PCARA Update

Volume 14, Issue 4 Peekskill / Cortlandt Amateur Radio Association Inc. April 2013

The quick Orange fox

On April 14, 2013, PCARA will have a table at the Orange County Amateur Radio Club (OCARC) Hamfest at the Town of Wallkill Community Center in Middletown, NY. If you have any items that you would like to sell, be sure to bring them along. Directions and further details can be found on the OCARC website: http://www.ocarc-ny.org/hamfest_2013.shtml.

Flashback to March 31, 2012 and the Orange County ARC Hamfest. L to R: Greg KB2CQE, Marylyn KC2NKU, Karl N2KZ, with Ray W2CH in the background.

It's official. PCARA will be holding a Fox Hunt on Saturday May 4, 2013 at 3:00 pm. Karl, N2KZ the winner of last year's hunt will be playing the part of the Fox in this year's exercise. As in years past, the hunt will begin at the Beach Shopping Center on Dayton Lane in Peekskill and conclude at a local restaurant of the Fox's choosing. Details will be discussed at the April meeting and posted on the PCARA website.

Just another reminder that PCARA will be participating in Field Day 2013 during the weekend of June 22 - 23, 2013 at Walter Panas High School in Cortlandt Manor, NY. We are still in need of volunteers for the overnight hours and during teardown on Sunday afternoon. Any time you would be able to share with us would be greatly appreciated. Thanks!

If you or someone you know is considering upgrading their license, there are a couple of opportunities during April. Our friends at PEARL are hosting VE sessions on Saturday April 6, 2013 at the Putnam County Bureau of Emergency Services, and Saturday April 27, 2013 at the Mahopac Public Library.

Our next regularly scheduled meeting will be Sunday April 7, 2013 at 3:00 pm at Hudson Valley Hospital Center in Cortlandt Manor, NY. I look forward to seeing each of you there.

- 73 de Greg, KB2CQE

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Contents

*Special **wireless** issue!*

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. Join net control Karl, N2KZ for news and neighborly information.

Adventures in DXing

– N2KZ

April Fools?

"AM and FM are being eliminated from the dash of two car companies within two years and will be eliminated from the dash of all cars within five years." Readers of *Radio Ink* Magazine, an insiders' broadcast trade publication, certainly took a double-take after reading this news. Writer Eric Rhoads later admitted that he completely misunderstood the panel of industry experts he interviewed at a conference for this article. True or not, it was the first time the press had raised the concept of a world without traditional radio.

Is the familiar AM/FM car radio under threat?

Here's the rationale: Car manufacturers want to produce vehicles that offer the most advanced technologies with a slick and attractive presentation. Many vehicles already feature attractive dashboard touch screens offering Bluetooth telephone interfaces, cellular assistance systems (like GM's On-Star) and access to popular Internet music services like Pandora. Think like a businessman and a world without AM and FM might actually make sense.

Buick's 2013 IntelliLink infotainment system.

In the end, it's all about money. Using an Internet radio delivery application, like the popular TuneIn or iHeart Radio, you could easily listen to radio stations all over the world with perfect digital quality, including all the ones you know well, residing on the local AM and FM bands. Your dashboard display would offer song titles, color graphics and a hook to instantly purchase the song you're hearing via Apple's iTunes. Your car manufacturer could offer lucrative plans providing unlimited wireless Internet data. Competing for data dollars would be phone providers like Verizon, AT&T, T-Mobile and Sprint. Advertising could be incorporated onto your dashboard display, as well.

Anyway you look at it, a lot of money could be exchanged by converting your car to Internet radio. Sleepy AM and FM can't churn new dollars like this! Gone would be ugly and impractical antennas devoted to traditional radios. Wi-Fi antennas are more compact and can be easily hidden on a car chassis. Research shows young people simply don't listen to traditional radio and want commercial-free sounds while they drive. All of this makes sense, right?

Who can listen to analog radio filled with noise, static and picket-fence fading? There are too many commercials, obnoxious DJs and irrelevant content that I'm just not interested in. Old-fashioned radio is 'so yesterday.' Well, maybe not yet. Listen to the amounts of money advertisers are still pouring into New York radio! Last year, five metro stations billed over forty million dollars in ad sales: Sportsradio WFAN, newsers WINS and WCBS, 'Lite 106.7' WLTW and the overall winner, Z-100 with top contemporary hits at $48.2 million. Notice three of these stations broadcast on good old AM!

Another major obstacle to en-masse Wi-Fi conversion is the reliability of its signal. If you are driving within large metropolitan areas, Wi-Fi is easy to find and enjoy seamlessly wherever you go. Move away from population centers and you might lose your connection with the world. Chances are you are connecting using frequencies from 700 MHz to as high as 2500 MHz way up in the UHF and microwave ranges. No retuning to another station from a different locale! It is a continually tentative game of 'now you see it – now you don't.'

In Amsterdam, Kit-Kat offers ***No Wi-Fi*** *zones, stretching 5 meters around each post. Have a break, have a loss of signal.*

Although an all Wi-Fi world isn't really practical today, it may become standard before we know it. The application TuneIn claims access to 70,000 stations

worldwide. Apple's iTunes has a similar endless list of listening suggestions. Around New York City, you may be able to log only 100 stations or more with a little effort if you dig through the static using AM and FM. Internet radio (when it works) is hard to beat! To everything there is a season and the season for Wi-Fi is near!

Wi fool around?

One person who really has the right idea is fellow PCARAn Ray, W2CH. Ray decided wisely to eliminate

W2CH has the control head for a multiband Yaesu FT-857D transceiver mounted on the dashboard.

clutter in his car and go with a 'one radio serves all' solution. Not only can Ray listen to AM or FM while driving, he has the entire world of shortwave at his fingertips including amateur radio bands and everything else in-between. The solution was a Yaesu FT-857D transceiver covering all frequencies of interest from DC to 470 MHz with just a few gaps. Ray cleverly mounted the rig's removable faceplate to his dashboard connected to the main chassis nested in his trunk. If Ray gets tired of Rush Limbaugh, he can switch to a 75 meter SSB ragchew and really get an earful! Ray can do something most of us can't: Some of the stations he can hear in his car he can talk back to – literally!

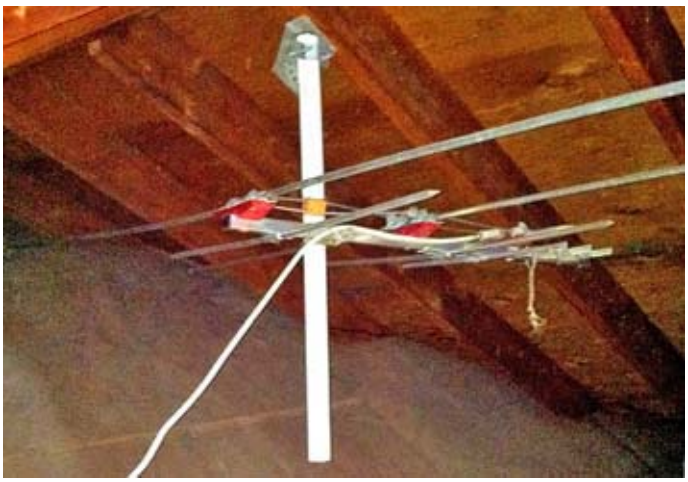
Mobile antennas – Maldol EX-104 for 2m/440 and a Diamond SD330 for HF.

Set a trap for FM

Viewing over-the-air digital television can be a challenge, too. Ever since the digital cut-over in June of 2009, WPIX-DT 11 and WNET-DT 13 have been hard to get. I had presumed that this was caused by these stations' low operating frequencies. Most New York City stations broadcast digital TV on UHF frequencies. After the digital cut-over, WABC, WPIX and WNET all reverted away from temporary UHF assignments back to their old analog channels. Field-strength-analysis web sites, like dtv.gov, suggested all three of these stations sent considerable signals my way. Why could I not bring them in?

Since about the year 2000, I have been using a Channel Master CM4228A 8-bay bow-tie antenna for digital television reception. This antenna was originally purchased in 1985 and is now on its second house! Its simple design and low wind resistance make it very hard to kill. Using the CM4228A, Channels 11 and 13 often drop out and die at the worst moments, so I began experimenting for a solution towards better reliability.

Poking around my attic, I discovered an old friend that I had nearly forgotten. Back in the good old days of analog TV, I had mounted a small TV antenna in my attic for use during power blackouts. My primary CM4228A used a phantom-powered, antenna-mounted pre-amplifier, so without power I could see nothing! Quickly switching to my backup antenna was a God-send when watching battery-operated TVs sitting in the dark! It is a compact Finco VHF/UHF combo



Finney Company's Finco VHF/UHF antenna in Karl's attic.

antenna designed for suburban use where strong signals reign.

To give you an idea just how old this antenna is, I bought it while employed by Arrow Electronics back in 1975. Not bad for only 38 years old! Since it had never been mounted outside, the antenna is in great condi-

tion and still works well. Would it provide enough signal to resolve DTV all the way out at my QTH 45 miles from the transmitter?

Amazingly, it did!

One thing piqued my curiousity: I use an indoor distribution amplifier to boost the antenna to several TV sets in my house. When the FM trap switch was off, channel 11 and 13 disappeared. When the FM trap was switched in, reception reappeared like magic. But why? PCARA's resident wizard, Bob N2CBH, had the answer. A little inexpensive pre-amp is certainly quite capable of creating good spurious harmonics. My two strongest nearby FM stations are WHUD Peekskill 100.7 and WFME 106.3 Mt. Kisco. Multiply these frequencies by two and the results tell the story: 201.4 (right in the middle of TV channel 11 198-204 MHz) and 212.6 MHz (within TV channel 13 210-216 MHz.)

FM traps for 75 ohm TV feeder by Jerrold Electronics (top) and Channel Master.

W3NJN bandpass filters for 80, 40 and 20 meters as used during PCARA Field Day.

Removing these FM signals before amplification makes all the difference. Aha! The mystery of the elusive Channels 11 and 13 was solved! Aren't FM traps a wonderful invention?!?

With my compact antenna, snuggled up into the eaves of my attic with a bracket and a leftover length of PVC pipe, I can receive 30 unduplicated TV services all the way from New York City. Not bad!

Rejection filters are also very effectively used during PCARA Field Days. Acquired by our editor, Malcolm NM9J, the W3NJN bandpass filters use a design with harmonics of the pass frequency strongly suppressed, allowing us to operate powerful transceivers in close proximity with little loss of performance. Resonance is a wonderful thing! The moral of our story: The world is ever changing. Adapt to it!

*W3NJN bandpass filter for 40 meters (7 MHz) with the cover off. In order to protect adjacent amateur bands, this model has an insertion loss of 38dB at 4 MHz and **70dB** at 14 MHz.*

Until next month, 73s es dit dit de N2KZ 'The Old Goat.'

Congratulations

Results for the 2012 New York QSO Party were recently published on the Rochester DX Association Web Site, http://www.rdxa.com. Winner of the plaque sponsored by PCARA was W2CCC, Cold Brook Contest Club in East Rochester, for their score of 64,842 in the New York Multi-One section. (Multi-One = Multiple operators with only a single transmitted signal at a time.)

Closer to home, Joe WA2MCR had the second highest score from "WES", Westchester County, with 19,125 points.

New York QSO Party certificates can be viewed online.

VHF/UHF tuner -W2CH

I recently saw a write-up for a couple of new MFJ products in the February 2013 issue of *Popular Communications* Magazine. One item was the MFJ-923 Dual Band VHF/UHF manual antenna tuner which shows SWR, Forward and Reflected power, for 144 and 440 MHz. It can be set for 30 or 300 watts ranges. MFJ rates it for 200 watts maximum on each band. I have never run much more than 100 watts on each respective band, so I find its power capacity suitable for my needs. The MFJ-923 lists for $199.95 with MFJ and some other dealers, while with HRO it's $189.95, and no shipping charges.

MFJ-923 antenna tuner in Ray's shack. [Photo by W2CH]

Operation is fairly simple and requires choosing the band, power, and adjusting two knobs on 144 MHz and three knobs on 440 MHz for lowest reflected power/SWR, and best power output. It might take some back and forth adjustment for best settings.

There is a switch on the back to select either two single band antenna inputs or to set one input for a dual band antenna — which is what my various VHF/UHF antennas are — so I set the switch to that position. There is also a front panel light for the meter with a cable to connect to 12 volts DC power.

Close-up of the illuminated meter.

There is an earlier model MFJ-922, which is similar, but much smaller, that I also own. It sold for about $80.00 and can handle 60 or 150 watt settings. The adjustment controls are recessed and are set with a small, mostly non-metallic screwdriver, but they are a bit hard to set due to their sensitivity to any metal on the tool. Since this unit has been around for some time there are reviews of this older tuner on eHam.net, and the reviews are mixed. Some reviewers gave a 5 out of 5 score, while others gave a 2 or 3 out of 5.

MFJ-922 tuner

I like to use a VHF/UHF tuner for my dual band beams — for example the MFJ-1768 dual band beam, which I like to use in the VHF/UHF SSB/CW contests. I have found that at 432 MHz, this beam needs help with a tuner to lower the SWR and get more power out on that frequency. I will have to try the new MFJ-923 tuner on my beams. So far I have only tried it on FM simplex/repeaters, but with success on both bands.

- Ray, W2CH

Route to a WAP

A couple of weeks ago, I noticed that wireless-connected network devices around the house had stopped working. Instead of the icon for a good, wireless Internet connection, there was an error symbol displayed. What was going on?

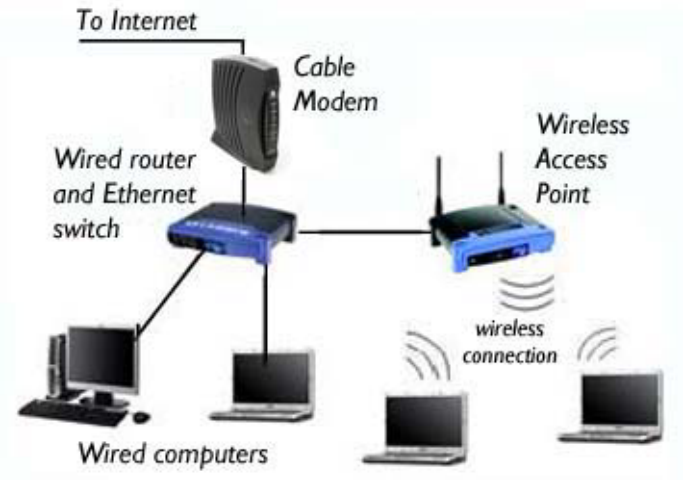
I was a late adopter of wireless Internet for the home — I still believe that if you have a choice of wired or wireless network connections, then wired will always be more reliable, especially if there is a microwave oven, Bluetooth device or cordless phone nearby. Then — in the days before tablets — I picked up an inexpensive Netbook with built-in Wi-Fi and suddenly wireless connection became a necessity. Nowadays you might also need Wi-Fi to accommodate a wireless Internet radio, e-Book reader, tablet, iPod, smartphone or wireless-connected video devices.

Linksys WAP54G wireless access point – had stopped working.

Separate channels

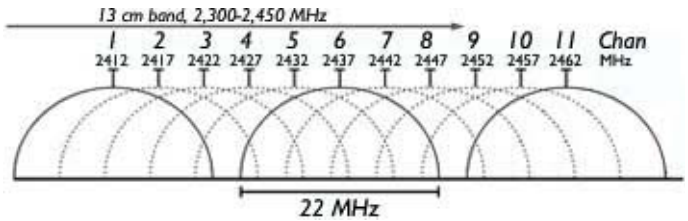
At the time, I was quite fond of Linksys products, so I had purchased a WAP54G **W**ireless **A**ccess **P**oint to plug into my Linksys wired router. One advantage of a separate Access Point is that it can be

positioned away from the Ethernet-wired router, in a good location for wireless coverage. This can be important if the router is located in a low, shielded spot — for example down in the basement, where the cable-TV or phone line first enters the house.



Use of a separate Wireless Access Point with a wired Router/ Ethernet switch can provide better wireless coverage.

The "G" in WAP54G and Wireless-G refers to the IEEE **802.11g** standard, which utilizes 2.4GHz frequencies, with a maximum data rate of 54 Mbps. In the USA, 802.11g devices can be programmed to operate on 11 overlapping channels, each of which is 22 MHz wide, with center frequencies from 2,412 MHz (Chan 1) to 2,462 MHz (Chan 11). Keen-eyed readers will note that channel 1 to channel 6 (center freq 2,437 MHz) are wholly within the amateur radio 13 cm band, 2,300-2,450 MHz.



Wireless-G channels and center frequencies in the USA.

In practice, an unlicensed 802.11g device in the USA can only use three non-overlapping channels. The default setting for a wireless router is usually channel 6, but an RF-savvy user will change the default to channel 1 or channel 11, depending on usage by other households nearby. Any other channel choice will overlap with *two* of the popular channels, either with channels 1 and 6 or channels 6 and 11.

Strong connection

A wireless device needs an antenna, and the Linksys WAP54G is equipped with two reverse-polarity TNC connectors on the rear panel. Radio amateurs will know that TNC stands for "Threaded Neill–Concelman" connector, which is named after the designers – Bell Labs' Paul Neill and Amphenol's Carl Concelman. The reverse-polarity means that the female contact has been moved from the chassis-mounted jack to the plug on the antenna.

Stock antennas supplied with the Linksys WAP54G have a reverse-polarity TNC plug connector.

The WAP54G arrived with two stock antennas to fit the RP-TNC connectors. These antennas are hinged at the base so they can be inclined at preset angles. The usual arrangement is to mount both antennas vertically, for omnidirectional coverage. You may wonder why Wireless-G routers and access points need *two* antennas. Only one antenna is used for transmitting, but *both antennas* are used for diversity reception. This is to overcome the problem of a single receive antenna entering a "null" when the signal from a moving transmitter cancels out because of reflections. Even though one receive antenna is in the null, there is a good chance that the second receive antenna is still hearing a good signal.

Gain an advantage

My wireless access point was installed at one corner of the house. As a result, the signal at the opposite corner was less than optimal. I fixed this problem by substituting a pair of Linksys "7dBi High Gain Antennas". While the stock Linksys antenna was only 4¾" long and probably has a gain of only 2dBi, the high gain 7dBi antenna is 10" high. Pulling off the ABS radome reveals three half waves separated by phasing coils, above a quarter wave decoupling sleeve.

While a gain antenna can improve signal strength

Linksys 7dBi High Gain Antennas.

at the far end of the house, it is worth remembering that you don't get something for nothing. The vertical collinear antenna obtains its gain by squashing the radiated RF into a narrow, circular pattern in the horizontal plane. If you need coverage on floors above or below the wireless access point, then signal strength upstairs and downstairs could actually *decrease* with a high-gain antenna.

Demise of an old friend

After more than three-years of reliable operation, my old Wireless Access Point had failed. I tried some trouble-shooting as suggested on the Internet — such as checking the coaxial cables wired to the antenna sockets and carrying out a complete reset to factory defaults — but no joy. So I began an urgent hunt for a replacement unit.

The Linksys WAP54G came from a local big box store, but a quick check on their web site showed this model was no longer available, and no other access points were in-stock locally. Prices seemed to have increased — and Wireless Access Points are significantly more expensive than a similar model wireless router. Then a thought crossed my mind — would it be possible to use an inexpensive wireless router as a wireless access point? The Internet proved helpful, suggesting that with some rather complex configuration, many wireless routers could indeed be used as a wireless access point. So later that evening I went to the nearest Radio Shack store and picked up an inexpensive Netgear N300 Wireless Router, model WNR2000v3.

Netgear N300 wireless router, model WNR2000v3

Relegate a router

I followed instructions on the Internet to connect a notebook computer directly to the new Netgear wireless router via Ethernet cable, then set the router's IP address to be different from my existing wired router and outside its DHCP range. DHCP (dynamic host configuration protocol) provides client devices on the network with their own IP addresses plus information about where to find the gateway and DNS servers. In order for the Netgear device to operate purely as a wireless access point, DHCP had to be turned off. After applying these changes to the Netgear N300, the notebook PC had to be given a static IP address to continue communication. The wireless settings of the new "Access Point" could then be defined, and the new unit was connected to the wired router's Ethernet switch on a standard port. From that point on, the Netgear N300 was acting as a wireless access point.

Later on, while navigating the Advanced menus on the Netgear N300, I noticed an option to configure the unit as a Wireless Access Point. A single checkbox converts the router into a wireless bridge, turning off NAT (network address translation) and DHCP both together. This turned out to be much simpler than the earlier procedure — and it's the method I would now recommend. Out of the box, first connect the N300 to the Internet as a standard router and update its firmware to the latest version. Next, use the menu: Advanced -> Setup ->Wireless Setup to configure the wireless settings for SSID, Channel and Security. Finally, in Advanced-> Setup ->Advanced Setup -> Wireless AP, check "Enable Access Point Mode" and (optionally) set a fixed IP address.

WNR2000v3 advanced menu allows simple setup as a Wireless Access Point through a single checkbox (arrowed).

The new Netgear N300, configured as a wireless access point works very well, with good signal strength all around the house. The unit does not employ external antennas, but instead has multiple, etched circuit board antennas inside the plastic case.

Route to follow

Even if you already have a wireless router, you may want to extend its wireless coverage over a wider area. One way to do this is with wireless access points wired back to your main Ethernet switch. Several of Netgear's wireless router models from the N300 upward can be configured in "Access Point Mode" and this is much less expensive than purchasing a dedicated wireless access point. You may find similar settings for "Access Point" operation in other manufacturer's wireless routers including D-Link and Belkin. - NM9J

Next generation

The article "Wireless generation" in the March 2013 *PCARA Update* triggered a few reactions. In the original article, I described how our parents and grandparents were affected by the efforts of Guglielmo Marconi and other wireless pioneers between the years of 1896 and 1923. I pointed out that — until Lee de Forest's invention of the "Audion" triode vacuum tube in 1907 — there was no means of electronic amplification. So wireless reception in the early days was solely dependent on detection of the RF energy picked up by a large receiving antenna.

Marconi's favored method of detecting RF energy in those earliest days was a tube filled with metal filings, invented by French scientist Édouard Branly. Branly noted that an insulating tube filled with loose metal filings had a relatively high electrical resistance, as measured by a Daniell cell and galvanometer. But when the tube of filings was exposed to a nearby electrical discharge from a Wimshurst machine or a Ruhmkorff coil, the electrical resistance of the filings dropped and the current shown by the galvanometer increased. The effect was apparent with the spark discharge several yards away, and could still be detected at a distance of 20 yards when a Wheatstone bridge was used to improve sensitivity of the galvanometer.

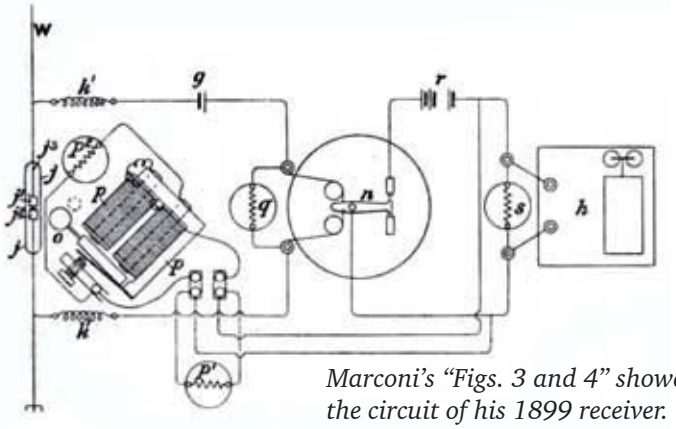
Coherent story

Branly's device was improved by British physicist Oliver Lodge. Lodge believed that the high frequency waves caused the metal particles to clump together or "cohere" and named the device a "coherer". Branly had already noted that the reduction in resistance of the metal filings would persist long after the electrical discharge was over. Lodge added a mechanical device known as a "decoherer" — a small hammer to tap the coherer tube and dislodge the metal filings, restoring their high resistance ready for the next RF signal.

Marconi developed Branly's coherer into a more sensitive detector of RF energy, substituting nickel/silver shavings for Branly's filings of iron, aluminum etc. and using an evacuated glass tube. In order to prevent the particles permanently "cohering" after detecting an RF signal, the "tapper" or decoherer was attached to a telegraph sounder which indicated the incoming dots and dashes as audible clicks.

Here, in Marconi's own words, is a description of how it all worked —

"One of the principal parts in my receiver is the sensitive tube or coherer or radio-conductor, which was discovered, I think I am right in saying, by Professor Calzecchi Onesti, of Ferm, and was improved by Branly, and modified by Professor Lodge and others. The only form of coherer I have found to be trustworthy and reliable for long distance work is one designed by myself and as shown in Fig. 3. It consists of a small glass tube, four centimetres long, into which metal pole pieces j^1 j^2, are tightly fitted. They are separated from each other by a small gap, which is partly filled with a mixture of nickel and silver filings. This coherer forms a part of a circuit containing the local cell and a sensitive telegraph relay actuating another circuit, which circuit works a trembler *p* or decoherer and a recording instrument *h*."



Marconi's "Figs. 3 and 4" showed the circuit of his 1899 receiver.

"In its normal condition the resistance of the filings in the tube *j* is infinite, or at least very great, but when the filings are influenced by electric waves or surgings, cohesion instantly takes place, and the tube becomes a comparatively good conductor, its resistance falling to between 100 and 500 ohms. This allows the current from the local cell *g* to actuate the relay *n*."

"One end of the tube is connected to earth and the other to a vertical conductor..."

"Small choking coils *k' k'* are introduced between the coherer and the relay. They compel the oscillating current due to the electric waves to traverse the coherer rather than waste its energy in the alternative path afforded by the relay."

"The oscillations induced on the strips *k k* or aerial conductor *W*, which acts as a resonator, by the radiation from the oscillator affect the sensitive tube. This effect on the tube consists, as we have said, in a great increase in its conductivity, thus completing the circuit and allowing the current from the cell to actuate the relay. The relay in its turn causes a larger battery *r* to pass a current through the tapper or interrupter *p* and also through the electro-magnets of the recording instrument *h*."

"The tapper or trembler is so adjusted as to tap the tube and shake the filings in it. If in the instant during which these various actions takes place, the electrical oscillations had died out in the resonator, the shake or tap given to the tube by the hammer *o* would have restored it to its normal high-resistance condition, and the Morse instrument or recorder would have marked a dot on the tape, but if the oscillations continue at very brief intervals, the acquired conductivity of the tube *j* is destroyed only for an instant by the tap of the trembler, and immediately re-established by the electrical surgings, and therefore the relay tapper and telegraph instrument are again actuated, and so until the oscillations from the radiator have ceased."

"The practical result is that the receiver is actuated for a time equal to that during which the key is pressed at the transmitting station." (*Proceedings of the Institution of Electrical Engineers, March 2, 1899.*)

Coherent theory

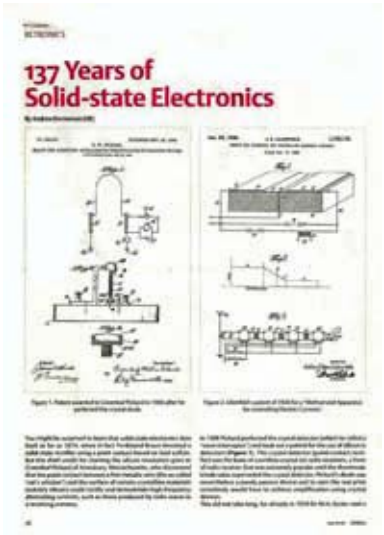
A good question to ask is — how did the "coherer" work? One suggestion is that the loose, metal filings were only in partial contact, so that overall there was a high

resistance between the outer electrodes of the coherer tube. The passage of RF energy through the tube would then cause the metal particles to clump together, with minute spot welds forming between their surfaces, lowering the overall resistance. The metal particles normally have their surfaces coated with oxides which have much higher resistance than a metal-to-metal contact. Recent work (e.g. by Eric Falcon and Bernard Castaing, *Am. J. Phys.* 73 (4), April 2005) suggests this theory is correct — current passing through the surface coating of the metal particles causes local heating, which then results in micro-welding between adjacent particles.

Another theory suggests that metal oxides on the surface of the metallic particles in close contact with each other might behave as a semiconductor junction, rectifying the RF signals.

Ye olde solid-state?

Henry, KB2VJP brought to my attention an article by Andy Emmerson, G8PTH, in the April 2010 issue of Netherlands electronic magazine "Elektor", http://www.elektor.com. In the article, G8PTH argues that solid state electronics date back to the point contact devices of the 19th century, while modern silicon devices date back to 1906, when G.W. Pickard of Amesbury, MA was awarded US Patent 836,531, "Means for receiving intelligence communicated by electric waves". Pickard's main invention is a detector of radio waves consisting of a fine-pointed metallic conductor held down by spring pressure against the surface of a non-metallic element such as *silicon*, having a high electrical resistance. Later experimenters changed the fine-pointed conductor into a length of fine, springy wire and called it a "cat's whisker". Early practitioners of radio reception had to probe the surface of a natural crystal of galena (lead sulfide), carborundum (silicon carbide) or silicon itself with the cat's whisker for a sensitive region where RF detection could take place. The point-contact junction of metal and semiconductor constitutes a Schottky barrier diode, which conducts in only one direction with a very low voltage drop — ideal for detecting weak RF signals.

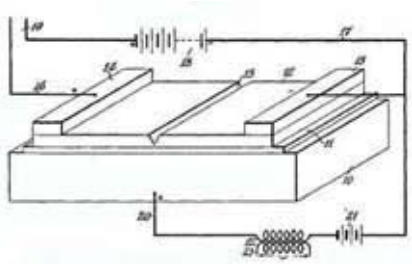


Elektor article by G8PTH.

Andy Emmerson goes on to argue that the first three-terminal semiconducting device with gain was *not* pioneered at Bell Labs by John Bardeen, William Shockley and Walter Brattain, where they invented the transistor in 1947-48. Instead, G8PTH points to US Patent 1,900,018 awarded to J.E. Lilienfield of Brooklyn, NY in March 1928 — "Device for controlling electric current". Lilienfield wrote: "The novel device may embody, for example, an amplifier in the use of which no filament heating or electron-producing means of this character are required, which device moreover may be operated under much lower voltage conditions than heretofore. Likewise it is also adaptable to the rectification (detection) of oscillating currents."


Bardeen, Shockley and Brattain at Bell Labs in 1948.

The device in Lilienfield's 1928 patent looks very similar to a Field Effect Transistor (FET). A metal substrate such as aluminum is covered with a thin, insulating layer of metal oxide or sulfide, then conducting electrodes of (for example) copper are spattered onto the insulating layer. By controlling the voltage across the insulating layer, the conductivity is modified. One of my contemporaries from college days, Dave Topham G3WKB believes the device described is very similar to a modern metal oxide FET.


Lilienfield's 1928 solid-state amplifier.

If you cannot obtain a copy of Elektor magazine, another version of Andy Emmerson's observations on crystal detectors and transistors is available at the following web address: http://www.beatriceco.com/bti/porticus/bell/belllabs_transistor1.html

First to filings

There was another observation about last month's article, coming from Jon Taylor, N2JLK of Torrance, CA. N2JLK argued that "Marconi was a fraud but a good businessman", with Nikola Tesla being the first person to utilize electro-magnetic waves. I won't go into detail of the disputed history here — all I said in the article was that Marconi arrived in London in 1896 and began to demonstrate the *practical* applications of wireless.

In rough chronological order, in 1865 the Scottish physicist James Clerk Maxwell published mathematical equations describing electromagnetic fields. During 1886-1888 the German physicist Heinrich Hertz demonstrated the creation, detection and reflection/refraction of electromagnetic waves with a wavelength around 4 meters, proving Maxwell's theory. From 1893 onwards, Nikola Tesla — who had a spell working for Edison — was able to demonstrate transmission and detection of Hertzian waves. At this same point in time, Oliver Lodge was making improvements to the Branly coherer, Alexander Popov was making similar improvements in Russia and the young Marconi was carrying out his own experiments on radio transmission and reception at his home in Italy. There were many 'pioneers' of wireless, but it was Marconi's company that contacted ships across seas and oceans, on the way to making wireless communication into a successful business. - NM9J

Peekskill / Cortlandt Amateur Radio Association

Mail: PCARA, PO Box 146, Crompond, NY 10517
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PCARA Update Editor: Malcolm Pritchard, NM9J
E-mail: NM9J @ arrl.net
Newsletter contributions are always very welcome!
Archive: http://home.computer.net/~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 the Hudson Valley Hospital Center, Route 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.

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 Apr 7: PCARA monthly meeting, Hudson Valley Hospital Center. 3:00 p.m.
Sat May 4: PCARA Foxhunt, starts 3:00 pm from 'The Beach' shopping center.

Hamfests

Sun Apr 7: Southington ARA Flea Market, Southington High Schl, 720 Pleasant Street, Southington, CT, 8:00 a.m.
Sun Apr 14: Orange County ARC Hamfest, Wallkill Community Center, 2 Wes Warren Road, Middletown, NY. 9:00 a.m. ***Club Table.***
Sat Apr 20: Splitrock ARA N. J. Hamfest, Roxbury Snr Cntr, 72 Eyland Av, Sucassunna, NJ. 8:00 am.

VE Test Sessions

Apr 6: PEARL, Putnam County BES TOPs, 112 Old Route 6, Carmel, NY. 12 noon. Contact NM9J.
Apr 6: Yonkers PAL Ham Radio Club, 127 N Broadwy, Yonkers NY. 2:00 pm. Contact: M Rapp, 914 907-6482.
Apr 7: Yonkers ARC, Yonkers PD, Grassy Sprain Rd., Yonkers. 8:30 am Contact D Calabrese, 914 667-0587.
Apr 11: WECA, Westchester Co Fire Trg Cen, 4 Dana Rd., Valhalla, NY. 7:00 pm. S. Rothman, 914 831-3258.
Apr 15: Columbia Univ VE Team ARC, 2960 Broadway, Columbia University, 115 Havemeyer Hall, New York, NY. 6:30 pm. Alan Crosswell, 212 854-3754.
Apr 27: PEARL, Mahopac Public Library, 668 Rt 6, Mahopac NY. 10:00 am. Contact NM9J.

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