



North Fulton Amateur Radio League NFARL eNEWS

April 2019

*Over 40 Years Promoting
Service | Friendship | Education | Fun*

www.nfarl.org



Georgia QSO Party 2019 is in the Books!

The Georgia QSO Party



Submit Your Scores!!!

The Georgia QSO Party is over, and the bands were alive and buzzing with activity over the weekend. It was great to hear so many club members on the air.

Now the fun continues (or as some would say, "the job is never finished until the paperwork is done").

If you participated in the GQP, please remember there are two score submissions that we need you to make.

1). Submit your Cabrillo file to the GQP noting "North Fulton Amateur Radio League" in the "Club Name" field as your affiliated club. There are excellent instructions on their webpage <http://georgiasoparty.org> under the "rules" tab on how to do this. The deadline is "no later than two weeks" after the GQP weekend - April 29th.

You can submit your entry directly on the Georgia QSO Party Log Submission page on the GQP webpage. Please send in your scores to the GQP. Regardless of how large or small your score is, NFARL will get credit for total points and number of submissions.

2). Submit your scores for the internal "NFARL GQP Challenge" in order to have your scores entered into the NFARL GQP festivities and possibly earn a coveted NFARL GQP Award.

(Continued on page 2)

(Continued from page 1)

The best way to do this is to download the spreadsheet form from the club website at <http://nfarl.org> . Then click on the link provided under the "Georgia QSO Party" or use the link below. Then, fill out the data needed, and e-mail the file to n4tol@arrl.net.

http://nfarl.org/GA_QSO_Party/GQP_submissions-2019.xls

If you have any difficulty with the download, please contact me and I will e-mail you a usable form, no problem.

We are setting the "NFARL Challenge" deadline as May 1st for the internal NFARL GQP submission. Last year, club members were recognized for key accomplishments in select categories and the highly coveted NFARL GQP certificates were awarded to many operators. So be sure to submit your scores to be eligible for a NFARL award.

Important - This summary spreadsheet is for internal club score keeping only -- results contained in it will not be sent to the GQP log manager for club credit. You must submit your entire log in Cabrillo format to the Georgia QSO Party for the North Fulton Amateur Radio League to receive credit for your score.

Thank you for participating in the GQP and for getting NFARL on the air!!!

If you have any questions, feel free to email me. I will be more than happy to assist you.

73 John N4TOL
n4tol@arrl.net

If you are interested in state QSO parties here are some more coming up:

Florida 4/27-4/28 and New England 5/4-5/5 (ME, NH, VT, MA, RI, and CT)

Strays from the Past / Jim Stafford, W4QO

From QST, April, 1951, as seen in the club library of QSTs for 50 years (held at W4QO's shack for check out): Page 48- **Numerology and Amateur Radio**

To see this article online: http://p1k.arrl.org/pubs_archive/32770

Note: The link above requires ARRL membership. Not an ARRL member? Join ARRL through NFARL and help your local club while you join the national organization for Ham radio! Follow the link below to join ARRL.

<https://www.nfarl.org/mart/?q=catalog/6/arrlmemberships>

NFARL Upcoming Events and Dates

- **Every Sunday — NFARES net** - 8:30 PM - 147.06 MHz (+) PL 100
All licensed Hams are welcome, you do not need to be an ARES member!
- **Every Monday — Tech Talk** - 8:30 PM - 145.47 MHz (-) PL 100
NFARL's flagship technical based "non check-in" net. The net is always better when using the web based chat room but Internet is not required to join the net. Check NFARL Nets [website](#) for more information and "how to".
- **Second Tuesday — NFARES Meeting** - 7:00 PM - 9:00 PM
Fellowship Bible Church, 480 W. Crossville Road, Roswell.
Check [NFARES.org](#) for more information.
- **Third Tuesday — NFARL Club Meeting** - **April 16, 2019**, 7:30 PM.
Pre-meeting activities begin at 7:00PM.
Location: [Alpharetta Adult Activity Center at North Park](#)
13450 Cogburn Road, Alpharetta, GA 30004
Program: "T-Hunting / Fox Hunting"
presented by Jim Sorenson, KA4IIA
- **Fourth Tuesday — NFARL Executive Team Meeting**
April 23, 2019, 7:00 PM
Location: [Arbor Terrace at Crabapple](#)
12200 Crabapple Road, Alpharetta, GA 30004
Meetings are open to all NFARL members. Space is available on a first arrival basis. Please contact the [President](#) to ensure available space.
- **Every Wednesday — Hungry Hams Lunch Bunch** - 11:15 AM
Meet with your fellow club members every Wednesday!
Slope's BBQ, 34 East Crossville Road, Roswell.
- **Every Thursday — YL OP Net** — 8:00 PM - 9:30 PM 145.47 MHz (-) PL 100
Check NFARL Nets [website](#) for "how to."
OM's (guys) are welcome to listen in to this YL net.
This is a great opportunity for YL's to get on the radio with other YL's!
- **Every Saturday — Royal Order of the Olde Geezers (ROOG) Lodge No. 1**
9:00 AM - Reveille Café, 2960 Shallowford Road, Marietta (at Sandy Plains and Shallowford). Everyone is welcome: You don't have to be "old" or a "geezer" to join this breakfast get-together.
- **Second Saturday — VE Testing** - 10:00 AM
NFARL provides Amateur (Ham) Radio test sessions on the second Saturday of each month - Walk-ins are welcome, no appointment is necessary. All exam modules are offered at all sessions.
Location: [Alpharetta Adult Activity Center at North Park](#)
13450 Cogburn Road, Alpharetta, GA 30004
Please check our [website](#) for more information.

New US Islands in Georgia / Terry Joyner, W4YBV

4 NEW ISLANDS JUST ADDED TO GEORGIA LIST IN MARCH.

With the new Margaretville at Lanier Islands opening this year 4 new named islands are now part of the US Island Awards Program. In March Qualification Manager Ted Sarah W8TTS announced that Blue Ridge island GA065, Georgia island GA 065, Hotel island GA066, and Legacy GA067 have been added to the list of Georgia islands bring the new total of islands in Georgia to 66, with 41 qualified and 25 not yet qualified. All 4 new islands are drive on islands.

New 3x3 us island vinyl stickers replica of the USI patch are out and I will have them on May 11 at the one day island Get -A- Way on West island for everyone who makes island contacts this year.

Good Luck.
Terry, W4YBV



Raspberry Pi Users!

The MagPi is the official monthly Raspberry Pi magazine. Their 3/28/19 issue (Issue #80) is available to download from their website for free. In it, you'll find a few projects related to ham radio. On page 62 there is an article on using a RPi to view ISS SSTV images and page 68 has their "Amazing Ham Radio Projects" including an ADS-B Flight Tracker, WSPR Transmitter, and Remote SDR Scanner to name a few.

If you're looking for a RPi, MicroCenter usually offers a Raspberry Pi Zero W for just \$5.00 (limit one at that price). You can reserve it in advance before driving to the store.

What else can you do with a Raspberry Pi?

Be sure to let us know what ham project you worked up with your Raspberry Pi!

The MagPi Magazine - The official Raspberry Pi magazine. www.raspberrypi.org/magpi

[Please help support NFARL eNews!](#)

Your eNews team is calling for original articles from NFARL members for your newsletter.

Please always email your articles in MS Word or other original editable format to enews@nfarl.org and include your content as attachments. Please avoid sending PDFs unless it is for reference only and is accompanied by the originating document. Photos, charts, etc. can be included in your document or included as additional attachments.

The submission deadline is usually the second Tuesday of each month.

Thanks for supporting NFARL and your club newsletter!

The Magic Ear / Jim Stafford, W4QO

Back in the December issue of The Spectrum Monitor magazine, Richard, KI6SN, had an article about a loop antenna for the broadcast band. I'd always wanted to try a BC band loop but just had not gotten around to it as they say. But the one described by Richard was so simple I could no longer put it off. Plus several NFARL members were about to conduct an Electronics Class at Mill Springs Academy. During the class, we had the students solder up an AM radio kit – the AM-780 from Elenco. I felt it might be interesting to match up the AM-780 project with a loop antenna to investigate results.



Richard's loop was built around a simple cardboard box. He proposed about 22 turns of copper wire and installed a 365 pfd variable capacitor to form the loop. I happened to just have a 365 pfd cap with a vernier dial on it in my junk box. The idea was to take a simple AM radio (and what could be simpler than the AM-780 which is a form of TRF set) and put it inside the loop. I had built one of the kits (which I highly recommend as a solder practice project for any young folks you might know) and immediately tried it in the loop.

WOW! It worked just like the AM loops I had seen demonstrated at other times. Stations barely audible without the loop seemed to come alive when coupled with the simple loop. We took it to the Thursday morning kit building session with the students. They were very excited as they powered up their AM radios and were able to receive several stations from the basic kit. Then as they place their radios inside the MAGIC EAR as I call it, we were all surprised again to hear the signals increase by several orders of magnitude. In the photo, Andrew (L) and Kai are checking out the Magic Ear on the radio just completed. The next day Kai reported that when he explained that he had actually built the radio, his father was amazed at his ability!

I have used the AM-780 and the Magic Ear during the evening to receive stations all over the eastern half of the US. Including Boston, NYC, New Orleans, and Chicago to name a few. One thing that puzzled me at first was that as I tuned the loop, different stations "come in" without touching the tuning dial on the radio. Of course, it peaked up the weak station I had tuned to when I first placed it in the loop but why would there be an apparent change in stations as I moved the 365 pfd cap tuning? Then I realized that this radio has such broad tuning that when the loop resonance is moved around the broadcast band, different stations are being amplified via the radio. In other words, the radio is broadly receiving many adjacent AM stations which are each "peaked up" with the loop tuning showing that we all learn as we experiment and try different things in radio.



NFARL in Ecuador! / David Sturm, HC5DX/WB4OZM

I moved to a farming community in Ecuador about 2.5 years ago. The view from my house is what my wife calls a " Million Dollar View" it overlooks two mountain ranges and two valleys. I can get a "heads up" about 15 minutes ahead of changing weather. The altitude at my shack is 8,300' (2500m) which is like getting 6db of extra gain on your antenna and low take off angle.

I have been working on a new tower that is about 200' from my first tower, that is a Glen Martin with Hazer (60') which has two Force 12 Yagis, one C-3E tribander and one 2 element 40m Magnum 240N. I'm adding the second tower at request from European Hams that have visited me for contesting so I can either do SO2R, and multi. Remember in Ecuador you are the DX.

The second tower will be a Rohn BX 50' (thank you Nathan for the donation!) I purchased an extra 8' section with tilt over base to make it 50' (really 48' plus with my 6061 T-6 aluminum 20' mast)

I'm having a FedEx pilot friend fly down my Force 12 4AB antenna which covers 17/15/12/10. There will be two separate feed lines, one for 17/15 and one 12/10. Three elements on each band!

Another antenna courtesy of FedEx delivery is a 5 element 15m by HyGain.

I will also add either my 5 element 6 meter yagi or my Optibeam 30m rotatable dipole to this new Rohn tower. Choices, choices.

I just ordered 350' of extra heavy gauge rotor wire from the Wireman and found a deal of 500' Times Microwave LMR-400 for \$350 shipped. I also ordered the 20' 2" .025 thick 6061 T-6 aluminum mast from Metal Super Markets for \$201. All three of these items will be going in a container down in San Antonio, TX and should get to Ecuador around June.

I've also been working on my RX antennas as since I'm on the Equator, I have Equatorial propagation where sometimes I get a 20db over S-9 report with only 100w and with their KW I'm getting them at 4-2 at best..

My RX antennas include:

- ◆ Two elevated BOGS in the NE/SW and NW/SE which are excellent performers.
- ◆ One Beverage pointing NNW for my buddies back in the States and Asia.
- ◆ One Reversible Beverage pointing NW/SE that is truly amazing on how quiet it is.

I'll be making another Reversible Beverage for NE/SW and will be doing End Fired Phased Beverages for Europe in the near future.

There is more information on my QRZ page.

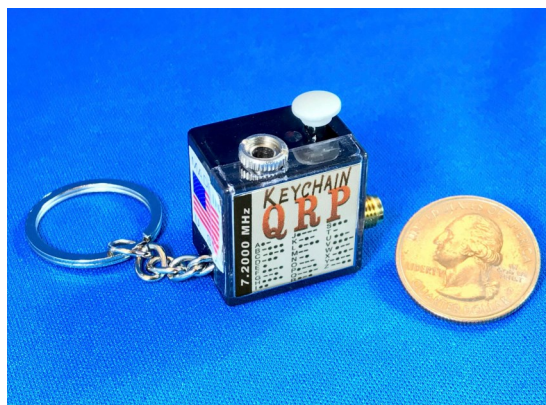
I'm renting my Shack out for individuals, couples and groups for DXing, contests and enjoying the beautiful scenery. When on the air here, you are the DX.

More information and pictures at: <http://www.carmenlaveranda.com/index.html>

The Quirky QRP KeyChain / Dave Slotter, W3DJS

I first learned of the QuirkyQRP keychain radio on the Amateur Radio Roundtable with W5KUB, found on the website <http://tmedlin.com/>. I was quite intrigued with the notion of a radio small enough to fit on a keychain, so I went ahead and ordered one off of Etsy. There, I learned the radios came in 10, 15, 17, 20, 40, 80 and 160 meter configurations. Each keychain radio only supports one band and one frequency. The wait time for delivery was supposed to be 4-6 weeks, but I received mine closer to 4 weeks.

The radio arrived via USPS from Ripon, California in a small brown envelope, and the contents consisted of the radio plus an instruction sheet and 9 volt Sunbeam battery. The radio itself is transmit-only, and comes with a built-in micro straight key button for CW operation, but also has a 3.5 mm jack for connecting an external straight key or electronic keyer. It also has a 50 ohm female SMA antenna connector, although a BNC connector is an option on the web store. The casing is somewhat translucent, and a LED inside of it lights up when you press down on the keyer. Finally, a 9 volt battery connector on the rear of the transmitter rounds out the connectors. The front of the transmitter has a morse code cheat sheet, and the side of the transmitter proudly displays an American flag with "Made in U.S.A." as it is handmade in USA by James Hannibal - KH2SR.



The dimensions of the QuirkyQRP Keychain Radio are 1" x 1" x 0.75" and includes a keychain (for its namesake). As this is a QRP radio, the power output is indicated to be 160 milliwatts maximum from the 9 volt battery, and it is hard-wired to transmit on 7.200 MHz. The instructions indicate that using more than 9 volts will damage the transmitter.

I personally find the construction to be mostly solid, although the built-in micro straight key button feels like it would not hold up to sustained long-term usage, and I would recommend using an external key with it. I like the small size of the keychain transmitter and how it is a conversation piece. At \$39.95, I find it to be quite affordable.

For more information on the QuirkyQRP keychain radio visit:

<https://www.etsy.com/shop/QuirkyQRPHamRadios>

Roswell FireLabs - MakerSpace Grand Opening

On behalf of all the hard-working makers at Roswell Firelabs, you are cordially invited to the GRAND OPENING of Roswell's first community makerspace! Join us Saturday, May 4th from 12pm - 2pm for raffles, maker demonstrations, and much more!

This event is open to everyone and is a great way to learn more about "maker" culture and get to know your Roswell neighbors. Event will be held rain or shine. Due to parking being limited at our facility, Carl Black has generously offered to provide shuttle service for this event. To utilize our shuttle you can park at the Connexions Plaza (across Holcomb Bridge Road from the makerspace) and follow the shuttle signs.

Atlanta Science Expo / Martha Muir, W4MSA

The 2019 Atlanta Science Festival Exploration Expo is now in the books. Once again, for the 6th year in a row, Amateur Radio was represented in one of the over 100 booths there spread out over Piedmont Park in downtown Atlanta.

Fourteen hams from the Alford Memorial RC, Atlanta RC, Georgia QRP Club, Gwinnett ARS, and the North Fulton ARL greeted the skazillions visitors to the Expo all day on Saturday, March 23. Folks took turns roaming the Expo area carrying a sign on a pool noodle that read "Care to Say Hello on Ham Radio?." Those willing to do so talked to someone manning the base station or another HT back in the booth. Wayne KE4WYU primarily edutained folks with Jim W4QO's visual demonstration of sound waves (until the kids wore out the old speaker). Jim N4BFR and Newt N4EWT were the leads in the 'tap your name out in CW' activity. Bob sent an antenna up in the air via a couple of small weather balloons he filled with helium. In some photos you'll see the balloons bending down close to the ground due to the strong winds we had early on. Pretty much everyone floated around to all activities when someone else needed a break.



My main, self-assigned, job was talking to any teachers who came by about why and how to get some ham radio in their classrooms. I also talked to them about applying for an ARISS. (The current window for applications just opened yesterday, BTW. They will accept applications until the end of May, I think.)



I also talked with folks, generally 20-30 year olds, who said they thought they might like to get involved in ham radio. Jim QO had prepared a document about the 'next steps' one would take once you decide to get involved.

A highlight for me was a 6th grader who came to our booth with his mother. The Mom and I chatted while the son got involved in all of our activities. She said that her son saw our name listed in the list of all the booths that would be at the Expo and made her bring him. He wants to become a ham. I gave her the 'next steps' document and then we talked more. It turns out that she is a math and science teacher at a

Cobb County middle school. Our talk shifted to ARISS. How could she not apply for an opportunity for her school's students to talk to an astronaut she said when I told her about applying for an ARISS.

I told her about Elden's Tech license classes for her son that are coming up but that I'd have to look up the details on it. In between my sending an email to Elden asking about his classes and his responding to me, the Mom emailed me to confirm her email address. I passed on the info about Elden's classes but then also gave her some resources her son can use to study on his own in case he wants to get his license sooner than July. Opportunities like this make me happy.

The Atlanta Science Festival folks don't make it easy to host a booth at the Expo. Each 10 x 10 foot booth costs \$800. There is no nearby parking; you have to move all your equipment a distance over bumpy grass. This year we didn't have to move our stuff as far as we did last year but the packing out procedure was ridiculously unkind (Expo was over at 4 PM but vehicles wouldn't be allowed on the access road until 5 PM – except for some folks). None the less, we belong there. The teachers I talked to made the bad parts tolerable. The folks curious about becoming a ham verified that we need to be there.

I went home exhausted but happy.



The hams involved in our booth on Saturday (in the order I happen to notice them to get their name on my list) are:

Jim S	W4QO
Jim R	N4BFR
Newt	N4EWT
Wayne	KE4WYU
Linda	KE4WYU/YL
Paul	W4KLY
Norm	WA4ZXV
Bob	NZ2Z
Mike	KK4KHS
Elliott	KJ4CQJ
Diane	KN4KSD
Janet	K4PRM
Audrey	KM4BUN
Jack	KM4ZIA
Tom	W4SDR

And me!



Martha,

W4MSA

HomeBrew 2 Meter / 70 Cm J Antenna / Mike Riley, KN4OAK

I obtained my General class ticket in 2018. I've set up a 40 meter center fed dipole antenna, was having fun on HF but wanted to expand my capability. I decided to place a VHF antenna on the property to achieve that expansion goal. I'm using a Yaesu FT-897 which I am very pleased with.

I began looking into antenna options during late summer 2018. After some initial scoping of what was commercially available I decided to attempt fabrication of the antenna. This decision was not because of the lack of commercial designs I found interesting, but because I wanted to enjoy the experience of building it myself and seeing it work. I selected a J-antenna (aka J-pole) because there were a few design plans available on the internet that looked as if they were simple enough to construct without any serious tooling or significant material costs. The design also seemed to satisfy other criteria I had in mind as well.

Here's a list of other design criteria I used to select and build the antenna.

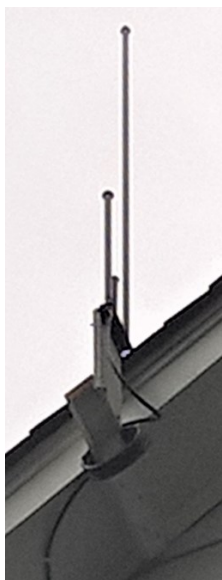
Criteria	Rationale
Safety; RF, electrical, structural, installation	Wanted to minimize or eliminate un-informed / unintended exposure to RF and power from contact or in field proximity. Had to be easy to physically handle and control during install, service and removal. Had to be structurally sound in regard to mounting method and exposure to weather and other environmental elements.
Low Cost of total loss: lowest investment in time and funds if totally destroyed somehow.	If the installation mounting were to fail unexpectedly I didn't want to have to break the budget to repair any failure during its journey to the ground. Or if a lightning strike were to occur, I needed to be able to fund a replacement without major budget implications.
Low cost of materials and effort to fabricate and install.	Needed to be installed at a total material cost (including feedline and other miscellaneous expenses) under \$200. Also need to be capable of fabrication under a week of elapsed time and installed in an afternoon by one person.
Visually imperceptible once installed	After installation I didn't want to see the antenna from the street side of the house or have it be a visual annoyance to neighbors.

My initial design selections were centered on the copper tube material / sweat fitted construction because materials are readily available. However, after looking through some commercial catalogues I happened to see a much simpler design 2 meter / 70 centimeter antenna offered by Arrow Antennas, 911 E. Fox Farm Rd. #2 Cheyenne, WY 82007. You can view their OSJ146/440 model here <http://www.arrowantennas.com/inst/OSJ146440.pdf> if you'd like the basic geometry details.

My antenna uses the same basic dimensional geometry except the elements are fabricated from 1/2" diameter EMT, the base is steel angle iron and the mounting arm is a 2x6" about 2 feet long with a 3/4" thick plywood panel used for the vertical part of the mounting arm.

(Continued on page 11)

(Continued from page 10)



To connect the EMT to the base I welded 3/8-16UNC bolts into the end of the EMT. This required a little bit of grinding to remove the bolt head corners so they'd fit snugly and on center into the EMT. I used a 3/8-24UNF bolt on the element that mounts to the SO-239 stub since that thread is 3/8-24UNF. If I recall the SO-239 stub may have been the most costly single piece item in the completed antenna structure. The EMT, hardware, and angle iron were procured at Lowe's. I am lucky to have a small MIG welder in my shop so fabrication was relatively simple. In order to close the top end of the EMT elements I turned small wooden plugs that fit into the tube ends and secured them with some 5 minute epoxy. The assembled antenna was painted flat black before installation. The other hardware used to mount the wooden arm is 5/16" x 2" lag bolts. The arm is also bolted to the plywood vertical panel. The panel is used to raise the antenna base above the edge of the roof deck. The roof deck has a metal (aluminum) drip edge so it was necessary to ensure the angle iron was just above the edge of the roof to minimize any RF effect.

The antenna works very well. I can assume the Arrow Antenna must work very well if not better, and I would recommend it if you are interested in purchasing a J-antenna like this one.

My installation uses a 125 foot run of feed line. The antenna is about 35 feet above the ground. In order to minimize loss at the VHF band application I used 25400F-PL-125 coax with connectors only at the ends. After installation I swept the antenna for SWR with my MFJ-259C. The sweep results are shown in the table right.

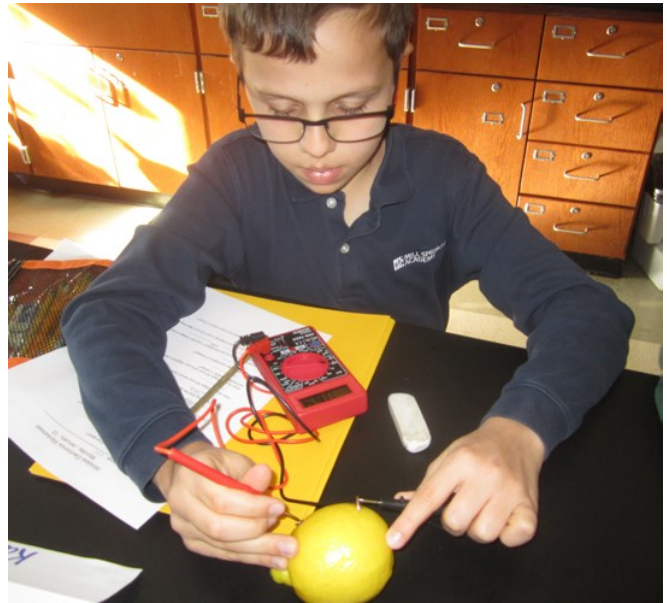
57F Sunny & dry		125ft ABR25400F					2nd Moun
MHz	SWR	Ohms	X	Z	Ø		SWR@Ø
151.11	1.8	70		33	79	27	1.8
149.02	1.6	32		7	33	10	1.6
148.04	1.5	61		21	66	23	1.5
146.99	1.4	56		17	58	0	1.4
146	1.2	40		5	40	0	1.2
145.05	1.3	58		12	60	10	1.3
144.04	1.2	56		9	57	0	1.2
143.02	1	46		0	46	0	1
141.99	1.1	57		0	57	0	1.1
140	1.1	54		5	54	0	1.1
135	1.3	37		4	38	0	1.3

Building and installing the antenna was very satisfying to me. I'm still learning the science behind the antenna function. I've also learned a few troubleshooting lessons as well. My good friend/Elmer Jim, N4SEC, proved instrumental in helping me sort out some start up issues with the radio settings.

Please feel free to contact me if you've got any questions regarding the antenna. You can reach me at mjrwrr@hotmail.com.

Thanks & 73,
Mike Riley KN4OAK





Left: Chuck Catledge AE4CW has some Mills Springs Academy students move a magnet near a coil of copper wire while watching a galvanometer. Right: A Mills Springs Academy student makes a battery out of a lemon. (Photos by Martha Muir W4MSA)

Bringing Ham Flavored STEM into the Classroom

By Martha Muir W4MSA

Members of the North Fulton Amateur Radio League (NFARL) spent a week working with some 7th and 8th grade students at Mill Springs Academy in Alpharetta, Georgia, teaching them some fundamental concepts of electronics with direct applications related to amateur radio. This is part of a program at Mill Springs called Winter Learning where students get to take a week-long seminar on a specialty topic. This specialty topic was titled "Electricity is Magnetic!" and was organized by Chuck Catledge AE-4CW and Jim Stafford W4QO.

Leading off this seminar on Monday was Chuck's presentation on the relationship between electricity and magnetism during which Chuck dropped a magnet through a PVC pipe and then one made of copper. Why didn't they fall at the same rate? Chuck then had the students move a magnet near a coil of copper wire while watching a galvanometer.

Chuck had the students make lemon batteries and shocked them all by forming a human wire that was connected to a Wimshurst machine. Chuck also had the students work with, manipulate, and make calculations with Ohm's Law. He then had the students put together simple circuits using some Snap Circuits kits. They made measurements and compared them to the calculated values they had determined earlier.

On Tuesday, Jim expanded on the fundamentals that Chuck had presented by further studying the many mea-

surements that can be obtained using multi-meters. The multi-meters were donated to the school by members of the North Fulton Amateur Radio League in Fulton County, Georgia. Jim had the students look at the color codes on some resistors and compare those indicated values with the actual values using the multi-meters. He had them calculate the resistance to limit current to an LED and then took the students through the steps to make an aluminum foil capacitor. He reinforced the basic design of an inductor by having them wind a coil of wire as an inductor.

On Wednesday, Garry Brass AK4NA spoke with the students about the various components that make radio communications work. He presented both the schematic images and actual items. The class started calling diodes 'the electricity police' since they restrict current to go just one way. Garry added interest to his presentation by sharing some of the experiences he had while serving as a geological oceanographer aboard various research ships, including some ice breakers that passed through the Arctic.

Later that day, Mike Cohen AD4MC taught the students about digital radio communications and also about ARES (Amateur Radio Emergency Services). A student, who was too shy to get on the air when we used HTs (Handy Talkies) during a simulated emergency net, fell in love with Mike's use of fldigi (fast light digital) to pass messages between laptop computers without the use of the Internet.

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Under the supervision of members of the North Fulton Amateur Radio League, Mill Springs Academy students work on their soldering techniques. (W4MSA photo)

Thursday brought a flood of Elmers to my classroom for what every student in this seminar listed as his/her favorite activity of the week: building a radio! Using Elenco AM-780 kits (which turned out to be an exceptional project) and with the guidance of Jim, Chuck, Garry, Tammy KK4USM, Grant KK4PCR, and Dana KN4BEV, the students attached and soldered all the various components, many of which had been talked about by Chuck, Jim, and Garry on previous days. The results were functioning AM radios, which they could tune to find local stations that were broadcasting sports, news or music. "My mom is not going to believe I built this!" gushed one student.

On Friday, Jim covered the nature of radio waves, including frequency vs. wavelength. Building on the many lab experiences that came before, Jim helped the students make and measure the quality of a simple wire dipole antenna.

Then Wes Lamboley W3WL dazzled the students with his Tesla coil and stories of his worldwide travels seeking out adventures in ham radio. Some of the students in the seminar had just read the story of Shackleton's near-disastrous attempt to cross Antarctica in 1914 in their Literature class. Wes regaled the students with stories of his DXpeditions to

Below: Mike Cohen AD4MC Mike AD4MC watches as a student tries out fldigi (fast light digital) communications. (W4MSA photo)



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Garry Brass AK4NA spoke with the students about the various components that make radio communications work. (W4MSA photo)

South Georgia and other areas traveled by Shackleton.

Concluding this week-long seminar was John Kludt K4SQC. It's a rather rough position to have to follow all the other activities that week but John did a great job. He presented the MAREA (Mars Lander Amateur Radio Robotics Exploration Activity) Boe Bot, a robot designed to simulate driving the Mars rovers. MAREA is controlled using commands sent by radio. It required the students to set up a path that the robot needed to cover and then input a series of commands to get the robot to follow that path. Distances needed to be measured and converted into rotations of the wheels, and angles needed to be measured to determine turns for the robot. After a few runs off the course, the students got the hang of programming the robot and upgraded their paths to more challenging ones. This seminar was designed to cover fundamental aspects of electronics with students, none of whom had finished a year of Physical Science, much less Physics. The ham mentors in this class did a marvelous job presenting these topics at a level these students could understand. The hands-on experiences, many ham radio-based, allowed the students to get the feel for how fun a future career in STEM could be. The Electronics class was followed by a

Students watch the robot steer through the maze. (W4MSA photo)





Garry AK4NA works with two students concurrently. (W4MSA photo)

week of license preparation helping students prepare for the Technician and General class exams.

A word about the North Fulton Amateur Radio League, which passed its 40th anniversary in 2017. NFARL is about the 10th largest general-purpose club in the US with almost 300 members. The club is located in Fulton County, Georgia, about 25 miles north of Atlanta and was the 2010 Dayton Hamvention Club of the Year – the first time the award was given. You can learn more about this exciting club by going to their website of over 300 pages at nfarl.org.

A word about the author of this article: Martha Muir W4MSA is a science and STEM enrichment teacher at Mill Springs Academy in Alpharetta, Georgia (www.millsprings.org). It has been a pleasure to meet and work with the great members of NFARL to bring the fun, camaraderie and STEM content embodied in ham radio to the students at our school. I am presently serving as the ARRL Section Youth Coordinator and Assistant Section Manager—Youth for Georgia as well as the current Secretary of NFARL. Thanks, NFARL.

Students are so proud of the radios they built. (W4SMA photo)



Mill Springs Academy's School Club Station

You can see most of our station in the background of the above photo of the August 2015 issue of *QST*. It was started with a School Station Grant from ARRL. Our school club's call sign is WA4MSA. Our club was established after we had our first three students earn a license (plus me, that made the four required for an official club) in 2013. The highlights of our program have been the two ARISS Radio Contacts we did in September 2013 and again May 2018. Both of those involved the whole school for mesmerizing experiences for all present.

We usually participate in the School Club Roundups, but generally not as the contest it is designed to be. Rather, we use it as an opportunity to introduce ham radio to anyone interested in 'playing radio,' whether they are in our club or not and licensed or not. (Lessons to be learned: Ham radio is fun! You don't have to know to whom you are speaking to have fun in a conversation. Hams are nice people.)

Once again, our mentors from NFARL help with this since I cannot give up that much class time during those weeks. Photos of our students participating in the SCR have appeared in *QST* in promotions for future School Club Roundups.

Our NFARL mentors have invited students in the Mill Springs ham program to go with them to present aspects of ham radio to other schools and at various public events such as the Atlanta Maker Faires and the Atlanta Science Festival's Expos. Two of our students have presented a session as part of Carole Perry's Youth Forum at the Dayton Hamvention. — Martha Muir W4MSA

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eNews can be located online at:

<https://www.nfarl.org/enews/eNewsIndex.html>

Club Repeaters

Frequency—Description	P.L. Tone	Location
145.470 (-) EchoLink Node 560686 NF4GA-R	100 Hz	Morgan Falls
147.060 (+) Primary ARES Repeater	100 Hz	Roswell Water Tower
* 224.620 (-) Joint Venture with MATPARC	100 Hz	TBD
443.150 (+)	100 Hz	Roswell Water Tower
444.475 (+)	100 Hz	Morgan Falls
* 927.0125 (-)	146.2 Hz	TBD

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