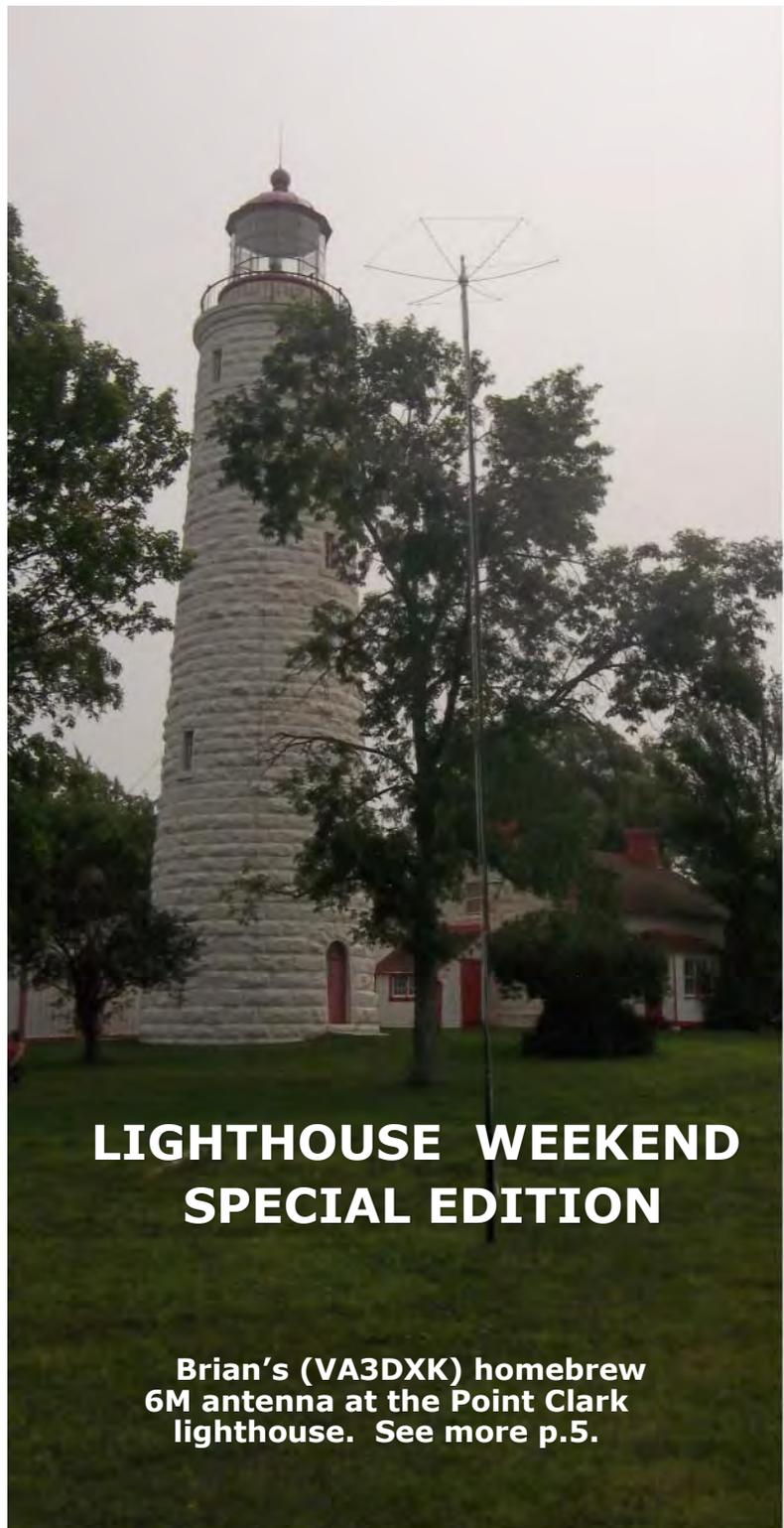




AUGUST 2018

Volume 7 Issue 8

VE3ERC-LUB



LIGHTHOUSE WEEKEND SPECIAL EDITION

Brian's (VA3DXK) homebrew 6M antenna at the Point Clark lighthouse. See more p.5.

- President:** Brian VA3DXK
- Vice-President:** Ted VE3TRQ
- Secretary:** Tom VE3DXQ
- Treasurer:** Paul VA3PDC
- Trustee:** John VE3JXX
- QSL Manager:** Paul VA3PDC
- Repeater Manager & Maintenance:** Wes VE3ML
- Website Admin:** Ted VE3TRQ
- Lighthouse:** Al VA3TET
- Maple Syrup Display:** Al VA3TET
- Newsletter:** Bob VE3IXX

ERC REPEATERS

- UHF 444.700 TONE: 131.8**
- UHF 444.700 TONE: 123.0**
- VHF 147.390 + TONE: 123.0**
- EMERGENCY SIMPLEX: 147.51**
- UHF- IRLP node 2404**
- VHF- IRLP node 2403, ECHOLINK node VE3ERC-R**

**In an emergency, tune
Into our repeaters,
UHF 444.700 or
VHF 147.390 or
HF 3.755 LSB or
Simplex 147.510
For coordination and
assignments.**



**Radio Amateurs
of Canada**

THE PREZ SEZ!

This club is Radio-ACTIVE
 This club is Radio-ACTIVE



President's Update for August 2018

As August draws to a close it seems right to look back over this last month of summer and the **Elmira Radio Club VE3ERC's** participation in the Lighthouse activation weekend at **Point Clark Lighthouse CA0011** on the eastern shore of Lake Huron. Great weather, a superb location, and wonderful comradery all came together to provide an absolutely fantastic time for our club's cherished third weekend in August event.

Several new homebrew antennas including an End fed open wire suspended from the lighthouse and a 6m hex-beam, graced the skyline and complimented the towering white limestone facade of the lighthouse. Our in-trailer security officer Frank VA3FJM monitored the site twenty-four-seven as they say, and AL VA3TET outdid himself yet again with his BBQ burgers and fried onion-mushroom toppings.

We were joined by Barry VE3ISX of ONTARS, Alicia VA3KGZ and other members of the VE3IHR Inverhuron Ham Club who were activating the Kincardine Lighthouse but decided to join us late in the day for socializing. Even our American friend Dan KB6NU and his wife made the long trek from the U.S. to join us once again! The public showed considerable interest in our goings on over the airwaves with several mentioning they will return to the lighthouse next year for the occasion and the burgers!

Thanks to Barry's VE3ISX comradery and support you can check out the photos and captions whereby he documented our event on the ONTARS website. As always Barry, an open invitation stands for this enjoyable event! http://www.ontars.com/Special%20Events/Lighthouse_erc_2018/index.html

Please remember to join us on **Wednesday, September 26th** at the Elmira Firehall for our Elmira Radio Club September Meeting.

The Golden Age of Wireless — some contend that the 1920s and 30s advent of vacuum tubes and heterodyne radios ushered in the Golden Age of Wireless. I disagree, the 'airwaves' are more active and diversified then ever. I challenge you to consider that we are living this Age right now! Check out my article 'Airwaves, Radio & the Golden Age of Wireless' (**on page 15**) and see if you agree with me.

Speaking of innovation, discovery, and advancement of Radio, have you considered signing up for the Elmira Radio Club's premier **HAM TECH Seminars** to advance and stimulate innovation in the amateur radio community. Time is running out for this premier day long event on September 22, 2018 at the Elmira Royal Canadian Legion Hall. Five speakers will present a variety of innovative, cutting edge topics geared to the amateur radio enthusiast. We are living in the Golden Age of Radio - come register, check it out!

HAM TECH Seminars to Register: e-mail raclausi@rogers.com
 -see the HAM TECH Flyer contained herein

Back-of-the-Napkin Eyeball

QSO notes and stuff

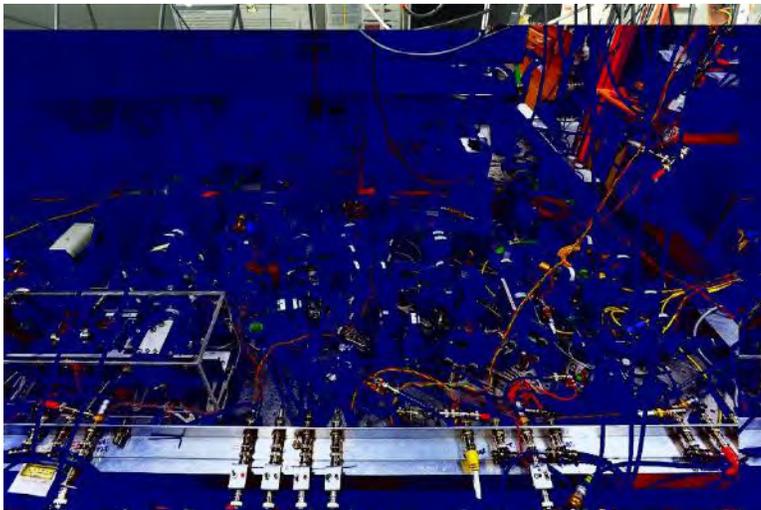
by Rich, ve3DCC

AUGUST 2018

We are in the process of completing our plans for the Elmira Ham Tech Seminar day set for Sept. 22, less than one month from today. It is a wonderful opportunity to spend a relaxed day with fellow amateurs in a congenial setting (The Elmira Legion Hall) and learn a bit more about the hobby. The \$30 registration includes lunch—what a deal!!! I hope you can attend. See the details, below , to register.

Al, va3TET and I had an opportunity to visit the Institute for Quantum Computing in Waterloo at the invitation of one of our Seminar speakers, Dr. Katanya Kuntz. She also invited us to two feature seminars- the first on "Controlling a Quantum Computer with Code" and the second on "A Universal Training Algorithm for Quantum Deep Learning". We also toured an "in-progress" laser experiment that was especially fascinating.

The laser experiment featured a large "table" where mirrors and lenses criss-crossed light paths to eventually pass thru crystals. The two light streams were in fact "entangled" particles from a common source. The light source was a \$250,000 engine that generated the entangled "photons". Our host mentioned that there are less precise devices available in the \$1000 range that might be of use to the Amateur Radio community. In my earlier columns, I have mentioned the interesting implications for the development of communications devices. I wonder if ,eventually, there will be exciting innovations from Hams in this field. Katanya was good enough to send me a photo of her ,similar, PHD experiment in Australia. This setup would be at home in any Ham basement! There is just the right number of wires and complexity to speed your heartbeat.



Al and I were pleasantly surprised to find that it all made sense when we looked at this in the context of what we knew as hams. At one point, over lunch, Al exclaimed, this is side-band and modulation at a quantum level. Our Phd hosts smiled and agreed. Somehow this just made sense—An MFJ publication, "Antennas and Transmission Lines" by John A.Kuecken begins

by defining an antenna as a "device which launches, retrieves or focuses an electromagnetic wave. This definition clearly includes topics which were

once considered in the realm of optics." The behaviour of light "waves" provides insights into the behaviour of RF. In many ways, these leading edge ideas are natural extensions of what Hams have been playing with for quite a while. We hope that our seminars will interest you, and perhaps open new opportunities for reading and research.

Besides Dr. Katanya Kuntz's talk, we will have: Dr. Gord Hayward ve3EOS will present an innovative use of AM signals to use the velocity of surface acoustic waves (SAW) to determine the binding of cancer bio-markers; Ted Rypma, ve3TRQ, will show how to implement Mesh radio networks; Bob Moyer, ve3NXT, licensee for our local Digital repeater will talk about DMR (Digital Radio); and you will see/hear a real working Model of a small size, big performance antenna by Al,va3TET, and Paul, ve3PVB.

Did I mention Lunch included.....

To register: email your intent to attend by emailing your name, call sign, email address, telephone number to: raclausi@rogers.com and indicate:

"PLEASE ADD MY NAME TO YOUR ATTENDANCE LIST for Saturday Sept. 22 Ham Session"

Then send a \$30 cheque payable to "Elmira Radio Club Inc. VE3ERC". Include your full name, call sign, email address, telephone number and QTH.

To "VE3ERC Tech Seminars c/o R.Clausi, ve3DCC, 1 Finch Place, Elmira, ON, N3B 3B3"

We will send out scheduling information prior to the event.

I hope you can join us.

De ve3DCC, Rich.

**VISIT THE ERC WEBSITE
AT**

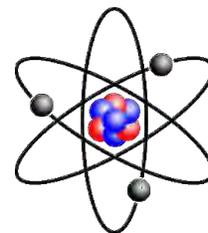
www.ve3erc.ca



ELMIRA RADIO CLUB VE3ERC

PRESENTS:

HAM TECH



**Seminars to advance and stimulate innovation
in the amateur radio community.**

SEPTEMBER 22, 2018 9 am TIL 4 pm
AT THE ROYAL CANADIAN LEGION HALL
ELMIRA, ONTARIO

FEATURED SPEAKERS INCLUDE:

Dr. Katanya Kuntz on Quantum Communications

Dr. Gord Hayward on Innovative Use of AM

Ted Rypma implementing Mesh Networks

Bob Moyer advantages of DMR (Digital Radio)

ERC Presentation: Small Size, Big Performance Antenna. Will demonstrate the characteristic with a real Model

PLUS ADDITIONAL SPEAKERS PENDING CONFIRMATION

\$30.00 INCLUDING (light) LUNCH

REGISTER EARLY! ONLY 50 SEATS AVAILABLE.

To Register: e-mail raclausi@rogers.com

Then Send a cheque payable to "Elmira Radio Club Inc VE3ERC"

To: VE3ERC Tech Seminar

c/o R. Clausi, VE3DCC

1 Finch Place, Elmira, ON, N3B 3B3

(Include full name, call sign, e-mail address, telephone number and city)



Pictures courtesy of Barry VE3ISX and ONTARS website.



Brian VA3DXK on 6M



Dan VA3SQD with XYL Anik running Ft-8 on his IC-7300



When the bands were very poor for RF QSO's the Eyeball QSO's were a-plenty!



Barry VE3ISX and AI VA3TET took turns running ONTARS from 8 to 10 am.



Bill VA3QB and Bruce VE3QB The Twin QB's!



Brian VA3DXK busy on 6meters with Dan KB6NU working the Elecraft KX3

A great number of XYL's attended this year



Tom VE3DXQ and Barb



Judy and Barry VE3ISX who have been adopted into the ERC family.



Tracy VA3TGY and Jason VE3JVG



Sandy and Ted VE3TRQ



Joan, XYL of Al VA3TET talking with Tracy VA3TGY



Dan VA3SQD and Anik

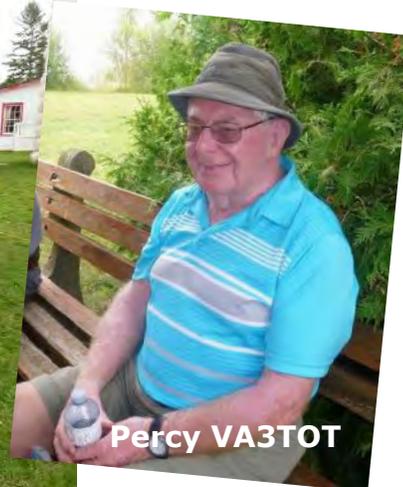
ERC Members mingled with visitors from all over.



Frank VA3FJM



Carol VE3IYY, Marvin VE3VCG, Alicia VE3KGZ with Judy (VE3ISX XYL) and Justin VA3AQZ son of Alica and Rob VE3PCP



Percy VA3TOT



Paul VE3PDC



Al VE3AUS, Ken VE3KCY, Barry VE3ISX



Bob VE3UTA



Al VE3AUS with XYL



Ted VE3JFI/VA3BT, Bruce VE3EAR



Bob VE3IXX



Barry VE3ISX with Dave VE3DJL
"On the Wild side!"



Chef Al VA3TET prepping his gourmet dish.



Ted VE3TRQ with Brian VA3DKX taking vector antenna measurements.



The gang, taking a break to pose for a picture of the "YMCA" for a group of young people on a scavenger hunt.



Jason VE3JVG Dennis VE3UTN and Frank VA3FJM

And then ending the day off with dinner in Kincardine.



Al VA3TET Dan KB6NU and Paul VA3PDC



Alicia VA3KGZ, Justin VA3AQZ, and Rob VE3PCP from Kincardine

**Just next door to Point Clark
the Inverhuron Ham Radio
Club**

**activated the Kincardine
Lighthouse. Once again a
thank you to Barry VE3ISX
and Ontars for the pictures.**



Rob VE3PCP



**From Left to right:
Fred Gibson VE3KHQ, Bob West VE3PCW, Val West
VE3VAL, Doug Hall VE3WRF,
Justin Noakes VA3AQZ, Alicia Noakes VA3KGZ.**



**Rob VE3PCP, Bob VE3IXX (visiting)
and Marvin VE3VCG**

Activating lighthouses during the annual Lighthouse/Lightship weekend has mushroomed this year. Mike, VE3MKX sent the following e-mail and pictures from their weekend at Victoria Harbour.

Pics from the Barrie ARC
Activating a lighthouse in Victoria harbour

Lighthouse # CA0046
<https://illw.net/>

The Barrie ARC set up three portable stations on Saturday and operated from 10am to approx 3pm !

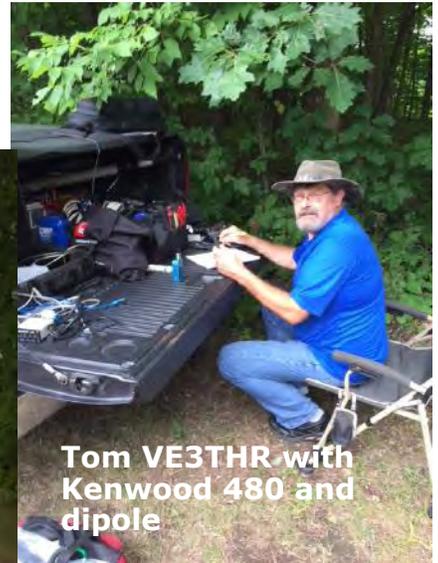
A fun time had by all !
73 Mike



AI VE3RRD- Elecraft KX3 QRP and dipole



John VE3APE, John VE3FDZ, Tom VE3THR, Ian VA3QT, AI VE3RRD, Bill VA3OL, Michele VE3WCX , Peter and Mike VE3MKX



Tom VE3THR with Kenwood 480 and dipole



IAN VA3QT



BILL VA3OL



AL, Ian and JOHN (the awards hunter) Kenwood 480 and dipole



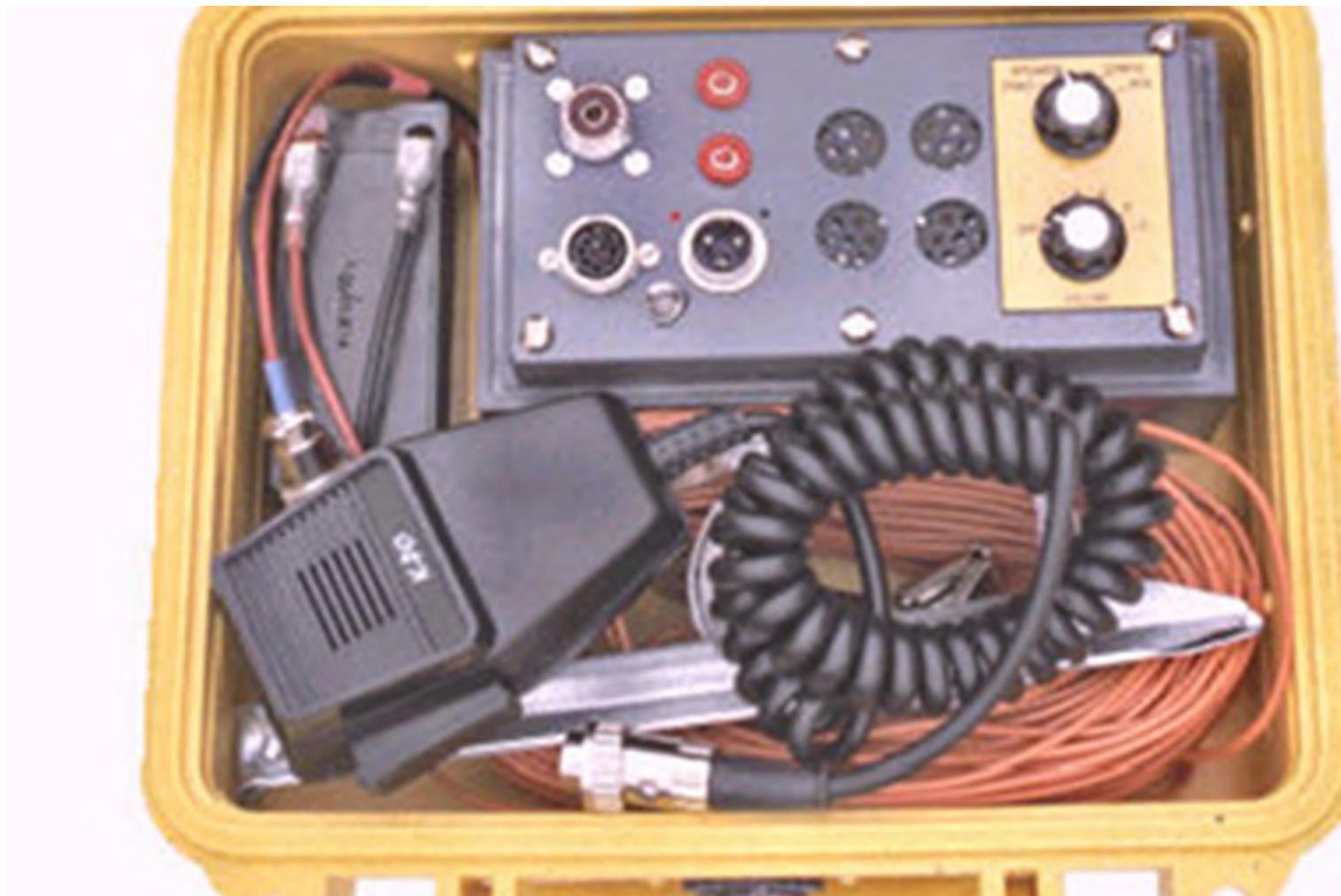
TAY HERITAGE COMMITTEE

Ham-designed Gear Used in Thailand Cave Rescue

by:

Al Williams

July 11, 2018



Unless you live in a cave, you've probably heard a little about the thirteen people — mostly children — trapped in the *Tham Luang Nang Non* cave in Thailand. What you may have missed, though, is the hacker/ham radio connection. The British Cave Rescue Council (BCRC) was asked for their expert help. [Rick Stanton], [John Volanthen] and [Rob Harper] answered the call. They were equipped with HeyPhones. The HeyPhone is a 17-year-old design from [John Hey, G3TDZ]. Sadly, [G3TDZ] is now a silent key (ham radio parlance for deceased) so he didn't get to see his design play a role in this high-profile rescue, although it has apparently been a part of many others in the past.

The HeyPhone is actually considered obsolete but is still in service with some teams. The radio uses USB (upper sideband, not universal serial bus) at 87 kHz. The low frequency can penetrate deep into the ground using either induction loop antennas like the older Molephone, or — more commonly — with electrodes injecting RF energy directly into the ground.

You can find a very detailed article about the radio from 2001 if you want more details. The system is somewhat dated, but apparently works well and that's what counts.

What we find interesting is that in today's world, people take wireless communications for granted and don't realize that cell phones don't work underground or in the face of wide-spread disasters. We would imagine most Hackaday readers know how cell phone towers use "cellular reuse" to support more than a handful of phones. Ask some non-technical friend if they know how a cell phone works and you'll be surprised how few people understand this. Ham radio operators and hackers are vital to building and deploying specialized radio systems in times of disaster or — in this case — where people need rescuing from an odd environment.

We were glad to see a nod to some hacker gear in the popular press. But we almost wish there had been more reporting on the volunteer divers and their hacked radio gear. We've talked about VLF radios before, but not for caving. Of course, in the old days, all radio was VLF and it might have even had some unintended consequences.

<https://hackaday.com/2018/07/11/ham-designed-gear-used-in-thailand-cave-rescue/>

We gratefully acknowledge the permission to reprint this article which was originally published on Hackaday. Here is a shorter link you may use to find this article:

<https://hackaday.com/?p=316089>

- **The article was originally authored by Al Williams.**

Ed.

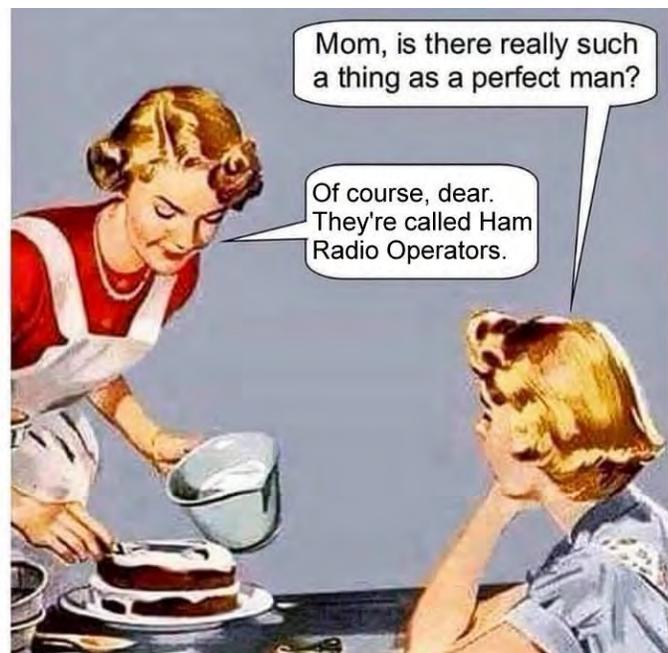
CONTRIBUTIONS TO VE3ERC-CLUB NEWSLETTER

Do you have an article you'd like to submit? Or photos? Do you have any comments you'd like to make?

Perhaps you'd like to share a photo of your shack, a special project you are working on or a special interest!

SEND THEM TO:

**Bob bobve3ixx@gmail.com
(519-787-2279)**



Thanks to Tony VE3DWI for sending this Clip.

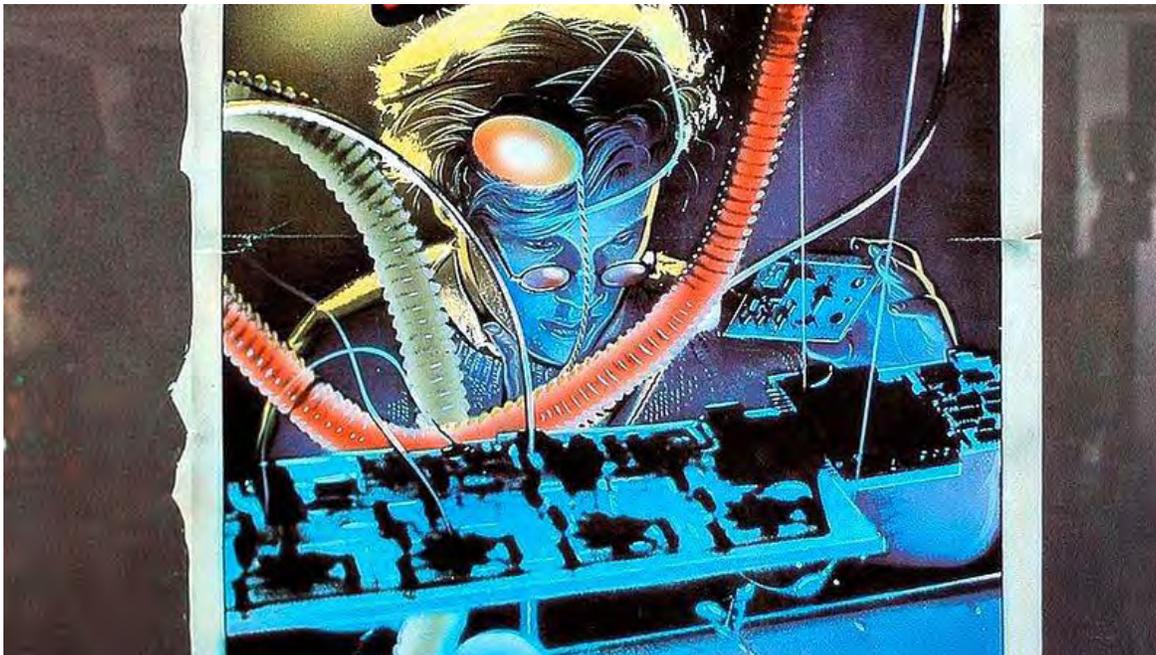
Airwaves, Radio & The Golden Age of Wireless

By Brian Filbey VA3DXK

'The Golden Age of Wireless' is the brilliant debut album by Thomas Dolby. Released in 1982, the album contains the familiar pop hit 'She Blinded Me with Science'. Following the album's overall theme of Radio are the songs 'Airwaves', 'Commercial Breakup', and 'Radio Silence'.

Opening with a eerie channel-change invoking radio wave sequence, this paean to electronic communication is evocative of old-time radio, and it elicits visions of darkened rooms illuminated by the glowing hum of vacuum tubes and crazed inventors who experimented with the 'airwaves'.

'Strange how the scale forms, In tiny patterns,
On my antenna, And The Five O'Clock Show, hello hello...
Through the airwaves, People never read the airwaves,
Do we only feel the airwaves,
I really should have seen through the airwaves'



Airwaves, wireless and the Golden Age of Radio? Are these truly things of the past? Consider an alternate view.

The invention of 'wireless' was originally based on the notion that an invisible 'ether' permeated the universe, and that this medium permitted the propagation or transmission of 'airwaves'.

'Airwaves' — In the late 19th century, luminiferous aether or ether ('luminiferous' meaning 'light-bearing'), was the postulated medium for the propagation of light. Luminiferous aether was invoked to explain the ability of the apparently wave-based light to propagate through empty space, something that waves should not be able to do. Ether was considered an invisible space-filling substance or field, thought to be necessary as a transmission medium for the propagation of electromagnetic or gravitational forces — 'airwaves'.

'Airwaves' or electromagnetic waves? Now-a-days we know better. It started with the discovery of radio waves or electromagnetic waves. Radio waves are a type of electromagnetic radiation that is transmitted in waves or particles at different wavelengths and frequencies.

This broad range of wavelengths is known as the electromagnetic (EM) spectrum. The electromagnetic spectrum includes, from longest wavelength to shortest: radio waves, microwaves, infrared, optical, ultraviolet, X-rays, and gamma-rays. All these types of electromagnetic waves are 'airwaves' that only differ from each other in wavelength. And as we now know, it is these 'airwaves' that have the capacity to transmit music, speech, pictures and other data invisibly through the air.

'Radio' — communication is the transmission of signals by modulation of electromagnetic waves with frequencies below those of visible light. Electromagnetic radiation travels by means of oscillating electromagnetic fields that pass through the air and the vacuum of space. Information is carried by systematically changing or modulating some property of the radiated waves such as amplitude, frequency, or phase.

Guglielmo Marconi, an Italian inventor, proved the feasibility of wireless radio communication. He sent and received his first radio signal in Italy in 1895. By 1899 he flashed the first wireless signal across the English Channel and two years later received the letter "S", telegraphed from England to Newfoundland. In essence Marconi developed, demonstrated and marketed the first successful long-distance wireless telegraph and in 1901 broadcast the first transatlantic radio signal from Newfoundland to England.

'Wireless' — one word with many meanings, the term "wireless" has referred to distinctly different things throughout the past century. The one common characteristic among all these uses of the word is that they all describe a communication product that sends or receives information via electromagnetic waves.

- 1900s—sending a wireless meant you were aboard a ship sending a telegram to the home office to let them know when you'd arrive.
- 1920s-1930s—listening to the wireless meant you could hear the Navy's time and weather reports, USDA's crop and market news, music from broadcast stations, as well as concerts, lectures, and sermons.
- 1980s—talking on your wireless unit meant you had a cellular or PCS telephone.
- 2003—using wireless likely means taking a picture using your digital 3G-enabled cell/PCS phone and sending it, along with a text message, to a friend's Internet email address.
- 2018—using text-messaging, snapchat and other social medium platforms, mesh networks, and digital radio.

'The Golden Age of Wireless' — people will generally consider the 1920s-1930s with the advent of Broadcast stations and tube wireless (radio) sets to be the Golden Age of Wireless. Perhaps the Golden Age of Broadcast radio - but to claim the 'Golden Age of Wireless', I disagree!

Consider the following. The first broadcasting of a radio transmission consisting of Morse code (or wireless telegraphy) was made from a temporary station set up by Guglielmo Marconi in 1895. The broadcasting of music and talk via radio started experimentally around 1905-1906, and commercially around 1920 to 1923. VHF (very high frequency) stations started 30 to 35 years later.

In the early days, radio stations broadcast on the long wave, medium wave and short wave bands, and later on VHF (very high frequency) and UHF (ultra high frequency). In 1930, radio was in its infancy, slowly becoming the essential device in North American homes

The most common type of wireless receiver before vacuum tubes was the crystal set. During the mid-1920s, amplifying vacuum tubes (or thermionic valves in the UK) revolutionized radio receivers and transmitters. A Dutch company made the first regular wireless broadcast for entertainment from the Hague on 6 November 1919. Its program was broadcast four nights per week on AM 670 metres.

On 27 August 1920, regular wireless broadcasts for entertainment began in Argentina. On 31 August 1920 the first known radio news program was broadcast by station 8MK, the unlicensed predecessor of WWJ (AM) in Detroit, Michigan. In 1922 regular wireless broadcasts for entertainment began in the UK from the Marconi Research Centre.

In the 1920s, amplifying vacuum tubes (US)/thermionic valves (UK) were invented, revolutionizing radio receivers and transmitters. Westinghouse engineers developed a more modern vacuum tube.

It took until the 1950s for virtually every country to have a broadcasting system, typically one owned and operated by the government. Alternative modes included commercial radio, as in the United States; or a dual system with both state sponsored and commercial stations, introduced in Australia as early as 1924, with Canada following in 1932.

By 1955, practically every family in North America and Western Europe, as well as Japan, had a radio. A dramatic change came in the 1960s when Sony introduced their first transistorized radio, small enough to fit in a vest pocket, and able to be powered by a small battery. It was durable, because there were no tubes to burn out. This event greatly expanded ownership and usage of radios. Access became practically universal across the world. But this was the 60s so how then could the 30s be the 'Golden Age'?

In the 1960s, VOR systems finally became widespread for aircraft navigation; before that, aircraft used commercial AM radio stations for navigation. AM stations are still marked on U.S. aviation charts.

Over the next twenty years, transistors displaced tubes almost completely except for picture tubes and very high power or very high frequency uses.

It was only in the 70s and 80s that Canada developed a more elaborate and advanced physical structure for delivering radio and television programs than could be found in any comparable country in the world. For example, in 1979 the US had 982 transmitters in operation, but Canada, with a tenth of the population, had 1045 (including rebroadcasting transmitters), a number that grew steadily over the years; by 1981 there were 1225 in operation in Canada, and by early 2010 there were 4918, including digital.

Today there are hundreds, if not thousands, of uses of radio spectrum and technology. Everything from baby monitors and broadcasting to radar, microwaves and radio beacons, remote controlled devices and toys, digital radio, mesh networks, meteor scatter and moonbounce - are all applications of radio. All these devices work by using 'airwaves' and 'wireless'.

Today the picture of the radio spectrum is a color-coded colossus composed of hundreds of bands allotted by the FCC from frequencies as low as 6 kilohertz to as high as 300 gigahertz. Very low frequencies—from 3 to 30 Hz, with wavelengths tens of thousands of miles long—are used to penetrate the oceans and communicate with submarines. Baby monitors operate at 49 megahertz. FM radio is positioned between 88 MHz and 108 MHz, and users as diverse as police dispatchers, air traffic controllers, and cell phone callers all have their own bands. At the upper end of the radio spectrum come microwaves, used for data transmission, radar, and of course, cooking. We keep finding more and more uses for radio, and frequencies never seem to end up on the scrap heap.

Albert Einstein, when asked, in 1938, to explain radio, is widely reported to have said: "You see, wire telegraph is a kind of a very, very long cat. You pull his tail in New York and his head is meowing in Los Angeles. Do you understand this? And radio operates exactly the same way: you send signals here, they receive them there. The only difference is that there is no cat."

I find it interesting in that this alludes to the Shroedinger's Cat scenario or state in which a cat that may be simultaneously both alive and dead, a state known as a quantum superposition, as a result of being linked to a random subatomic event that may or may not occur. This too alludes to cutting edge research into Quantum radio and the modulation of sub atomic particles for the purpose of communication.

Wireless communication is revolutionizing the way we speak to each other, conduct business, socialize, and organize our lives. Today, smartphones, GPS devices and wireless Internet connections are as indispensable as they are commonplace. Our reliance on 'wireless' communication will only increase in the future. In fact, experts believe that by 2020, mobile data traffic will likely be 1,000 times what it is today!

There is still much more to discover about light, radio waves, and electromagnetic radiation. There's potential to gain even greater insights and uncover more secrets about the 'airwaves', 'wireless' and how we can use it.

In fact I'd say that WE are living in the 'Golden Age of Wireless'!

Brian VA3DXK

WEDNESDAY NITE NET CONTROLLERS

AUGUST 1 - TED VE3TRQ

AUGUST 8 - AL VA3TET

AUGUST 15 - REG VE3RVH

AUGUST 22 - TOM VE3DXQ

AUGUST 29 - PAUL VE3PVB

SEPTEMBER 5 - BRIAN VA3DXK

SEPTEMBER 12 - BOB VE3IXX

SEPTEMBER 19 - TED VE3TRQ

SEPTEMBER 26 - MEETING

OCTOBER 3 - AL VA3TET

3D printed parts for ham radio

By Dan Romanchik, KB6NU

One of the things that I keep telling myself that I need learn how to do is 3D printing. This morning, I ran across a couple more 3D printing projects for ham radio that I thought I'd pass along.

The first I found on reddit: 3D Printed Parts for Portable Tape Measure Yagi Designs (https://www.reddit.com/r/amateurradio/comments/963br3/3D_printed_parts_for_portable_tape_measure_yagi/). The summary on Thingiverse (<https://www.thingiverse.com/thing:3042505>), which is a website where "makers" share their designs, says:



These parts are made for use with 1-in. PVC pipe and 1-in. Harbor Freight tape measure steel. You can use electrical tape to attach the element holders to the side of the pipe, and use the driven element bridge to give structural rigidity across the driven dipole element. I have used this with up to 5 elements on 2m with good success. When not using the antenna, just pinch the elements to remove them from the holders, and store them INSIDE the tube! you can add some end caps to make this ultra portable. Use these parts with any of the multitude of tape measure YAGI design guides online.

Here's a look at an antenna made with these parts:



The element holders are attached to the boom with electrical tape in the photo above. While I haven't tried it, I'd suggest that the antenna might be a bit more robust if you could screw or perhaps glue the holders to the boom.

There are lots of other cool amateur radio 3D printing projects available on Thingiverse (<https://www.thingiverse.com/search?q=ham+radio&dwh=415b6d8da129c3c>). Browsing through the list quickly, here are just two that look like they might be useful to me:

- Soldering Fingers (<https://www.thingiverse.com/thing:1725308>). This project looks simple and quick.
- μ Bitx Case (<https://www.thingiverse.com/thing:2925336>). I still gotta do something with the μ Bitx I bought. This looks like it might get me started.

Finally getting in gear

Last week, I attended a 3D printing class at our local maker space, All Hands Active (allhandsactive.org), and now I feel like I can finally attempt a 3D printing project. I'm thinking about starting out with the simple Soldering Fingers project. If that goes well, I'll try a Raspberry Pic case and finally start using that in the shack. And, while these projects all seem pretty cool, I feel like I'm only scratching the surface.

Have any of you 3D printed anything cool for your ham radio projects? Is there another source of designs for ham radio 3D printed stuff besides Thingiverse?

When he's not 3D printing enclosures for his ham radio projects, Dan blogs about amateur radio, writes exam study guides (www.kb6nu.com/study-guides), and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him about your experiences with 3D printing at cwgeek@kb6nu.com.



Mark your Calendar

**The ERC September Meeting is
Wednesday, September 26
At 7 pm
At the Elmira Fire Hall.**

See you there!