



Radio Waves

News you can use for license instruction and radio science education

ARRL — The national association for AMATEUR RADIO

Winter 2015

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Don't Miss...

In the last issue of *Radio Waves*, we told you about the K4AMG Memorial Amateur Radio Club and how it helped introduce Amateur Radio into the curriculum in a high school in Chesapeake, Virginia. You'll find more on that effort in the related article, "Teaching the Future with Ham Radio," in the March 2015 issue of *QST*. To view it online now, visit www.arrl.org/articles-and-stories.

High School Club Radio Active in Fargo

BY EDITH LENNON, N2ZRW

At the Shanley High School Amateur Radio Club, KDØTCP, in Fargo, North Dakota, the students really take charge.

"I have told them that it is their club, and that my job is just to make sure no one dies," jokes science teacher Tim Cruff, KØCRF, of the organization he began in 2012 in this Catholic school.

His words must have sunk in, because members are deeply involved in many aspects of Amateur Radio. They can even achieve a varsity letter in Radio Club, provided they earn their licenses, continue their education, provide service to the school and community, are active in club activities and on the radio, and meet the basic academic standards of the school.

For community service, last year KDØTCP hosted the Red River Radio

Amateurs and their emergency communications trailer for the North Dakota QSO Party. Students have also operated their own site for Field Day, assisting with the Fargo Marathon as spotters at safety stops, and volunteer for just about every run, bike race, or walk for area charities. Academically, students have used their Amateur Radio knowledge to design payloads and launch high-altitude balloons.

The club is open to high school and middle school students. So far, nine students have earned their licenses and five their high school letters. "We just had about a dozen new students sign up, so the [current members] are going to start working with them on studying for their exams," says Cruff.

Edith Lennon, N2ZRW, is Contributing Editor to Radio Waves.



Patrick Donegan, KDØVSX (rear), then a junior, operates from the Red River Radio Amateurs' emergency communications trailer during the North Dakota QSO Party in 2014, as Alan Schoberg, AIØQ, looks on. (Photo by Tim Cruff, KØCRF)



(From left to right) 2015 RARC president David Robinson, KJ4LHP, instructor Buck Vaughn, KR4NL, at the microphone, and instructor Bruce MacAlister, W4BRU, demonstrate the effectiveness of SSB over AM by showing the RF envelopes. (Photo by Joe Mahoney, KI4GAP)

Enrichment in Richmond — Club Takes a Faculty Approach

BY BRUCE MACALISTER, W4BRU

Like many organizations of its kind, the Richmond Amateur Radio Club, in Richmond, Virginia, offers licensing classes for new and upgrading hams. But RARC has developed a robust core teaching team that also allows it to provide enrichment instruction to help radio amateurs enjoy their hobby to the fullest.

We are a “faculty” of 13 instructors. There is one teacher each for Tech, General, and Extra, with assistant instructors most semesters. The assistants take a class when the lead instructor can’t be present, so that accounts for six. The other instructors are for our enrichment classes: “Electronics for Hams,” “Morse Code,” “Antenna Modeling,” “D-Star Setup & Operations,” and “HF and DX Operations.” Those classes are taught based on demand and instructor availability. For example, last year we taught “Electronics for Hams” for the first time in a few years, owing to the lack of a willing instructor previously. We offer Technician, General, and Extra class licensing instruction every semester if there are three or more students for a class. Occasionally, we have a semester when the instructor isn’t available and I’m not able to back-fill with one of the assistants. That happened with the Extra class last year.

We really do operate as a faculty. For example, in the exam prep classes we all share a set of demos and show-and-tell

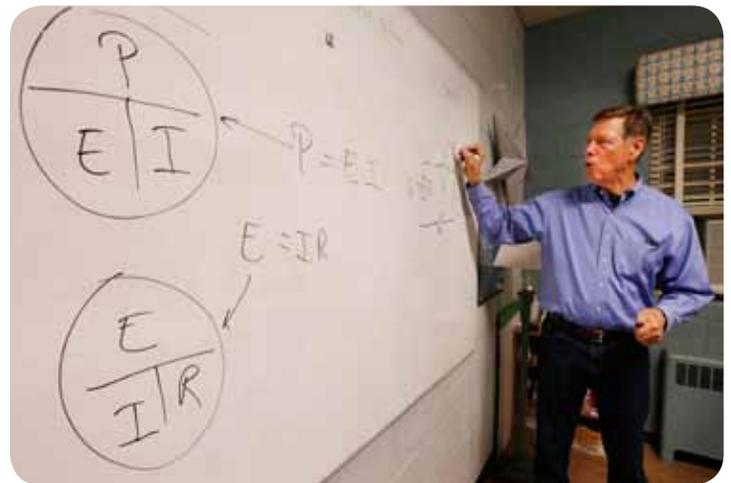
components. We find that demonstrations and tactile learning (handing components around, pushing buttons on transceivers, etc.) aids learning for many students.

Those classes basically follow the ARRL texts with a push to use the QRZ topical tests as practice during the week. Instructors have their personal notes that supplement the text.

Each year, about 15 to 25 hams take the enrichment classes and about 60 take the licensing classes, with half being Technician students. Our classes are open to all, not just RARC members, and even some of our instructors are not club members. They last 10 weeks, with an exam offered by our VEs at the end. Students pay \$15 a semester no matter how many classes they take. We make an annual contribution to the church that gives us good teaching facilities and we have the cost of teaching supplies to cover.

To learn more about what we do, visit our website at <http://rarclub.net>.

Bruce MacAlister, W4BRU, a ham since 1995, is an instructor in the RARC radio school. He is a retired computer-software engineer, project manager, and technical writer.



Instructor David Hines, K4HIN, helping students in the General class with an exam question requiring a knowledge of both Ohm’s Law and power formulas. (Photo by Joe Mahoney, KI4GAP)

Update on Recent ARISS Activities

Recent ARISS Contact Has Far Reach

Interviews with the crew aboard the International Space Station continue to mesmerize many young people who get to enjoy contacts with them through the Amateur Radio on the International Space Station (ARISS) program.

A direct radio contact with students at **Richmond Heights Middle School** and at **BioTech @ Richmond Heights High School** in Miami, Florida, via W1HQL, was successful on January 15, 2015. Astronaut Samantha Cristoforetti, IZØUDF, answered 12 questions for an audience of 400 students during the 10-minute contact window. Local NPR affiliate WLRN posted a story and some audio of the interview [here](#).

Reaching beyond the immediate audience of that contact, students in Elsie Martinez' second grade class at **JB**



Astronaut Samantha Cristoforetti, IZØUDF, on the radio with students from the ISS.

Muller Elementary School in Laredo, Texas, witnessed a live feed of the event streamed over the Internet. Martinez shared the following comments about her students' reactions to the experience with Assistant Principal Dan Mateo at BioTech High School, who then passed them along to *Radio Waves*:

My students are 7–8 years old and while they are very young, I was able to see how watching this live feed sparked curiosity and interest in them. They were attentive during the viewing and full of questions when it was over. Some asked to know more about the astronauts in space. Others wondered what it is like to be a student in your school and have

the privilege of learning science with hands-on field work.

I, as an educator, especially enjoyed listening to one of your students ask Miss Cristoforetti about her education and the importance it played in her career. It led my classroom discussion into their future plans and reinforced the message that an education is necessary, and that with an education and perseverance, they can achieve greatness.

It is never too soon to expose these children to the possibilities that are out there. After watching and discussing the video, they began talking among themselves about how exciting it would be to visit space or work for NASA.

Fifteen U.S. Schools Move Forward into Next Stage of ARISS Selection

The ARISS US management team recently announced that 15 schools/organizations that submitted a proposal during the latest proposal window have been accepted to move forward into the next stage of planning for a scheduled contact. They must now complete an acceptable equipment plan demonstrating their ability to execute the ham radio contact. For the list of the schools/organizations and for further details, refer to the ARRL news story [here](#).

ARISS US will open a new proposal window in mid-February for schools/organizations desiring to host a scheduled contact in early 2016. Watch for details at www.arrl.org/hosting-an-ariss-contact.



Astronaut Wiseman Praises Amateur Radio on YouTube Interview

Aboard the International Space Station, Expedition 41 Flight Engineer Reid Wiseman, KF5LKT, of NASA discussed life in space during an in-flight Q&A session October 10. Wiseman answered questions fans submitted on YouTube using #askAstro. Questions ranged from aliens in space to the investigations happening onboard to benefit Earth and included a question from a young ham in the U.S. wanting to know what he thought about ham radio. Listen to Wiseman's answer at www.youtube.com/watch?v=5nLFNG-Njlo.

Instructor Corner — News, Ideas, Support

What's Worthy on the Web



Larry Kendall, K6NDL, demonstrates Lenz's Law with a "magnet falling through a pipe" for Elena Gaston, KM4DHG, at the Teachers Institute. Find details on this demonstration at www.arrl.org/instruction-teaching-and-study-aids. (Photo by K1DMJ)



Do you have a suggestion or resource to share with your fellow instructors? Send it to Debra Johnson, K1DMJ, Education Services Manager, at djohnson@arrrl.org



ITC Discovery Videos

The ITC's (International Telecommunication Union's) ICT Discovery mission is "to entertain and educate the public on the evolution and exciting future of ICT alongside the role of ITU in connecting our world and facilitating the transformation of people's lives everywhere." (ICT stands for information and communication technologies.)

Following are links to ITC Discovery videos on YouTube that offer brief, easy-to-understand explanations of what's behind some of our most common forms of telecommunications:

"How radio works" — www.youtube.com/watch?v=db5iyApKbsU

"How television works" — www.youtube.com/watch?v=CfP5PgXV3Fw

"How telephone works" — www.youtube.com/watch?v=Ygrx3yVeyFO

"How satellite communication works" — www.youtube.com/watch?v=HC_RAhz6duA

Electromagnetism & Magnets Demo

A magnet/copper pipe YouTube demo provides a useful illustration of basic principles of radio science: how radio waves travel and the role of electromagnetic fields. A magnet's movement is seen to create a current that lights an LED. Point your browser to www.youtube.com/watch?v=tV1v4AO1Uss.

Science Buddies for the Classroom

The website of the award-winning, non-profit organization Science Buddies (www.sciencebuddies.org) offers teachers and parents free project ideas, from beginner to advanced, from all areas of science. You'll find a wealth of material in the Electricity & Electronics category.

The physics section has projects relevant to radio/satellite communications, including one called, "Outer Space, The Silent Frontier: An Experiment on Sound

Waves." There's even a project that involves setting up an Amateur Radio station to contact the International Space Station.

There are many other suggestions to explore, as well as a handy chart that demonstrates how Science Buddies projects can fulfill Next Generation Science Standards. Follow this path to the url: www.sciencebuddies.org/science-fair-projects/teacher_resources_ngss_standards.pdf.

Education & Technology Program News

Announcing 2015 Teachers Institute Professional Development Seminars

ARRL's Education & Technology Program will be offering three sessions of the "Introduction to Wireless Technology" seminar and one advanced seminar on "Remote Sensing and Data Gathering" during late June and July 2015 (see box below for dates and locations).

Applications will be available on our website by mid-February and are due

back by May 1, 2015. Read more about this professional development opportunity at www.arrl.org/ti and look for an announcement in the March issue of *QST*. Brochures will be available to share with interested teachers. The Teachers Institute is open to teachers of students in grades 4–12, as well as those instructing at the post-secondary level.

2015 Teachers Institute Schedule	
Dates	Location
TI-1 Introduction to Wireless Technology	
June 22–25, 2015	Parallax, Inc., Rocklin, CA
July 7–10, 2015	ARRL Headquarters, Newington, CT
July 13–16, 2015	Dayton Amateur Radio Assoc., Dayton, OH
TI-2 Remote Sensing and Data Gathering	
July 20–24, 2015	ARRL Headquarters, Newington, CT

Teachers Institute Feedback

ARRL receives anonymous feedback from evaluations students complete at the conclusion of every Teachers Institute. Here's a sampling of what our graduates had to say about their experiences:

"This seminar was my first experience with remote data and sensing using Amateur Radio...the hands-on way the instructor led the class helped me gain the knowledge and confidence I needed for implementing a data collection/remote sensing facet in my science classes." (TI-2 graduate)

"I'm used to thinking about many of the electronics and radio wave concepts from a 'first principles' physics approach, so it was really helpful to see how they could be presented in a straight-forward manner in relatively little time...I'm walking away from the workshop much more excited about ham radio for myself and a teaching tool!" (TI-1 graduate)

"I was really inspired by the instruction, the clarity of ideas presented, and the amount of information crammed into a 4-day session....It was intense, and I learned a lot." (TI-2 graduate)



Robert Kim, licensed as KC3DGU while at the Teachers Institute last July, watches his robot perform in the maze challenge. (Photo by K1DMJ)

Fund a Seat at the Teachers Institute

You can provide an opportunity for students to learn about Amateur Radio by educating a teacher.

Consider the impact one enthusiastic teacher can make on a single classroom, or on several sections of students, during a school year. Perhaps this could be a rewarding fundraising project for your club, or a way for you as an individual to make a difference. With your help, ARRL can continue its important work of training teachers and inspiring young people with Amateur Radio in their classrooms.

The Teachers Institute is supported by donations to the Education & Technology Fund. ARRL President Kay Craigie, N3KN, herself an enthusiastic donor to the Education & Technology Program, explains her personal passion for this program in her letter to ETP donors. You'll find it posted on our website, linked to the ETP Fund page, at www.arrl.org/education-and-technology-fund.

Dayton Amateur Radio Association has funded several sessions of the TI over the years, enabling us to offer training and resources to over 60 teachers. The ability to provide funding on that scale is not possible for most clubs, but you can contribute on a more manageable scale. Follow the lead of Gwinnett Amateur Radio Society, W4GR, in Gwinnett County, Georgia, and of Lee Ciereszko, N4TCW, who decided to fund a seat for one participant.

Direct costs to provide for travel, accommodations, instruction, and resources for one teacher at the TI are \$2,000–\$2,500. Donations from the ham radio community have helped the ARRL Education & Technology Program provide training and resources to more than 650 teachers since the TI's inception in 2004. Let's keep a good thing going, one teacher at a time!

2014 ETP Grants Awarded



Members of KB3WOA, the radio club at Forest Knolls Elementary School, Silver Spring, Maryland. (Photo by Melissa Happ, KB3VEX)

Grants awarded through the November 2014 grant cycle included school station grants to Banning Lewis Academy in Colorado Springs, Colorado, and Southport Elementary School in Kenosha, Wisconsin. Progress grants were awarded to Ankeny Centennial High School in Ankeny, Iowa, Forest Knolls Elementary in Silver Spring, Maryland, and South Hopkins Middle School in Nortonville, Kentucky. For details, point your browser [here](#).



Learn more about the ETP Grant Program at www.arrl.org/etp-grants.

Licensing Updates

Revisions to General License Question Pool

As you are probably aware, the FCC question pool for Amateur Radio General license exams will change effective July 1, 2015. The new pool has been released by the Question Pool Committee (QPC) of the National Conference of Volunteer Examiner Coordinators (NCVEC) and is posted on its website at www.ncvec.org/ama_news_article.php?id=112.

This question pool becomes effective for all Element 3 examinations to be administered on July 1, 2015, and remains valid until June 30, 2019.

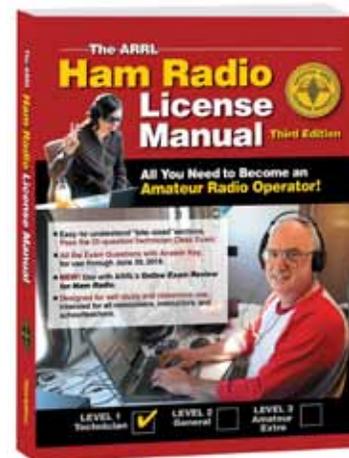
According to NCVEC's QPC Chair Roland Anders, K3RA, the General class question pool was reviewed to remove questions that have become somewhat outdated and to add others on topics that have newly entered the hobby. The biggest change is

the added emphasis given to digital communications.

ARRL study manual author Ward Silver, NØAX, has developed a spreadsheet cross referencing the existing General question pool with the new pool for July 2015. This will help instructors identify where they need to make changes in their General license preparation instruction. The spreadsheet is posted on the ARRL website at www.arrl.org/instruction-arrl-resources.

New ARRL Student Study and Instructor Materials

ARRL will be updating its student study manual, the *ARRL General Class License Manual*, and *ARRL's General Q&A* for release in April. The League is also developing materials for General license upgrade instruction, including lesson plans and PowerPoint® slides



Watch for the new *ARRL General Class License Manual* coming soon.

that will correspond with the sequence of presentation of topics in the new edition of the student study manual. The new lesson materials for General license instruction will be offered in a print publication that will be combined with the materials already available as a free download from the ARRL website for Technician license instruction. Find out what's currently available at www.arrl.org/instruction-arrl-resources.

The new, coordinating PowerPoints for General instruction will be available for ARRL-registered instructors to download from the ARRL website. The League expects to have the General instructor publication available in the ARRL store soon after the release of the new study manual.

Those who prefer electronic versions of the study manuals will be pleased to learn that the recent 3rd edition of *ARRL's Ham Radio License Manual* and *ARRL's Tech Q&A* are now available for sale in a Kindle version. Kindle editions of the new 8th edition of the *ARRL General Class License Manual* and *ARRL's General Q&A* are also planned.

2014 Licensing Statistics

The following 2014 year-end report of FCC licenses issued is supplied by Maria Somma, AB1FM, ARRL VEC Manager.

At the end of December, the total number of U.S. Radio Amateurs licensed in the FCC database was 726,275, the highest number ever!

New amateur licenses issued were up by an incredible 15% compared to 2013 (33,241 versus 28,886), setting a record in recent years.

Upgraded amateur licenses were also up in 2014 by an unprecedented 13% (10,556 versus 9,325).

FCC RESULTS THROUGH DECEMBER			
License Action	2013	2014	% Change
New Licenses	28,886	33,241	15%
Upgraded Licenses	9,325	10,556	13%

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Teachers Institute on Wireless Technology:
www.arrl.org/teachers-institute-on-wireless-technology

ARRL Program:
www.arrl.org/amateur-radio-on-the-international-space-station

Announcements, Upcoming Events, Opportunities, and Deadlines

School Club Roundup — The 2015 Winter/Spring Term for the School Club Roundup will run from **February 9–13**. For details, visit www.arrl.org/school-club-roundup.

ARISS Proposal Window — The ARISS Program will open a proposal window in **mid-February** to accept submissions from educational organizations seeking to host scheduled contacts with the ISS in 2016. Visit www.arrl.org/hosting-an-ariss-contact for more information.

Thinking Day on the Air (TDOTA) — This event gives members of the World Association of Girl Guides and Girl Scouts an opportunity to talk to other members from all over the world via Amateur Radio. This year it will be held on **February 21–22**. Visit www.guides-on-the-air.co.uk.

Teachers Institute — The ARRL Teachers Institute is accepting applications for 2015 sessions. The application deadline is **May 1, 2015**. For more information, visit www.arrl.org/teachers-institute-application.

FAR Amateur Radio Scholarships — The 2015 FAR (Foundation for Amateur Radio) Scholarship application form is now available on the FAR web site (www.farweb.org). The deadline for application receipt is **March 30, 2015**.

Herb S. Brier Instructor of the Year Award — The deadline for nominations for this year's Herb S. Brier Award is **March 15, 2015**. This award was created to recognize amateur radio instructors who demonstrate effective teaching and dedication. Visit www.arrl.org/herb-s-brier-award for details. Please note that the documentation that must accompany a nomination may take some preparation time.

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