BARC
Newsletter

Issue # 2008-1
February 2008

Club call: VE3GCB

Club repeater: VE3RAG
147.000+

Barrie Amateur Radio Club Newsletter

Editorial

Well, it was a nice dream. The following is an edited statement from Bob Simpson VE3ODR – President of Lake Simcoe Repeater Association:

Someone has come along and expressed an interest in buying the Edgar property from ORC (Ontario Reality Cooperation). ORC has exercised their right to issue a 6 month notice to vacate, which means that both the existing LSR tower and the Rogers tower that LSRA had acquired will be torn down this year. The entire Edgar property will no doubt be levelled and prepared for some type of development. End of story at Edgar. It's time to move on.

Maybe all this has been a good thing. It forces us to have a long hard look at just what services we are providing the amateur radio community. It's true most of the repeaters in our area are not used. Are all these repeaters providing a service? How many of you would like to see an intelligent linking system that would cover all of Simcoe County up through Muskoka? How about ATV? Are we planning for D-Star or Apco25? Now before you scream, "Who can afford it?", consider that it wasn't that many years ago that amateurs screamed they could not afford to go from CW to AM - it will spell ruin- the end of CW, AM to SSB - is far too complicated! When FM came along - who could possibly afford to put up a repeater let alone buy the equipment!

This is a good time for all repeater owners and interested parties to come together, pool our resources, our money, and coordinate our efforts to build better communication systems. This is long overdue.

It really is time to stop making these vanilla-flavoured repeaters. Let's start the re-thinking process.

Some of us had some "fun" putting up Jack VE3RDQ's new R8 HF vertical antenna on a 30 foot TV tower beside his house one cold afternoon/evening. He is now on the air on HF with his new Icom IC-7000 transceiver.

There are 6 new hams as a result of the Simcoe County Ham Radio Emergency Communications course completed last month, 3 more persons still have to write the exam. The BARC ham classes are almost finished and the 5 students will be writing the exam later this month.

If you have anything you would like included in future issues of the newsletter, please email them to me or bring them to a club meeting.

Editor – Al Duncan VE3RRD

If you have any inquiries, you can contact the club via the following email address:

HamRadio@barriearc.com

Be sure to visit the Barrie Amateur Radio Club webpage at:

http://www.barriearc.com/

Next Club Meeting

The next general BARC meeting will be on Tuesday, 12 February 2008. Start time is 7 pm and the location is upstairs in the Zehrs Store community room at the corner of Big Bay Point Rd and Yonge Street.
You do not need to be a club member to attend the BARC meetings. Everyone is welcome.

Minutes of all meetings back to November 2004 can be found by clicking on the BARC Minutes of Monthly Meetings link found on the club webpage.
Back issues of this newsletter for 2007 can also be downloaded from the BARC website.

If you would like to do a presentation or a "show and tell" at one of the BARC meetings, please contact someone on the executive. Come and show off your latest ham project.

Other Events

Don't forget the regular Monday evening ARES net at 7:30pm on the VE3RAG (147.000+) repeater. Net control is Dave VE3ILA

Morning Breakfast Groups
Currently there are two "Ham" breakfast gatherings in Barrie – everyone is welcome (talk-in is on VE3RAG 147.000+).

- Every Saturday morning at 8am at "Debb's Place" restaurant located at 352 Huronia Road near the intersection with Big Bay Point road.
- Most Wednesday mornings at 9am at the restaurant at the Atrium located at the corner of Cundles Rd. and St. Vincent (check on VE3RAG).

Guides on the Air (GOTA) – 16 & 17 February 2008 (hosted by OARC at Big Cedar)
Ontario QSO Party (contest) – 19 & 20 April 2008
Walk for Dog Guides – 31 May 2008 at Centennial Park, Barrie
Celebrate Barrie – June 2008 at Centennial Park, Barrie
Field Day – 28 & 29 June 2008 at the Oro Fair Grounds
Ride for Literacy – 19 July 2008, 5 checkpoints around Lake Simcoe

If you can help out with any of the above events, please contact the club executive.

Looking for some “new” ham gear? Check the Ontario Swap Shop http://www.ontarioswapshop.com/
And the LSR swap page http://www.alslinkwith.com/ve3lsr/swap.htm

Find out when all the Hamfests are scheduled by going to: http://rac.eton.ca/events/upcoming.php
A listing of Hamfests in the U.S. can be found at:
http://www.dxzone.com/catalog/Ham_Radio/Hamfests/

The Technical Corner

In the “The Technical Corner”, subjects of a more technical nature relating to Amateur Radio and electronics will be covered. This will include the reprinting of technical submissions from other newsletters. Please send any submissions that you wish included to me, this includes any good articles you have from old newsletters from other clubs.

Editor: Al Duncan VE3RRD

An Inexpensive, High-Performance, Ugly 50ohm Balun

Building a no-grief 1.8MHz to 30MHz 50ohm choke-balun is easy. No costly ferrite-cores are needed, just a short length of 3 to 5 inch size plastic pipe, about 25 feet of 50ohm coax plus some nylon cable ties. Solid-dielectric coax is best for this application because foam-dielectric has a tendency to allow a change in the conductor to conductor spacing over a period of time if it is bent into a tight circle. This can eventually result in voltage breakdown of the internal insulation. The required length of the plastic pipe depends on the diameter and length of the coax used and the diameter of the pipe. For RG-213/U coax, about one foot of 5 inch size pipe is needed for a 1.8MHz to 30MHz balun. For 3.5MHz to 30MHz coverage, about 18 to 20 feet of coax is needed. This length of coax is also adequate for most applications on 1.8MHz. The number of turns is not critical because the inductance depends more on the length of the wire (coax) than on the number of turns, which will vary depending on the diameter of the plastic pipe that is used. The coax is single-layer close-wound on the plastic pipe. The first and last turns of the coax are secured to the plastic pipe with nylon cable ties passed through small holes drilled in the plastic pipe. The coil winding must not be placed against a conductor. The name of this simple but effective device is a choke-balun.

Some people build choke-baluns, without a plastic coil-form, by scramble-winding the coax into a coil and taping it together. The problem with scramble-winding is that the first and last turns of the coax may touch each other. This creates two complications. The distributed-capacitance of the balun is increased and the RF-lossy vinyl jacket of the coax is subjected to a high RF-voltage. The single-layer winding on the plastic coil-form construction method solves these problems since it divides the RF-voltage and capacitance evenly across each turn of the balun.

A more compact, less ugly, 1 to 1 impedance-ratio, 50ohm trifilar-wound (with wire) ferrite-core balun could also be used but there would be some tradeoffs. Ferrite cores are not cheap. Also, the air-core of the coax-balun can't saturate like the ferrite-core and, unlike ferrite-core wire-wound baluns, single-layer wound coax-baluns almost never have an insulation breakdown problem. Also, a trifilar-wound balun does not like to work into anything but a perfectly balanced load. With an imperfectly balanced load, the coax-balun will not, as does the trifilar balun, generate a differential, third RF-current on the outside of the coax that brings the RF to the input of the tuner. The choke-balun is not fussy. It will work as well into a less than perfectly balanced load as it will into a perfectly balanced load, and do so without the possibility of creating a differential RF-current on the station ground and fricasseeing the operator's fingers.

An Easy to Install Vertical Loop for 80-6 Meters

by John Reisenauer, Jr. KL7JR

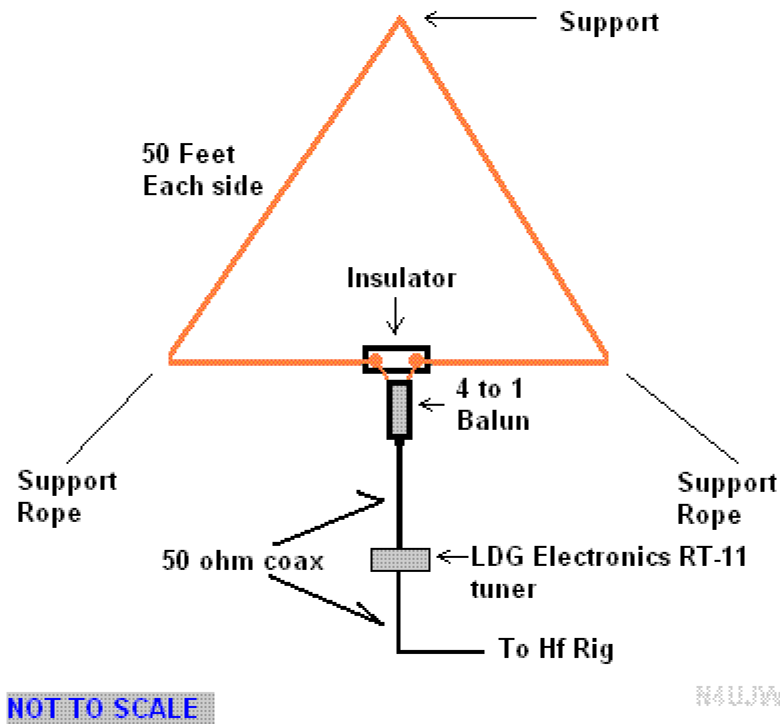
A previous loop article by Steve Ford, WB8IMY (May 2002 QST, "One Stealthy Delta") caught my attention, especially because I've had such favorable results with other loops I've experimented with in the past.

I wanted an "easy to install" loop for my portable island operations. One that was "long" enough for 80 meter work. I did modify Steve's design a bit to more fit my needs (ie- longer antenna since I'd usually have the real estate on portable outings and I wanted my tuner closer to the rig).

My portable loop is 150 feet long (50 ft per side) and includes a 4:1 balun at the feed point midway on the horizontal side. A short run of RG-8X coax was all I needed to reach my permanently installed tuner in my motor home (it probably would have been better using a minimum coax length of 50 feet?).
The loop only took a few hours to make and the cost was about $20 for wire (I used #12 solid insulated house wire left over from another project and scrap PVC pipe for the insulators). Schedule 40 PVC pipe and fittings along with solid insulated wire work better in cold temperatures according to my experience.

Picture a triangle with one pointed end up for the apex and the feed point in the center of the bottom horizontal portion of the loop. It doesn't get much simpler than this.

For those of us who like to know how many wavelengths make up this 150 feet long loop (1005 divided by frequency in MHz):
28MHz (4.3 wl), 24 MHz (3.7 wl), 21 MHz (3.2 wl), 18 MHz (2.7 wl), 14 MHz (2.1 wl), 10 MHz (1.5 wl), 7 MHz (1 wl) and 3.5 MHz (.5 wl).



On a long March, 2003 weekend outing, It took me about 2 hours to set up the antenna, mostly because of the irregular shaped campsite I was using with respect to tree spacing and wire always tangles up when I'm around!

I was only able to get the loop apex up about 30 feet (higher is better) and one end of antenna was at 12 feet off the ground and the other was about 6 feet, with the feed point about 7 feet "sloped" away from the apex and bent in one direction (I made the antenna fit the lot).

At a height of 40 feet or higher, the antenna would more resemble a delta loop no doubt! I was confident this "sloping loop" would work fine even though it deviated a bit from the original design of three sides at 40 feet long each and didn't turn out looking exactly like a triangle.
The loop loaded easily on all bands 10-80 meters with my new LDG Electronics RT-11 tuner and old FT-840 transceiver. It may even have loaded on 160 meters but I forgot to try. I don't have 6 meter capability (yet!) so will take Steve's word that it loads on that band as well.

My results were: 15m K4, 17m JA and K0, 20m KL7, K2-K8, UR4 and VE3, 40M K6 and K7, 80M K6 and K7. There just wasn't a lot of DX on, but I managed to work most every station I called.
I also installed my old Hustler 5 BTV vertical to compare with the loop on receive. I knew what the 5BTV could do and wanted to see if the two antennas differed much.

Since my motor home roof is metal, I put the 5BTVs feed point at about 6 inches above the roof for a ground plane effect to avoid installing elevated ground radials or to ground mount it creating a safety hazard. (Close encounters with park rangers can make for short camping trips)!

It only took about 15 minutes to install the 5BTV. (Note: both antennas were mostly pre-assembled to save time in the field). Both the loop and 5BTV received about the same on 80-15 meters in "side-by-side" comparisons throughout the 3 day test. Ten meters was dead each time I checked, so I concentrated on the lower bands.
I worked almost the same call areas on the 5BTV as with the loop. On a few occasions, the 5BTV was one to two "s" units better on 20m while the loop was also one to two "s" units stronger a few times on 80m.
I'm sure horizontal to vertical (and vice-versa) polarization characteristics between the other station's antennas and my antennas had much to do with it.
For the most part, both the loop and 5BTV were pretty much even on receive. On a second outing a few weeks later, the bands were more favorable allowing me to work a lot of DX on 17, 40 and 80 meters including KL7, KH6, H44, J88, TG9, JR3, PP5 and others plus many stateside contacts with the loop. I was particularly amazed by band conditions on 17 meters and how easy it was to break big pileups! The loop went up a lot faster too at a more "antenna friendly" camp site!
In conclusion, I was satisfied with the results of my efforts experimenting with both antennas. For long-duration portable outings, or fixed station use (if you have the room), I'd go with the loop antenna simply due to the economics ($20 for wire vs. about $150 and up for a commercially made multi-band vertical) and because I'm partial to homebrew wire loop antennas. I highly recommend you read Steve's well prepared article mentioned at the beginning. It laid the ground work for my experimenting.
His Original article link by Steve Ford, WB8IMY (May 2002 QST, "One Stealthy Delta") is:
www.sgcworld.com/Publications/Articles/237qst0502.pdf

73 John ~ KL7JR

Slingshot Launcher
Or
How to Get That Dipole Antenna High Enough in the Tree

Al – VE3RRD

Field Day and JOTA for 2007 taught me one thing – a lot of time can be wasted trying to get antenna support ropes up in trees if you don't have the proper tool. I think we spent over an hour twirling a weight on the end of a cord and trying to toss it up over a high tree limb to support one end of a multi-band dipole. We never did get it over the limb we wanted and had to settle for a lower one.
I ran across a simple slingshot launcher on a webpage by K1DEU and decided to give it a try.

For those of you who want to build something bigger and better, take a look at the compact, high power CSV19 pneumatic launcher at http://www.antennalaunchers.com/csv19/index.html.

Two views of the finished launcher, ready to use. The 15lb monofilament line is heavy enough to pull a light weight cord of greater strength back over the tree. This small cord can be used to support some antennas or could be used to pull a stronger rope back over the tree.

All the parts are available from the local Canadian Tire store.

75-4772-0	Crossman “Tempest” slingshot	12.99
78-4429-4	Zebco 404LE fishing reel with 15lb line	14.99
78-4970-2	1 ounce RedWolf bell sinkers (pkg of 3)	.99
63-2139-0	7/32 inch stainless hose clamps (2 required)	2.18
78-5067-8	size 8 swivel snap (package of 10)	2.19
23-6010-6	¼ inch neoprene rubber hose (2 ft length)	4.99
	Total cost	$38.33 or $43.33 with tax

Other than the fishing reel (which you may already have) and the slingshot, the only other pricy item is the rubber hose. It must be ¼ inch inside diameter and about ½ inch outside diameter – only a 4 inch length of hose is required.

Assembly only takes about 15 minutes (part of which is getting the packaging open). Pull one end of the wrist support sling off the ¼“ steel rod, and slip on a 4 inch length of neoprene hose (takes a little wiggling). Next slip on the two hose clamps (screw facing down or to the right - away from your wrist). Re-install the wrist support sling, position the reel as shown in the photo and tighten up the hose clamps to hold it in place. Tie on one of the swivels to the 15 pound fishing line, attach a sinker and you’re done!

The rounded sinkers are a bit difficult to keep in the leather pocket when getting ready to launch, so I dipped them a couple of times in red “Brush-On Electrical Tape” to make them easy to grip and easier to see up in a tree. You can get Brush-On Electrical Tape at Princess Auto for about $5 for a 118ml (4 fl oz) can. If this product rubs off too easily, I may try heat-shrink tubing over the sinker.

In this picture, the line release button on the rear of the reel had not been pressed, so the line is pulled tight. In actual use, once the line is released, it tends to hang loosely and care must be taken not to snag it prior to firing.

How did it work? On the first test “firing”, the weight was released at an upward angle of about 45 degrees and landed in the snow about 150 feet away. The only problem discovered is that the fishing line easily gets tangled in bushes and takes awhile to recover if you have missed your shot at the tree limb.

The 1:1 Current Balun

Roy Lewallen, W7EL

(Revised 95-11-13 and 95-11-17. Revised equations marked with (*))

This analysis

- Presents an analytical circuit model of the 1:1 current balun, including finite impedance.

- Gives equations for several key performance characteristics of a 1:1 current balun in typical applications.

- Analyzes the effect of using a 1:1 current balun with an antenna tuner, when connected to either the tuner input or output.

For information about what a balun does, see "Some Aspects of the Balun Problem" by Walt Maxwell, W2DU, QST, March, 1983, p. 38, and "Baluns: What They Do and How They Do It" in the ARRL Antenna Compendium, Volume 1, p.157.

A 1:1 current balun can be made by winding a two-conductor transmission line (e.g., twisted pair) or coaxial cable through a toroidal core or on onto a ferrite rod, or by placing ferrite cores over a twisted-pair or coax transmission line. Or, coax can be coiled to create a broadly resonant circuit for the current on the outside of the coax. The same model can be used for any of these configurations:

```
              1:1
            Ideal xfmr
a ---------UUUUUU---------- c
b --.------UUUUUU-------.-- d
    |      ________      |
    |     |        |     |
     ----|  Zw     |-----
          |________|
```

(For this entire discussion, the assumption is made that the length of the transmission line used to construct the balun is short in terms of wavelength, so it can be accurately represented by lumped elements. The analysis isn't valid if this assumption isn't true.)

Zw is the winding impedance. It's the impedance that the winding would have if the winding were made of a single conductor. If a low-frequency ferrite toroidal core or beads are used, Zw is chiefly resistive; if a high-frequency ferrite is used, it's chiefly inductive, but in general it can be any combination of resistance and reactance. Without a core or coil, Zw is the "longitudinal impedance" -- the impedance of the wire itself.

For coax, Zw represents the impedance to current flowing on the outside of the shield, while the "ideal transformer" models the inside of the coax. The "ideal transformer" action comes about because of the complete coupling of the fields from currents on the two conductors inside the coax. With non-coax transmission lines, the assumption is again made that the fields from the two wires completely couple. This assumption is good as long as the two conductors are very close together. The model winding impedance Zw represents the impedance to common-mode currents and can be split evenly between the two conductors or it can be placed all on either side. It makes no difference because of the action of the "ideal transformer".

The "ideal transformer" is the source of the following two rules:

Va - Vc = Vb - Vd

and

The currents in the two windings of the "ideal transformer" are equal and opposite.

From the first equation can also be derived that $V_a - V_b = V_c - V_d$.

A simplified model of the balun's environment is:

```
      Is     ___________         Z1    I1
     -->    |           |        ___  -->
 +   -----a-|           |-c-----|___|------.
Vs          |  BALUN    |        ___       |
 -   --.--b-|           |-d-----|___|------.
       |    |___________|             <--  |
       |                         Z2    I2  |
      GND                                 GND
```

A very important point is that the two places labeled "GND" are THE SAME POINT. If Z1 and Z2 represent an antenna or antenna/feedline, the path back to the balun input must be included in values Z1 and Z2. Or, to put it another way, Z1 is the impedance measured between terminals c and b, and Z2 the impedance between d and b, with the balun disconnected.

Using this simple circuit and the two balun rules, we can calculate the following:

Ratio of currents in Z1 and Z2: $I1/I2 = (Z2 + Zw) / Zw$

Balun input impedance: $Vs/Is = Z1 + (Z2 \| Zw)$

Voltage across balun winding:
$Vb - Vd = Vs * (Z2 \| Zw) / (Z1 + (Z2 \| Zw))$

Ratio of coax outer shield current or twinlead "antenna current" to the total conductor current):
$(I1 - I2) / (I1 + I2) = (Z2 \| Zw) / (2Zw - (Z2 \| Zw))$ (*)
$= Z2 / (Z2 + 2Zw)$ (*)

where $Z2 \| Zw$ = the value of Z2 in parallel with Zw.

These equations show a few interesting things. First is that as Zw gets very large, I1 and I2 become equal and the "antenna current" drops to zero.
This represents the perfect current balun, and shows why we strive to maximize the balun impedance.

Another interesting thing is that the current balance is dependent on only Z2 and Zw, and is completely independent of Z1. If Z2 becomes zero, the current balance is perfect regardless of Zw. If Z1 and Z2 represent an antenna or antenna and feedline, this isn't likely to happen. Remember that Z2 is the impedance from terminal d back to terminal b. Even if one end of a coaxial cable shield is connected to d and the other end to the earth, there can still be a significant impedance between the two. If the coax is a sizeable fraction of a wavelength long, the impedance can be quite high.

Note that Z2 shows up only in parallel with Zw. This isn't surprising, since the two are, in fact, connected in parallel. It does lead to the observation that the currents in Z1 and Z2 can be made equal by putting another impedance Zw * Z1 / Z2 (*)from terminal c to ground. Although the connection of this extra impedance is the same as for the "tertiary" winding of a 1:1 "voltage" balun, the latter doesn't fulfill this function because of its coupling to the other windings. To use an added impedance for this purpose requires isolating it from the 1:1 current balun; it should be a separate component. If the antenna is balanced with respect to ground, the added impedance is simply equal to Zw, and another balun could be used, with its input terminals shorted together and output terminals shorted together. However, if the balun impedance is low enough that this becomes necessary to achieve balance, balun current will be large, and overheating may result.

Finally, the equations show that to analyze the important elements of balun operation, we have to know Z1, Z2, and Zw -- although we can calculate the current balance by knowing only Z2 and Zw.

What happens when a tuner is used? To analyze this, I modeled a simple "tuner" as a 1:n turns ratio transformer:

```
  __________   __________
   --> Iin  | |  --> Iout
            | C
            C C
in       1  C C  n      out
            | C
            | |
  __________|_|__________
```

Notice that the bottoms of the two windings are connected together. This is to represent the tuner's single "ground" terminal. No winding impedance is included in the model, since a tuner probably won't be a transformer in the first place, but rather some other circuit which effects an impedance transformation. This model was chosen to investigate some of the fundamental properties of baluns, which will hold regardless of the exact tuner topology.

Once again, there are two rules for the model:

Vout = n * Vin

Iout = Iin / n

Here's a representation of a typical hookup with a tuner.

```
      Is    _________       ___________         Z1    I1
     -->  |         |     |           |        ___  -->
 +  ------|         |---a-|           |-c-----|___|------.
Vs        | TUNER   |     |  BALUN    |        ___        |
 -  --.---|         |---b-|           |-d-----|___|------.
      |   |_________|     |___________|             <--  |
      |                                        Z2    I2  |
     GND                                                GND
```

Notice that no additional connection to "GND" is shown, since the tuner's connection to the common point called "GND" is via its lower terminal(s).

Again, the rules can be applied and results calculated:

Ratio of currents in Z1 and Z2: $I_1/I_2 = (Z_2 + Z_w) / Z_w$

System input impedance: $V_s/I_s = (Z_1 + (Z_2 \| Z_w)) / n^2$

Voltage across balun winding:

$$V_b - V_d = n \cdot V_s \cdot (Z_2 \| Z_w) / (Z_1 + (Z_2 \| Z_w))$$

Ratio of coax outer shield current or twinlead "antenna current" to the total conductor current):

$$(I_1 - I_2) / (I_1 + I_2) = (Z_2 \| Z_w) / (2Z_w - (Z_2 \| Z_w)) \quad (*)$$
$$= Z_2 / (Z_2 + 2Z_w) \quad (*)$$

The only changes from the no-tuner case are the input Z, which is transformed by n^2 as expected, and the voltage across the balun winding which has increased by a factor of n. Again, to achieve good current balance requires only that Zw be much greater than Z2. However, some situations requiring a tuner present a high value of Z2, making good current balance difficult to achieve.

Finally, move the balun to the tuner input and do the calculations:

Ratio of currents in Z1 and Z2: $I_1/I_2 = (Z_2 + Z_w) / Z_w$

System input impedance: $V_s/I_s = (Z_1 + (Z_2 \| Z_w)) / n^2$

Voltage across balun winding:

$$V_b - V_d = n \cdot V_s \cdot (Z_2 \| Z_w) / (Z_1 + (Z_2 \| Z_w))$$

Ratio of coax outer shield current or twinlead "antenna current" to the total conductor current):

$$(I_1 - I_2) / (I_1 + I_2) = (Z_2 \| Z_w) / (2Z_w - (Z_2 \| Z_w)) \quad (*)$$
$$= Z_2 / (Z_2 + 2Z_w) \quad (*)$$

The results are identical to those with the balun at the tuner output! Even the voltage across the balun winding is the same. This wasn't, to me, an obvious outcome. (And, in fact, I'd believed otherwise for years.) However, the equations have been carefully checked and are correct. In addition, an experiment was set up using a characterized balun and transformer "tuner" and the results confirm the analysis. I want to thank Tom Rausch, W8JI, for making a comment on the Internet which prodded me into doing the tuner analysis.

With these models, 1:1 current balun performance should be straightforward to analyze under most operating conditions. It is hoped that this will put to rest some of the speculation surrounding these simple devices.

Roy Lewallen, W7EL (October 14, 1995)

Don't be afraid of electronics, remember that in earlier days of Amateur Radio, homebrewing ones own equipment was the norm – if you bought everything from a store you were called "an appliance operator" and pitied for your lack of project homebrewing ability.

A good way to increase your knowledge is to sit in on the Basic Amateur Radio Course classes offered by the club each year, it's free and many subjects are discussed and demonstrated. So try building something, even if it is only a wire antenna or other basic project, and you will enjoy the feeling of satisfaction and pride that a "store bought" will never bring. Simply "owning" stuff can never replace "building" and experimenting. **THIS** is what Ham Radio is really all about!

This certificate (in a frame) will be presented to each ham who taught one or more classes.