds me when reading the newspaper on line, from talk

shows I listen to while commuting, Internet technical chat groups, *QST* magazine, *QRZ.com* or when researching projects or interest quests. A good question follows the line between difficulty and simplicity. I look for relevancy to amateur radio or at least topics that are considered general knowledge. Good ideas are always welcomed!

Even the preamble to the net has history! Harking back to the days of 2 meter AM and general communication receivers, another local ham, K8EFA, 'Goose' Edwards, always used to welcome 'all the shortwave listeners' every morning when he checked in. Goose knew the Michigan Old Goats Net had a pretty good listener following. Many, many people had scanners on in their houses to keep up with police, fire and other events. The daily Old Goats Net at 8:30 a.m. often served as a local newscast. You know when you walk into the local hardware store and people are talking about what the Goats said this morning people were definitely tuning in. In memory of Goose, I welcome 'the shortwave listeners' too!

Not everything in our Goats format came from Michigan. I elaborated the question idea by going to four or even five questions a week. The topic of the week used to be derived from what anyone or everyone mentioned in round one.

During the early weeks of our net, this sometimes worked. When it didn't, conversation sometimes lagged. It just made more sense to add a topic... at least to get started with.

The PCARA Old Goats Net is as alive as you or me.

One never knows what things will be mentioned or brought up. In every sense, it is quite a group conversation and every net is a snapshot of exactly where we are at a given moment. Lots of our organizing and discussion have led to great things!

Shaky Technical Beginnings

When the Old Goats Net started, my only gear for two meters was my Icom IC-T7H HT. I would operate from the second story of my home QTH to add height to my "almost 5 watts to rubber duckie antenna" transmissions. This immediately proved intermittent and annoying, so I went to a variety of trunk mounted antennas on my old Toyota Corolla.

With varying degrees of success, each week before the net, I would slowly roll up and down my driveway to find a sweet spot. I was determined to provide the best signal possible! Malcolm, NM9J, would listen to my signal and eventually pronounce my signal as tolerable or, at least, with a little background noise. I would park my car and there I would sit, rain or shine or

snow, and pray that my batteries would not wear down! I eventually bought backup battery packs and even a car cord to insure that I could make it until at least 9:00 p.m. without dropping out!

In the summer, I would conduct the net with my windows open listening to peeper frogs, watching fireflies and seeing the herds of deer walk by during the net. The winters could be pretty brutal. You would find me bundled up in overcoats, with the car heater on periodically, just to stay warm! Why did I do



Spring peeper frog.

During the warmer months, I tried all sorts of experiments. I used my recovered from-the-trash broadcast auxiliary Yagi, mounted vertically on a mast that I

shoved into the ground in a shrubby bush near my front door. I also tried putting my 2m/440 mag-mount in various places. All attempts proved somewhat successful but none really made my signal undeniably solid.

A major breakthrough came in February of 2012. I became frustrated with the performance of my meek HT. My usual W2NYW repeater QSO pals, Bob, N2CBH and Malcolm, NM9J, were more than tired and annoyed with my ever-fading and picket-fencing signals. No big antenna could bring solid signals out of my car, especially during my challenging rides through the rocky terrain between my home QTH and my workplace in Stamford, Connecticut.

There had to be a solution and there was! I purchased a Yaesu FT-1900R 2 meter transceiver capable of 55 watts. My car now had serious power on the air.



Trunk-mounted Diamond NR-22L on Karl's Toyota.

this? I didn't have a practical method of using my HT on AC power — and — I didn't have a good spot for a vertical antenna for 2 meters in my attic or roof without having a very long and prohibitive coaxial feedline.



Net control bundled up in a winter coat.

This was the standard until December 2015 when my Corolla came to an end. Now I use the same rig but inside my home QTH connected to an Arrow 4-element Yagi.

Since the antenna has substantial forward gain, I now operate the FT-1900R with the lowest power possible at five watts. It seems that this is more than enough



Arrow 4-element Yagi mounted indoors.

power for full quieting. Sitting inside is luxurious compared to a driver's seat in a car!

The current station seems to be pretty good in performance. When not participating in the PCARA Goats Net, I like to experiment with my full 55 watts with my four-element Yagi via simplex on 146.520 MHz and surrounds. I have been able to reach southern New Jersey, western Pennsylvania and the north shore of Long Island without much effort. Not bad! Using the same Yagi, I was able to be heard by the recent Anthony's Nose special event station at just 300 milliwatts using my Icom HT. There is plenty of fun to be found!

There are always more improvements to be made. With a hefty heat sink built into the chassis, the Yaesu FT-1900R can get quite toasty especially when operating at full power. I have seen the internal thermometer reach to 170 degrees Fahrenheit! I fit the back of my rig with a perfectly sized miniature muffin fan connected to the same power supply that I use to power



Yaesu FT-1900R transceiver with cooling fan at rear.

the transceiver. Now the rig never exceeds about 85 degrees. Nothing is more satisfying as a very simple and effective quick fix!

If I had to explain the PCARA Old Goat's Net in one word, it would be 'col-

laborative.' A hearty note of thanks needs to be given to two friends who have watched my back for years. Malcolm, NM9J and Bob, N2CBH have always covered me

when I am away. On occasion, some of these alternate hostings were nearly without notice. I remember, at least once, falling asleep and awakening in a panic at 8:15 p.m. only to find that Malcolm had started the net without me. All sorts of things would delay me, like being caught in traffic outside of the range of the repeater. Malcolm and Bob were ever ready to take the microphone and start the show. You two are a God-send! More than once, I have started Goats while driving my car having my wife or one of my daughters write down call signs as we speed home! At PCARA... we make it happen!

You can't have a net on your repeater without a working repeater! Our chief engineer, Bob, N2CBH, has spent tremendous effort and time over the years to keep our voice on the air. Bob is resourceful, talented and a master of improvisation. We owe Bob many thanks for great signals and for the long term reliability of our repeaters. Bob also steps in and hosts the net and always fields questions that are great technical quizzes even for the best of us. Bravo!

Good Times

We have enjoyed some astounding DX check-ins during our Goats Net. The PCARA repeater can be heard far and wide! Hams chancing upon our net have chimed in from around Binghamton in Central New York, Southern New Jersey, the south shore of Long Island and the Hartford area.

We had one after-party on six meters where a group of Goats check-ins made a rendezvous with a contesting ham and a group of his friends from Central Connecticut on six meters USB. We have also met on 440 MHz and 10 meters during our experiments. During the very first years of the net, we even sent slow scan TV pictures to each other via our 2m repeater. I remember we had to limit our frame size to get our entire scan transmitted before the repeater's two minute time out!

One night before Goats, I heard meteorologist Craig Allen on WCBS 880 mention that the Space Shuttle would have a pass-by at just after 8:00 p.m. high in the sky. I drove my Corolla to a nearby recreational field for a good view and egged everyone on the net to pause and look up at the proper moment. A few of us actually saw it soar across the bright sky at about 8:15 p.m. that night.

Hopefully, the memorable moments have only just begun. What may happen is only limited to our imagination! Tune into the Old Goats Net every Thursday at 8:00 p.m. and see what happens next! Until next month, 73 es dit dit de N2KZ 'The Old Goat'.



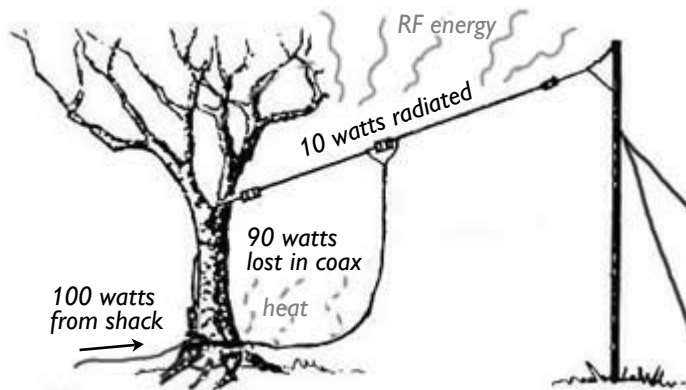
40 meter dipole on 20 meters? – NE2Q

[Guest contributor Jay, NE2Q explains the best way to use a half wave dipole cut for the 40 meter band on 20 meters. –Ed.]

Just for fun I checked both my EZNEC & TLW (transmission line) programs to see what a 40 meter dipole at 45 ft high and fed with 150 ft of transmission line would show as feedline loss when operating it on 20 meters. Some hams try doing this but don't understand why they get poor results. Then again, many hams do unusual things with their antennas and don't realize why the results are poor. They blame their antenna rather than the underlying physics.

In this scenario, with RG-8 50 ohm coax, the feedline loss would be 9.8 dB. You would of course need an antenna tuner to reduce SWR down to a level that the radio could cope with. Many unsuspecting hams think that use of a tuner to get a low SWR means they are getting all their power out to the antenna. That is a big error as the radio sees low SWR but at the output of the tuner, the SWR and losses are sky high.

9.8 dB loss represents an almost 10 times reduction in power. Your 100 watt rig would only transfer 10 watts to the antenna. The rest would be wasted in the coaxial cable. Received signals will also be reduced in strength. Many weak signals would not be heard at all.



Center-feeding a half-wave dipole on its 2nd harmonic ($2 \times f_1$) using coaxial cable results in most of the RF power being wasted.

Now if you took the same scenario and replace the 150 feet of coax with 600 ohm home brew parallel wire transmission line, the loss would be only 0.4 dB. That is a big difference. That 40 meter dipole would then work very well on 20 meters. Actually with around 2 dB more gain than a regular 20 meter half wave dipole.

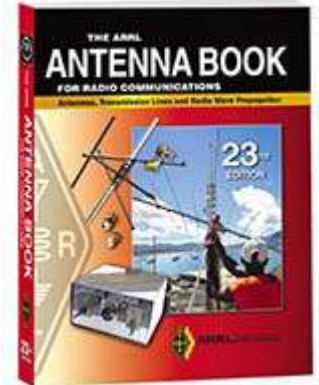
- Jay, NE2Q

Notes from the editor

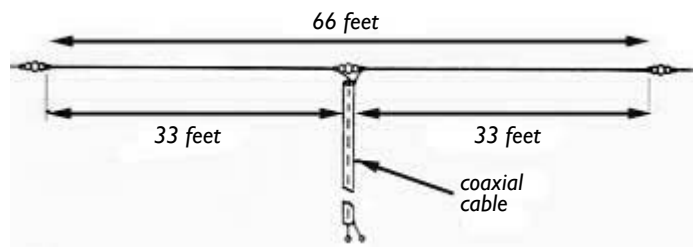
Antenna software: Jay mentions two items of software, EZNEC and TLW. EZNEC is antenna modeling software supplied by Roy Lewallen, W7EL. The cost starts at \$99.00. See <https://www.eznec.com/>. A free evaluation version with restricted capabilities is also available from W7EL.

TLW is the Transmission Line Program for Windows by Dean Straw, N6BV, supplied on the CD-ROM which accompanies recent editions of the ARRL Antenna Book. TLW allows calculation of transmission line loss arising from an impedance mismatch for coaxial and open wire feeders. The ARRL Antenna Book contains a great deal of useful information — the software supplied on CD makes it even more valuable.

There are alternatives to EZNEC. Your editor employs the free MMANA-GAL antenna modeling software, described in PCARA Update, June 2015, along with the RSGB book “An Introduction to Antenna Modelling” by Steve Nichols, GOKYA.



Source of the problem: A center-fed half wave dipole for 40 meters is approximately 66-67 feet long. This antenna would have a free space impedance at 7.15 MHz of 72 ohms resistive. Feeding such an antenna with 50 ohm coaxial cable — such as RG-8/U (Belden 9913) — will result in a standing wave ratio



Half-wave dipole for 40 meters fed with coaxial cable.

(SWR) of 1.44:1 at the antenna end of the cable. If the antenna was perfectly matched to 50 ohms, the loss in 150 feet of RG-8/U would be 0.5 dB. The additional loss in the cable due to the mismatch SWR is only 0.035 dB. (Any SWR less than 2:1 should have negligible effect on additional loss.)

If we try to use this same antenna on 20 meters (14.24 MHz) the antenna is now a full wavelength long and the center feed point is looking into two half waves of wire — with a high antenna impedance of around 4400 ohms resistive and -1700 ohms reactive. See

picture along-side.

SWR on 14 MHz with 50 ohm coax would be in the region of 100:1.

Trying to feed the full-wave antenna with coaxial cable is inefficient because feeder losses become much

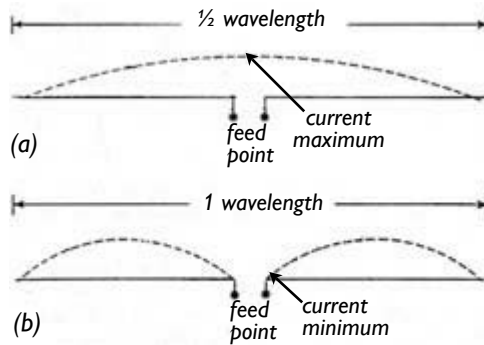
worse at high standing wave ratios. The peaks of high current in the feeder cause high I^2R copper losses and the high voltage points lead to high dielectric losses. In Jay's example, the additional loss in 150 ft of RG-8/U cable due to SWR jumps to around 9.7 dB at 14.24 MHz, for a total line loss of 10.4 dB.

This additional loss can be **reduced** by changing the feeder to a much higher characteristic impedance. Use of 600 ohm open-line feeder as suggested by Jay is one way to do this. 450 ohm ladder line is an alternative. You would still need a wide-range antenna tuning unit (ATU) with balanced output to match the open wire feeder to 50 ohms. A transceiver's internal ATU is unlikely to have sufficient range for this task.

Other techniques: There are several ways to arrange a wire antenna so it can be fed efficiently with coaxial cable on two or more bands. For example:

- Multiband dipole with wires of different lengths all fed in parallel, also known as a 'fan dipole'. See *PCARA Update* for June 2004 and June 2016.
- Trap dipole with frequency-sensitive LC circuits to isolate outer wire ends at higher frequencies.
- Use of a parallel-wire matching section followed by coaxial cable to the radio, in G5RV-style. One example is the ZS6BKW dipole which can give a low SWR on five bands — 7 MHz, 14 MHz, 18 MHz, 24 MHz and 28 MHz. See *PCARA Update*, July 2009.
- Off-center fed dipole (OCFD), sometimes incorrectly described as a Windom. With a feed point $\frac{1}{3}$ of the total length from one end, a 4:1 balun at the feed point and coaxial cable down to the radio, this antenna can provide a good match on 7 MHz, 14 MHz, 18 MHz, 24.9 MHz and 28.5 MHz.
- Finally, you can minimize losses in coaxial cable by locating a *remote* automatic antenna tuning unit at the *far* end of the cable, close to the antenna.

—Ed.



(a) center-fed **half-wave** dipole has high current and low voltage at the feed point.
(b) center-fed **full-wave** dipole has low current and high voltage at the feed point, resulting in a much higher impedance.

Ham higher learning - KD2ITZ

Amateur radio encompasses many fascinating aspects and its technology progresses rapidly. Thankfully, the hobby has its own institute of higher learning.

Ham Radio University will be in session on Saturday, January 6, 2018 at **LIU Post** in Brookville, NY. The annual event

features thirty educational forums, a keynote address by ARRL

Hudson Division Director Mike Lisenco N2YBB, work-

shops, demos, a VE session, door prizes, and more. HRU starts at 8:30 a.m. and ends at 3:20 p.m. Access to this wealth of information is offered for the suggested donation of only \$5.00. More information is available on the HRU website:

<http://hamradiouniversity.org/>

Although 2018 marks the 19th year for the event, it will be the first time at LIU Post. The school's address is 720 Northern Boulevard, Brookville, NY 11548.



There will even be a presentation describing the college's broadcast station WCWP 88.1 FM.

For those unable to travel to Nassau County, there

are still opportunities to participate. A special event station W2HRU will be heard on the HF bands. Many informative presentations from years past can be found at the HRU YouTube channel:

<http://www.youtube.com/channel/UCa7iNvhJXSGqLjvbqJF1iAg>

Ham radio always presents the opportunity to learn new information. HRU is the place for amateurs of all levels to further their education. Several PCARA members have expressed interest in attending. Anyone wishing to carpool to the campus is encouraged to send a message to the PCARA Yahoo! Group.

- Lou, KD2ITZ

Run Against Hunger - official report

Thanks to Henry, KB2VJP the editorial department has received an official report on the recent **Run Against Hunger**. This fund-raising event took place on Sunday October 15, 2017 in and around Croton-on-Hudson. A three-page letter from the run organizers to the editor of the Croton *Gazette* was published in the newspaper's issue dated December 14-20, 2017.



Runners begin the 10k at the 37th annual Harry Chapin Memorial Run Against Hunger on Sunday, October 15

To the editor:
We want to thank the entire Croton community for the success of our 37th annual Harry Chapin Memorial Run Against Hunger. We reached 998 participants to all three events, our third highest total ever, and enjoyed a record-tying fund-raising year.

granted us permission for our 10K runners and vehicles to cross the dam. The Croton Village Board of Trustees also granted us route approvals for all three events—the 5K Run and Walk through the Morningside neighborhood, the Croton George Trail and Cleveland Drive, the One Mile Fun Run

Multi-page report describing the 2017 Run Against Hunger was published in the December 14 Croton Gazette.

ever, and enjoyed a record-tying fund-raising year.

They go on to thank all official and volunteer organizations that provided support for the Run Against Hunger. This included the three schools in Croton, especially Croton-Harmon High School (CHHS) where Race headquarters was located. Also mentioned were NYC Department of Environmental Protection Police, State Police, Westchester County Police, Croton Police and EMS departments.

A special mention was made for the amateur radio groups that assisted. Here is the relevant paragraph from the Croton *Gazette*.

“Local amateur radio groups joined us for the fourth year to improve communications and safety around the courses of all three of our events. President Greg Appleyard of the Peekskill-Cortlandt Amateur Radio Association (PCARA) along with member Al Krieger (*sic*) and Megan Hall from Croton EMS all met with us for a very helpful planning session in early October so we could better knit together our safety net. PCARA volunteers joined forces with members of the Westchester Emergency Communications Association (WECA), led by Kathleen O’Keefe, Public Service Director, and Larrie Sutliff, Education Director. With the Westchester County Mobile Amateur Radio Command

Center (RACES) truck set up at CHHS, Net Control was ably managed by Allan (*sic*) N2YGK and Kathleen KC2VCT. Out on the course were volunteers Larrie W2UL, Greg KB2CQE, Victor KC2UAP, Richard, N1GIL, Jay N1NRP, Marlon KC1EHW, Malcolm NM9J, Robert N2TSE and Al K2DMV. With eleven individuals from both groups all working together they gave us excellent communications coverage, including six different spots and the Trail Car for the 10K course, for all three events.

The professionalism of both of these groups certainly belies the word “amateur” and we are indebted to them for continuing to help us make significant improvements in race safety. Having in-progress race updates from their posts out on the 10K course was very helpful in tracking our runners. Fortunately, we did not need their services in reporting any injuries or other significant issues.”

The report concludes by noting that 2017’s effort raised \$47,000 to be used in Westchester, across the U.S., and overseas to help grow and provide food for those in need. Funds were divided among local and international organizations including the Croton-Cortlandt Food Pantry, the Croton Caring Committee and Caring for the Homeless of Peekskill, Fred’s Pantry, Hillside Food Outreach in Pleasantville and the Food Bank for Westchester.

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No road race can exist without

This paragraph on amateur radio explains the role of WECA and PCARA in support of 2017’s Run Against Hunger.

- NM9J

Church support – December 24

PCARA had been asked by Kathy Campolo (aka Mrs N2LJO) to provide radio support for the 4:00 p.m. Christmas Mass on December 24 at the Church of the Holy Spirit on Route 202.

At 2:30 p.m. Greg KB2CQE and Malcolm NM9J arrived at the Church parking lot, donned their reflective vests then rang the bell at the rectory to let Fr. John know we were there. Fr. John was pleased to see us at one of the busiest events in the church year. We were informed that cars could park on the grass above the upper lot this time and we should look out for Fr. Francis who was to be granted VIP parking. The afternoon was sunny, though the temperature was only 40°F and there was a chilly breeze blowing past.

Bob N2CBH and David KD2EVI arrived shortly afterwards. After a short strategy discussion we moved to our chosen positions with Bob by the Church doors, NM9J at the traffic circle, Greg at the upper parking lot and David watching over the approach to the grass parking.



L to R: Greg KB2CQE, David KD2EVI and Bob N2CBH prepare to co-ordinate vehicle arrivals at the Church of the Holy Spirit on Sunday December 24.

In a few minutes, vehicles began arriving at a steady pace. By 3:20 p.m. the lower lot near the traffic circle was full and NM9J had to wave vehicles onward. At 3:40 p.m. Greg and David reported that the paved parking was full and they would begin parking vehicles on the grass. It did not take very long before the grass parking was also full — fortunately the 4:00 p.m. start time was rapidly approaching and the rush of vehicles began to slow down. A few late-comers were carefully parked around the circle, then Greg, Bob and David walked down to the main entrance off Route 202 to advise drivers that the parking space was completely full.

Remaining parishioners who arrived late decided to park in an empty lot across the street. The danger then was for pedestrians crossing busy Route 202 — this was coordinated by Bob and Greg who slowed down oncoming traffic and guided families across the street into the Church entrance.



After the parking lot became completely full, Greg KB2CQE, David KD2EVI and Bob N2CBH moved down to the site entrance, just off Route 202.

By 4:15 p.m. arrivals had slowed to a halt, so we secured the operation and retired to Dunkin' Donuts for a welcome, warming drink.

Amateur Radio Class

An amateur radio class covering our local area begins in the New Year, January 2018.

WECA Extra Class

Westchester Emergency Communications Association is sponsoring an **Extra Class** training course commencing on Tuesday January 2, 2018 and continuing for nine sessions until Tuesday March 6. A V.E. Test session will be available at the conclusion. Location is the Westchester County Fire Training Center, 4 Dana Road, Valhalla, NY and classes run from 7:00 p.m. to 9:15 p.m. Pre-registration is not required. Further details are available from class instructor Larry, W2UL, (732) 693-45-4, W2UL 'at' WECA.org. Directions to the venue are available on the ARRL web site at:



<http://www.arrl.org/courses/valhalla-ny-10595-19> .WECA's own web site can be found at: <http://www.weca.org/> .

It's Straight Key time

Straight Key Night

ARRL **Straight Key Night** takes place every year on January 1. Timing is based on UTC/Greenwich Mean Time, beginning at 0000 UTC on January 1 — in our area this corresponds to 7:00 p.m. Eastern Standard Time on New Year's Eve, Sunday December 31 2017. The event lasts 24 hours, ending at 23:59 UTC or 6:59 p.m. Eastern on New Year's Day, Monday January 1, 2018.



Participants in ARRL Straight Key Night are encouraged to get on the air and make conversational-style CW QSOs rather than short contest exchanges. The use of straight keys or bugs to send CW is preferred. There are no points to score and all who participate are winners. Use of old-time equipment is not compulsory, but many people fire up a well-loved vintage transmitter or transceiver for old times' sake.

Straight Key Month

The **Straight Key Century Club (SKCC)** holds an annual on-air event to commemorate the club's founding. This takes place immediately after the end of ARRL Straight Key Night, lasting from January 2nd to January 31st. The intention is to introduce or reacquaint radio amateurs to the fun of hand-keyed Morse code sent with straight keys, bugs or side-swipers. For further details see the following page on the SKCC web site: <http://www.skccgroup.com/k3y/k3y.php>.



SKCC has a Special Event call sign for the occasion — **K3Y**. The call is employed by participating SKCC members on a rotating basis throughout the event.



Members and non-members are invited to seek out the U.S.A.-based K3Y stations plus participating DX stations. Non-members are *encouraged* but not

required to use straight keys for their K3Y contact.

Our very own Charles, N2SO will be taking part in the SKCC event, signing **K3Y/2**. His first period on the air is on January 2nd from 13:00-14:00 UTC (8:00 – 9:00 a.m. Eastern). You can find a full list of the K3Y

operators at:

http://www.skccgroup.com/k3y/k3y-docs/K3Y_Calendar_List.txt.

Straight Key Month is *not* a contest — you can make contact with K3Y stations using *any* of the HF bands, apart from 60 meters. Last January, your editor came across Charles operating K3Y/2 on 10.1 MHz. Join in and work K3Y during January 2018 for some month-long CW enjoyment.

Breakfast picture

The following picture was taken at the well-attended PCARA Breakfast which took place on Saturday December 16, 2017. The next PCARA Breakfast is scheduled for Saturday January 20, 2018.



The PCARA breakfast at Turco's, Yorktown Heights on Saturday Dec 16, 2017. Yorktown Supervisor-Elect Ilan Gilbert is visible at the head of the table, with Jared KD2HXZ and Greg KB2CQE standing at right.

Bring & Buy reminder

Remember — the first PCARA meeting of the New Year, on Sunday January 9 at Hudson Valley Hospital will include the **Annual Bring and Buy Auction**. The auction is scheduled at this time of year partly because of the lack of local Hamfests.

Members and friends can bring radio-related items to the auction and have them sold by the PCARA auctioneer. Items that you no longer have much use for could still have significant value to others.



Please keep the circle of radio life turning by checking in your own shack, basement or attic for a few items that you have not used in a while. Dust them off and bring them along on January 9. If you are successful in selling, a small donation to PCARA funds would be much appreciated.

Essential₂ guys

This is another of the occasional *PCARA Update* articles explaining how chemistry is “essential₂” amateur radio, electronics and life in general. The topic this time is **aramid fibers**, where “Aramid” is short for “aromatic polyamide” better known by the Du Pont™ tradename Kevlar®. These products are employed in a variety of applications, including radio and electronics.

A little history

The story begins with Stephanie L. Kwolek, born in New Kensington, PA, 18 miles from Pittsburgh, in 1923. Stephanie was introduced to chemistry in high school and decided to continue her study of the subject with the intention of proceeding to medical school after graduating as a chemist. She entered Carnegie Institute of Technology (now Carnegie Mellon University) in Pittsburgh in 1942, graduating in 1946 just after World War II was over.



Stephanie Kwolek pictured in her laboratory circa 1980. [DuPont pic]

Following graduation, Stephanie Kwolek paid a visit to the DuPont Company in Buffalo, NY. She made a presentation to demonstrate her knowledge of chemistry and was offered a job as a textile chemist. Her work began at the Buffalo, NY Laboratories, then she moved to DuPont’s “Pioneering Research Laboratory” at the Experimental Station in Wilmington, DE where Textile Fibers Department was transferred in 1950.

DuPont’s 150-acre Experimental Station had a strong reputation for chemical research, including the 1935 discovery of Nylon 6,6 by Wallace Carothers. (See “Essential₂ Socks”, *PCARA Update*, June 2010 pp 4-6.)

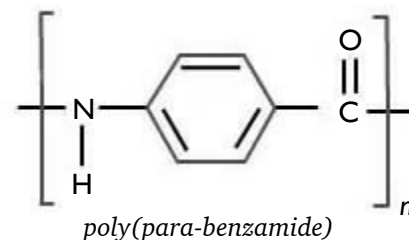


DuPont’s famous Experimental Station in Wilmington, Delaware.

In the mid-1960s, nylon and polyester were state-of-the-art in high strength polymers. Processing of these materials required high-temperature **melt spinning**, followed by mechanical drawing of the fiber

to achieve maximum strength. Dupont’s Textile Fibers Department was working on lower-temperature processes to achieve even stronger polymers.

Stephanie Kwolek’s work involved preparation of intermediates, synthesis of aromatic polyamides of high molecular weight, dissolving the polyamides in solvents, and spinning these solutions into fibers. In 1965 she found that poly(*para*-benzamide) could form liquid crystal solutions in an unusual solvent — concentrated sulfuric acid. The “*para*” orientation of substituents, opposite each other on the benzene ring,



encourages formation of rod-like fiber structures in solution. As concentration is increased the rods associate in parallel alignment, showing a high degree of ordering. This phase, with rod-like molecules aligned parallel with each other is termed “nematic” and also accounts for the behavior of the polarizing layers in a liquid crystal display. (For an account of liquid crystal displays see “Essential₂ Radio”, *PCARA Update*, July 2006, pp 7-9.)

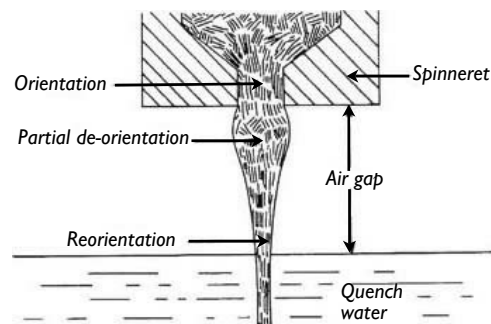
In Stephanie Kwolek’s own words describing her extended chain polymers... “They were difficult to dissolve, but I found a solvent to dissolve them in. And the solution was very peculiar. It was not the typical polymer solution, which is sort of like syrup, but instead this was a very thin solution. It was very watery. Not only was it watery, it was opalescent. The fellow who does the spinning looked at it and said this solution is too thin, it’s too watery, furthermore it has particles in it and it’s going to plug up my equipment.”

But the solution was eventually spun and the fiber product was strong and stiff. Stephanie Kwolek sent it for testing, but did not hear from the Physical Testing lab. She inquired about her sample and was told that her fiber was stronger than anything previously tested and the lab was ordering steel fiber testing equipment.

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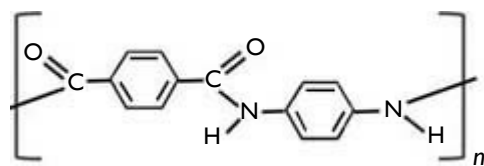
In order to create fibers, the liquid crystal polymer solution is pulled through small holes in a device known as a spinneret.

Shear forces act on the randomly oriented domains to make them fully oriented, so they emerge with near-perfect molecular orientation. The result is very strong fibers.



In dry-jet wet-spinning, strands of polymer solution are drawn through the spinneret through an air-gap into a liquid bath, forming filaments with near-perfect molecular orientation.

Stephanie Kwolek's discovery started an intense period of chemical synthesis and testing by a team at DuPont which led to an improvement over poly-p-benzamide and the filing in 1971 of U.S. Patent 3,819,587 "Wholly aromatic carbocyclic polycarbonamide fiber having orientation angle of less than about 45 degrees". Fibers of **poly-para-phenylene terephthalamide** were introduced by DuPont in 1971 as the high-strength aramid fiber Kevlar[®]. The polymer is prepared by a condensation reaction of 1,4-phenylene diamine with terephthaloyl chloride, which is carried out in an organic solvent.



Poly(para-phenylene terephthalamide)

Properties

The long chains of *para*-substituted aromatic rings present in aramid fibers give the material high thermal stability, high chemical stability plus great mechanical strength and stiffness for a given weight. Kevlar fibers have a tensile strength higher than steel wire while the material's specific density is roughly 20% that of steel. This results in a specific tensile strength (strength to weight ratio) roughly 5 times that of steel and twice that of nylon and polyester. Aramid fibers are strong in tension, but weak in compression, so they cannot always replace steel in applications where compressive forces are in play.

p-Aramid fibers are highly heat resistant — they do not melt as with thermoplastic polymers such as polyethylene or nylon — instead the product begins to decompose around 800-850°F. The fibers are electrical insulators with a dielectric constant of 3.5-4.5, similar to quartz. Characteristic color is yellow.

Strong acids and bases can cause chemical degradation of aramid fibers, but most other solvents and chemicals have little effect.

One weak point is ultra-violet radiation — which is absorbed by the aromatic rings, leading to a change in color from yellow to brown and a reduction in physical strength due to oxidation. The fibers are to some extent self-protecting as the UV-exposed exterior protects the interior — but for maximum performance DuPont recommends storage of fibers away from UV light sources. Rope and cable should be over-braided with a different fiber for UV protection, or an extruded jacket should be applied over the aramid core. Moisture should also be excluded to prevent frost damage.



Kevlar fibers.

Applications

The first application for DuPont's *p*-aramid fibers was in radial tire cords that reinforce rubber in high-performance tires, replacing the steel wire that was previously used. The best-known application nowadays is in the bullet-proof and stab-proof body armor for police and military personnel. The light-weight of Kevlar combined with its ability to absorb energy and prevent penetration by projectiles explain its success. DuPont estimates that over 3,100 officers have been saved from death or serious injury to-date. On a smaller scale, Kevlar is used in gloves and protective clothing to prevent cuts and other injuries that occur in glass and sheet metal factories. Kevlar chaps are available for use with chain saws as well as Kevlar-lined jeans for bikers.



Police body armor.

Ropes and Cables

Ropes and cables based on Kevlar combine great strength, temperature resistance and lightness. Unlike steel, the cables are resistant to corrosion — and are electrically non-conducting. Kevlar cables are used in light suspension bridges, in elevators and in marine applications such as lightweight mooring ropes and tow ropes.

My former employer had a product that competes with Kevlar — trade name Twaron[®]. This polymer, developed in the Netherlands in the 1970's, was manufactured using a different solvent system compared with DuPont's process. A patent dispute followed, which was finally resolved in 1988.

Our previous headquarters site in the Netherlands had a **pedestrian bridge** between



Aerial view of pedestrian bridge over site entry road in Arnhem, the Netherlands.

buildings that was suspended with Twaron fiber cables. I am happy to report that I have crossed that bridge and lived to tell the tale.

The Twaron para-aramid fiber business is still located in the Netherlands but is now owned by the Japanese chemical company, Teijin.

Rope for radio

If you have a material that is five times stronger than steel, that does not corrode and does not conduct electricity, where might you use it in radio? The correct answer is — in guys for radio masts and towers. The traditional material for guy ropes is extra high strength (EHS) galvanized steel. This is not an easy material to manipulate and use of conducting metal for tower guys brings several problems including de-tuning of the resonant structure, alteration of the antenna pattern and corrosion of metal leading to failure. Metal to metal corrosion can also cause “rusty bolt effect” rectification, which leads to inter-modulation and other RF interference. The traditional way to overcome these problems is by breaking the conductive tower guys into non-resonant lengths using ceramic insulators. But those ceramic insulators can suffer from surface contamination, leading to arcing and physical failure in the presence of high power RF. Total non-resonance can be especially difficult to achieve in amateur radio, where we have a wide choice of frequencies available.



MF transmitter mast at Moorside Edge, England has steel guys broken up with multiple insulators.

The Phillystran company of Montgomeryville, PA manufactures specialty ropes from aramid resins, and was the first to manufacture rope from Kevlar at its introduction in 1972. Phillystran® products are used in a broad range of rope applications including mooring lines, winch lines, boat rigging, structural and support lines, power cables and **broadcast tower guy cables**.

Phillystran HPTG high performance tower guy ropes employ a high strength aramid fiber core, surrounded by a jacket of extruded polyethylene. The external jacket



Phillystran HPTG 6700I tower guy line has a breaking strength of 6700 pounds.

protects the aramid fibers from ultra-violet radiation.

Phillystran HPTG-I fiber guying systems also have a core of aramid fiber, but the thick, protective jacket consists of an extruded co-polymer of polyurethane for good weathering, blended with carbon black pigment for maximum UV resistance.

Phillystran recommends that tower guys should be terminated *above* ground level with a short length of steel cable down to the anchor. This protects against accidents with yard equipment, ground fires and vandalism that could damage the polymeric material.

Phillystran HPTG-I tower guys have been employed for AM, FM and TV towers in hot and cold climates from Saudi Arabia to Greenland. The new **One World Trade Center** building in New York City uses HPTG-I guy assemblies to support the steel spire at the top. The spire extends height of the 1368 foot building to

1776 feet and is already delivering broadcast signals to the New York metro area with DTV transmissions from WNJU/WNBC. The Fox stations WNYW and WWOR TV should follow in early 2018.



The 408 foot spire atop One World Trade Center is held in place by eight HPTG-I high-performance tower guy assemblies from Phillystran.

The 408-foot spire is held in place using eight synthetic fiber HPTG-I (high-performance tower guy) assemblies arranged in four pairs, designed to withstand the most extreme weather conditions. Each 100 foot strand is 6 inches in diameter with a break strength of more than 1.7 million pounds. The lines are made from Teijin's Twaron, which is similar to Kevlar.

For details of these products, pay a visit to the Phillystran web site, <http://phillystran.com/>. For information about using these products in amateur radio, take a look at <https://www.dxengineering.com/> and the ARRL Antenna Book.

Finest fibers

Back in the day when telephone service was delivered by copper pairs and wire drops from a nearby utility pole, there was always the problem of maintaining the aerial drop wire in bad weather, especially

during ice storms. Traditional drop wire construction featured a PVC sheath over a pair of conductors made of high-tensile copper-clad steel, also known as Copperweld®. Another design features a steel messenger line alongside the copper pair, all within the same PVC jacket.



Telephone drop wire with steel messenger line contained in the same insulating jacket as the copper conductors.

As telecom cables have made the transition from copper to fiber optic, there has been a

change in the method of protecting and suspending



Fiber-optic aerial cable with Kevlar yarn wrapping for protection. [DuPont pic.]

these cables containing their thin, fragile strands of glass or other optical fiber. Instead of steel, the preferred material is aramid fiber, for its strength, light weight and immunity to

electromagnetic disturbance. Aramid fibers such as Kevlar are applied around the periphery of the fiber cable to provide crush-resistance and safeguard against mechanical stresses. Kevlar is also used as the central strength member, although FRP is also employed in this role. (FRP, fiber reinforced polymer is described in “Essential₂ Domes”, PCARA Update, April 2015.)

The Kevlar layer can be made to act as a water-block by treating the fiber surface with water-absorbing polymers such as Swellcoat™ from Fiber-Line. This prevents water penetrating the inner cable and affecting performance of the optical fibers.

Aramid fibers are not only used for aerial fiber optic cables — the material is also used in less rugged fiber optic cables for indoor use. These cables may not be exposed to



Indoor fiber optic cable with aramid yarn for physical protection.

ice-storms, but they still need mechanical protection for the slender optical fibers while being pulled into place through cable ducts and plenum spaces.

Electronic strength



B&W speaker with Kevlar cone.

Kevlar aramid fibers turn up in electronics. One place where the fibers are easily seen is in high-end loudspeaker cones with their characteristic color of aramid yellow. Another application is in fine-gauge cables for today's portable electronics including headphone cables, USB cables and charging cords. A Kevlar thread running through the cable adds strength that would normally require a much thicker construction. And if you seek the strongest line for fishing, for flying kites or for pulling up wire antennas then Kevlar may be your best choice.

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Belkin iPhone Lightning to USB cable with Kevlar strength thread.

Essential₂ guys ♂

Perhaps you thought that the title of this article refers to products that are essential to males. It is certainly true that many fields where aramid fibers are employed have a preponderance of male personnel — including civil engineering, law enforcement, the armed forces — plus tower installers and cable riggers.

But even if aramid fibers are essential to ‘guys’, we should remember that these days it is equally valuable to ‘gals’ — and it was a skilled lady chemist who discovered the material and its remarkable properties. What's more, those discoveries took place at a time when female chemists were rarely encountered in research laboratories. Thank you Stephanie Kwolek, 1923-2014.



Stephanie Kwolek pictured in 1999 with a molecular model of a para-aramid. [ACS/MIT pic]

- NM9J

[Sources for this item include an article in the Nov 2017 ACS Newsletter for Senior Chemists by Dr. Rita M. Vasta, who first met Stephanie Kwolek in 1982 at DuPont's Pioneering Research Lab.]

Peekskill / Cortlandt Amateur Radio Association

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Newsletter contributions are always very welcome!

Archive: <http://home.lanline.com/~pcara/newslett.htm>

PCARA Information

PCARA is a **Non-Profit Community Service**

Organization. PCARA meetings take place the first Sunday of each month* at 3:00 p.m. in Dining Room B of NewYork-Presbyterian/Hudson Valley Hospital, Rt. 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). Talk-in is available on the 146.67 repeater. *Apart from holidays and July/August break.

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

Sun Jan 7, 2018: PCARA meeting, Annual Bring & Buy Auction. New York Presbyterian - Hudson Valley Hospital, 3:00 p.m.

Sat Jan 20, 2018: PCARA Breakfast, Turco's, Yorktown Heights. 9:00 a.m.

Hamfests

Sat Jan 6, 2018: Ham Radio University and ARRL NYC/LI Section Convention, LIU/Post, Hillwood Commons Student Center, 720 Northern Blvd, Brookville, NY. Doors open 7:30 a.m.

Sun Feb 25: Long Island Hamfest and Electronics Fair, Levittown Hall, 201 Levittown Parkway, Hicksville, NY. Doors open 9:00 a.m.

VE Test Sessions

Jan 6, 13, 20, 27: Westchester ARC Radio Barn, 4 Ledge-wood Pl, Armonk, NY. 12:00. Pre-reg M. Rapp, (914) 907-6482.

Jan 11: WECA, Westchester Co Fire Trg Center, 4 Dana Rd., Valhalla, NY. 7:00 p.m. S. Rothman, (914) 949-1463.

Jan 14: Yonkers ARC, Will Library, 1500 Central Park Ave, Yonkers NY. 1:00 pm. Pre-reg. John WB2AUL, (914) 969-6548.

Jan 19: Orange County ARC, Munger Cottage, 183 Main Street, Cornwall NY. 6:00 p.m. Contact Joseph J. DeLorenzo (845) 534-3146.

Jan 22: Columbia Univ ARC, 531 Studebaker Bldg, 622 W 132nd St, New York. 6:30 pm, Alan Crosswell (212) 854-



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