# FEEDBACK

The OFFICIAL Newsletter of the
**Georgian Bay Amateur Radio Club Inc.**

Sponsoring
VE3OSR FM REPEATER 146.940- OWEN SOUND
VE3IJD PACKET BBS 145.630 KEADY

February 1997


**REGULAR EVENTS**

**GBARC MEETINGS:** 4th Tuesday of each month at the Billy Bishop Airport 7:30 P.M.

**BREAKFAST MEETINGS:** 2nd and last Saturday of each month at the Rockford Esso, 9:30 A.M.

**GBARC INFORMATION:** Information regarding membership should be directed to VE3NEM Tom Merner RR#4 Owen Sound, N4K5N6 371-0655

**FEEDBACK:** Submissions or letters to the editor should be directed to VE3TSA Tom St.Amand, 1232 3rd Ave . East, Owen Sound N4K2L5

## Minutes of GBARC Executive Meeting February 15 1997

The members of the executive and general membership present were ve3xox, ve3nem, ve3tsa, ve3nbj, ve3lkd, ve3iod, va3cjm and va3jrf. The meeting was opened by ve3xox advising the members present that a hobbymarket meeting would also be completed following the executive meeting. Items discussed were as follows:

Club Incorporation: Norm ve3nbj reviewed with the members present the requirements necessary to keep the club incorporation documents up to date. Members present reviewed the "notice of change" forms that have been prepared to update changes to the elected officers of the club for the past year. Approval was given to forward copies of these documents to the ministry of consumer relations for their database. Review of the requirements for annual minutes of the corporation was discussed also. It was agreed that annual minutes will be prepared at the June meeting and new change of notice will be prepared for the incoming executive. Financial and membership year ends will continue to be December 31st. as they have been.

Airport fees: Bob ve3xox reported to the group that the airport meeting room has raised its cost to forty dollars per meeting. A discussion of possible meeting places was made with Jim va3cjm indicating that the owen sound yacht club may be a possibility. He will check into this and report to the club on his findings. It was agreed that the airport is a good facility but is getting costly for the amount of time it is rented by the club.

Wiarton airport: A brief discussion of the Wiarton proposal was made. The airport group is having organizational difficulties at this time and this issue has been put on hold due to no response from their end.

Repeaters: Bob ve3xox has suggested a letter to the repeater council regarding the current problems associated with the Ipperwash repeater. They have increased power level and recent antenna changes have caused considerable infringement on the 146.94 frequency and this may help resolve this. Bob gave an overview of the changes to the osr repeator that have occured in recent months and the need for antenna repairs to complete the upgrade. Discussion of possible repeater links or upgrades was made for consideration in the future.

Agenda for meeting feb.25/97: Discussion of the items for the next general meeting at the Billy Bishop Airport in Owen Sound.

The meeting was moved for closure by Tom ve3nem and seconded by Tom ve3tsa....minutes by ve3nbj

# The Existential Pleasures of Amateur Radio

by Brad Rodriguez, VE3RHJ

I don't remember how I first got hooked on electronics. As a child in the U.S., I loved science, and I particularly loved science experiments with batteries and magnets and such. I soon acquired the Lafayette and Allied Radio catalogs, and began ordering books and parts by mail. My first clear memory is of my first transistor project -- a photocell relay -- which I took to show my fourth-grade class.

As my projects became more sophisticated, so did my library, and eventually I was prompted to mail-order a copy of the 1970 Radio Amateur's Handbook. I think it was this, plus meeting some friends of my father's who were CB enthusiasts, which sparked my interest in shortwave radio. I started with a no-name 5-band shortwave radio from the local hardware store...then an 8-bander...then a Realistic DX-150, my first "real" communications receiver. But listening wasn't enough for me...I wanted to get on the air!

Informed of these aspirations, my grandfather gave me an Instructograph code machine for Christmas (still a proud possession!). I began struggling with the 5 wpm code requirement, alternating between the Instructograph and LP records from Ameco. In those days, the exam had to be written at an FCC office, a few hundred miles away -- which meant I could only write the exam when we went to visit my grandparents.

For a year I agonized over the Morse Code. In those days, the U.S. Novice class licence was limited to CW and 75 watts. Theory was a snap, so I resolved to go straight for my Technician class licence, which had the same 5 wpm code requirement but gave full privileges above 50 MHz. (Rather like today's Canadian Basic licence, except that I could

run a full kilowatt.) Even so, it took three trips to that intimidating FCC office before I passed the 5 wpm exam in 1972.

It was the wrong time and place to be a Technician. 2 metre FM did not yet exist, and I was at least a hundred miles from a city of any size. I knew no other hams. My only source of information was the Handbook, which in those days carried advertisements in the back. I chose my first rig from those ads; an Ameco TX-62 transmitter, which seemed the ideal rig for 6 and 2 metres. I built VHF receiving converters from International Crystal modules. I upgraded to a Realistic AX-190 receiver. Alas, my logbook remained empty.

The breakthrough came in mid-1972, when I enrolled in a two-week summer engineering camp at a nearby university. I met a friend with similar interests, and while wandering the campus, we stumbled by accident into the amateur radio club. None were Technician-class, so we were allowed to use the 6 metre AM rig they scorned. I quickly met some other Techs in the city, and I learned about the local amateur radio dealer. When I returned home, I had new Tecraft 6- and 2-metre converters, and a weekly schedule with another high-school student.

Ironically, I could hear his SSB signal but he couldn't hear my AM signal, so I had to send my half of our conversations in CW...until I upgraded to the same rig he had (a Gonset Sidewinder). Then a 100 watt amplifier. Then a kilowatt. Then an 8-element 6 metre beam. I left the rig on constantly, hoping to catch the rare sporadic-E openings. I was hooked.

The next year I enrolled in that same university, and became an active member of the radio club. Being surrounded by General-class amateurs working Europe every day was too much for me; I buckled down and practiced the code until I finally passed the 13 wpm exam. My first HF rig (selected from QST this time) was the Kenwood Twins, and oh, was I proud to set them up in a spare corner of the club's "shack!"

Some people are never satisfied...after a few years of happy HF operation, I was bitten by the QRP bug. I sold the Kenwoods and bought an original Ten-Tec Argonaut. Alas, I learned the hard way that QRP requires a good antenna -- and a random wire out of the dorm room window doesn't qualify. About this time I became a computer hobbyist, so my amateur career went "on hold" for a few years.

It had a brief revival after I got my first job, and a co-worker sold me his Drake B-line for a ridiculously low price. I worked occasional DX with this rig, but I still didn't have the room for a proper antenna. My back yard was smaller than some people's gardens, and I'd had disappointing experiences with verticals. (Since then my faith in vertical antennas has been restored.)

It took getting married and moving to a farm in Canada to fully revive my interest in ham radio. My wife bought me a modern solid-state rig as a gift, and I promptly strung an all-band GD-9 Windom antenna, using my U.S. call "portable VE3." With some intensive code practice, I passed the 15 wpm exam; fortunately my U.S. experience counted toward the then-necessary 250 QSOs. For the first time in my life, I had all privileges on all bands!

Now, after twenty-five years of hamming, I'm a confirmed nostalgia junkie. I still own the original Argonaut, the Drake twins, and (incredibly) the 6 metre Tecraft converter. Occasionally I see a bit of my past offered for sale; that's how I acquired a replacement AX-190, TX-62, and Kenwood twins. Someday I'll duplicate my original station. When I do, listen for me calling CQ on 6-metre CW...unless, of course, I find a used Gonset Sidewinder for sale.

## The Tate Family

You have probobly heard of the TATE family. They have membership in every organization, including Amateur Radio.

First, there is Dic Tate, who wants to run everything. Then there is Ro Tate who is always trying to change things.

Next there is Agi Tate, who stirs up trouble whenever possible, with his brother, Iri Tata who is always there with a wet blanket every time a new idea is suggested.

Hesi Tate and Vegi Tate are there to say they can't possibly work but are more than willing to watch everyone else.

Imi Tate just wants to copy others and refuses to try anything new. Devas Tate loves to interrupt and shoot down everyone else's ideas. Poten Tate wants to be the big shot. It's a good thing we often have Facili Tate, Cogi Tate, and Medi Tate, who save the day and get everyone pulling together.

## COMPUTER POEM ?

Here's an easy game to play
Here's an easy thing to say

If a packet hits a pocket on a socket on a port,
And the bus is interrupted as a very last resort
And the address of the memory makes your floppy disk abort,
Then the socket packet pocket has an error to report.

If your cursor finds a menu item followed by a dash,
And the double-clicking icon puts your window in the trash,
And your data is corrupted ' cause the index doesn't hash',
Then your situations hopeless and your systems gonna crash!

If the label on the cable on the table at your house
Says the network is connected to the button on the mouse,
But your packets want to tunnel on another protocol,
That's repeatedly rejected by the printer down the hall,

And your screen is all distorted by the side effects of Gauss,
So your icons in the windows are so wavy as a souse,
Then you may as well reboot and go out with a bang,
'Cause as sure as I'm a poet, the sucker's gonna hang!

When the copy of your floppy's getting sloppy on the disk,
And the microcode instructions cause unecessary RISC
Then you have to flash your memory and you'll want to RAM your ROM
Quickly turn off the computer and be sure to tell your MOM!

● *Practical Hints for Improving Performance of Antennas, Transmission Lines and Matching Devices*

# V.H.F. Antenna Facts and Fallacies

BY EDWARD P. TILTON,* W1HDQ

## Part 1 — Antenna Design

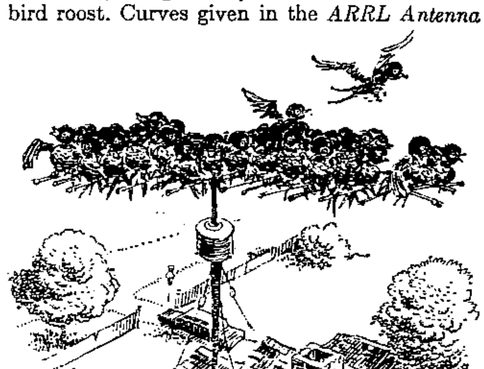
ANTENNAS are a prime subject for discussion wherever hams gather, and because precise measurement and evaluation are difficult under average amateur operating conditions, we have built up a choice collection of conflicting ideas about antennas and transmission lines over the years. The writer, in common with many other v.h.f. men, has found work with antennas to be a most interesting, though occasionally baffling, aspect of the hobby. It is also highly rewarding, as improvements in the antenna system pay off in both transmitting and receiving, and gains achieved through antenna work often represent greater system improvement than could be obtained from comparable expenditures for other station equipment.

Information to be presented here was compiled to answer questions commonly asked of the writer in correspondence, in radio club meetings, conventions and on-the-air discussions of antenna problems. It is based on practical experience, and results quoted are those that can be achieved under typical amateur conditions. Let's consider the antenna factors first. We'll get to transmission lines and matching systems later on.

### How Much Gain?

It's a sad fact, but antenna-gain claims tend to be on the optimistic side. Even if accurate, and quoted with the best intentions, they still may apply to only one frequency, and to a special set of conditions. Furthermore, they may be stated in terms that are confusing to the average amateur reader. Very few of us can measure antenna gain accurately. The writer frankly admits that he cannot, after many years and man-hours of trying, usually with better facilities than are at the disposal of most amateur workers. On-the-air evaluation of antennas is also far from simple or easy. What really counts is whether or not a new antenna increases your coverage appreciably, giving you a stronger or more consistent signal at distant points than you had before. You may look for other gains, such as reduction in interference from stations off the line of the beam. The point is that some understanding of antenna principles is important if you would make an intelligent choice of antennas to be used at your station, whether you intend to buy them or build them yourself. Many factors will enter into your selection of a suitable array, and most of them will not be discussed in a manufacturer's literature. There is a great deal more to antenna performance than just a maker's or designer's gain claim, expressed to the last fraction of a decibel. More on practical evaluation later.

Gain in Yagi arrays is related to boom length, as well as to number of elements. Putting in more than the required number of elements for a given length of boom merely runs up your bill for aluminum, though it may make the beam a better bird roost. Curves given in the *ARRL Antenna*



*Book* make these factors stand out clearly. They show, for example, that a 5-element Yagi needs a boom about ¾-wavelength long, and th[illegible] should give a gain of 9½ db. at its design fre-quency. A 10-element Yagi should be 2.5 wavelengths long, and it is good for 13 db. For 15 elements you need a 4.5-wavelength boom, and you can get up to 16 db. out of it, if you're lucky. These gains are for the center frequency, and are the best that can be expected. Anyone who exceeds them is very likely making a measuring error or trifling with fact.

Gain is achieved only by modifying the radiation pattern of an antenna, taking power from some directions and putting it into others. A convenient way to express gain, therefore, is with reference to an antenna that would radiate equally in all directions. Such an antenna would be a point source, and it exists in theory only. The *isotropic antenna* has a special appeal for the fellow who wants to make his antenna look good on paper, since it would be 2.14 db. poorer than a half-wave dipole. "Gain over isotropic" is a handy and legitimate way to express antenna performance, so long as the reader understands that it is being done this way. Chances are that you'll find it being done more often, as time goes on, but remember that gain figures so quoted are 2 db. higher than gain over a dipole, a term more familiar to amateur readers.

### Single or Stacked Yagis

Whether you should stack two small Yagis or put up a single long one depends on what you want to do best with your antenna. If lower radiation angle is important, and it is for most o[illegible] stacking will do it. Despite what one often he[illegible] to the contrary, adding elements to a single Yagi will not affect the radiation angle materially. Added elements sharpen the pattern, but the angle above the horizon does not change appreciably, so long as height above ground is not changed. Stacking two or more Yagis in a vertical plane will lower the radiation angle, and this is often beneficial. It probably will extend your coverage noticeably, yet it does not sharpen the horizontal lobe. Aiming problems are not increased, and the system's frequency response is not changed appreciably.

Doubling the number of elements, or doubling the boom length and adding the appropriate number of directors in a single Yagi may give about the same gain as stacking two small ones — about 3 db. — but it makes aiming more critical because of the sharper main lobe. It will also sharpen the frequency response quite markedly. The long Yagi is fine if you want lots of gain over a narrow segment of the band. The sharper pattern may be helpful in cutting down interference, if you live in an area of high activity. But if you want to work effectively over most of the band, with a minimum of beam rotating, a high-gain long Yagi is not for you.

### Yagi or Collinear?

This is an "evergreen," for which there is no one pat answer. Like so many other antenna decisions, this one depends on your objectives in the

* V.H.F. Editor, *QST*.

**There is probably no field in which more seemingly conflicting information has been published than in connection with amateur antennas and feed systems, particularly those for v.h.f. and u.h.f. use. Here is a distillation of many years of experience in working with beams on amateur bands from 28 through 1300 Mc. that may help to clear up some points that may have puzzled you. Though primarily concerned with v.h.f. arrays, it will be of interest to antenna experimenters on lower bands as well.**

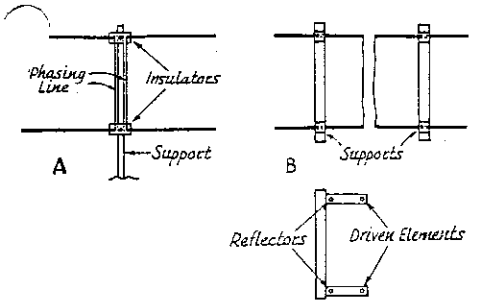



Fig. 1—Wrong and right ways to make a collinear array. At A is a method occasionally used, where elements, phasing lines and supports are joined mechanically at insulating blocks. This produces capacitive loading at the hot element ends, detuning the system and impairing its effectiveness. A much better approach is shown at B. Here the elements are mounted at their low-voltage points, and the structure for supporting the array is entirely in back of the driven and reflector elements. Supporting frame may be either wood or metal, and no insulation is required.

game. The collinear array is big and rather hard to handle mechanically, but it works well over a wide frequency range and is very easy to match and feed. If you value wide frequency response, you'll find a collinear superior to a Yagi, even though the latter has a higher gain rating. If narrow frequency coverage and critical adjustment don't worry you, the long Yagi is a very good bet.

A few words about construction of collinears may be appropriate here. Arrays of phased elements have gotten an unsavory reputation in some quarters because they were improperly designed. Impedance at the ends of half-wave elements is very high. These element ends should not be mounted on insulators. The best way to make a collinear v.h.f. array, whether you use wood or metal supporting structure, is to mount the elements at their low-voltage points. With half-wave elements this is at the center, not the ends. Fig. 1 shows the right and wrong of it.

Some years ago the writer and W1VLH ran some interesting experiments with collinear arrays on 144 Mc. One of them was a manufactured 16-element array being sold widely at that time. Its inner element ends, phasing lines and metal supports were all joined mechanically in a molded vinyl insulator, as in Fig. 1A. This made a nice-looking array having good mechanical balance and low wind resistance, but checks on its performance showed that capacitive loading caused by the insulators was throwing the thing almost completely out of whack. It was highly reactive across the whole 2-meter band, and could not be matched by any simple adjustable matching device. Putting two of these 16s together to make a 32-element array made the problem even worse. The pattern with either 16 or 32 elements was full of minor lobes, and the gains were several decibels lower than arrays of these configurations should have given.

We then built 16- and 32-element arrays of the same physical dimensions, but with the elements mounted at their centers, as in Fig. 1-B. All-

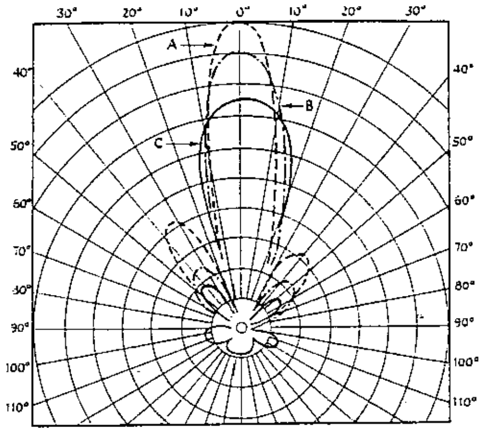



Fig. 2—Approximate horizontal patterns of a 32-element 2-meter collinear, showing the effect of increasing spacing between the inner element ends. Pattern C is with the element ends two inches apart, the procedure normally used in such arrays. Pattern B resulted when the spacing was increased to ¼ wavelength. Pattern A was taken with ⅝-wavelength spacing between inner element ends. Note that the main lobe is longer and sharper with the wider spacings. Minor lobe content also increases, and this is a limiting factor in bay spacing in all types of arrays. No attempt is made here to show fine detail in the smaller side and rear lobes.

metal construction was used, with all elements in front of the metal supporting structure, and no insulation anywhere except in the phasing lines (All-wood design would serve equally well.) These arrays could be matched perfectly with a simple adjustable "Q" section, indicating that they were resonant in the band, where they should be. Their patterns were far cleaner than the insulated models and the gains were much better. The insulator-mounted arrays worked after a fashion, simply because they were big, but the difference between them and the properly-made collinears was like the proverbial night and day.

### *Stacking Problems*

To stack horizontally or vertically is a question that comes up most often in connection with collinears, but the principles apply to Yagis as well. Gain is more or less the same with arrays side by side or one above the other, but the difference in the patterns is important. Stacking vertically narrows the vertical pattern but not the horizontal. This is usually what we want, since it gives gain without increasing aiming problems. Horizontal stacking narrows the horizontal pattern, and this may be troublesome, especially with collinear arrays, which have fairly sharp forward lobes already.

With horizontal stacking, spacing between element ends affects gain and pattern sharpness. The change in pattern is shown in Fig. 2. This was made with the 32-element array for 144 Mc. mentioned above, and shown in the *ARRL Antenna Book*, Fig. 10-35. It will be seen that gain is considerably improved at the wider spacings, and the main lobe is sharper. Widening of the spacing between the inner ends of a side-by-side 32-element array for 144 Mc. makes it something of a horse to handle, but the extra gain may be worthwhile at 220 or 432 Mc. Remember, though, that this gain comes from narrowing the main lobe. You need a stable support and something better than the average TV rotator to handle the baseball-bat pattern that comes with the wider spacings.

A 48-element collinear array for 432 Mc. is presently in use at W1HDQ. It is basically four 12-element collinears, with half-wave spacing between the inner element ends. Its design and structural features may be described in a future article.

In stacking horizontal Yagis one above the other on a single support, certain considerations apply whether the bays are for different bands or for the same band. As a rule of thumb, the minimum desirable spacing is one-half the boom length for two bays on the same band, or half the boom length of the higher-frequency array where two bands are involved.

In the stacked two-band array of Fig. 3, the 50-Mc. 4-element Yagi is going to "look like ground" to the 7-element 144-Mc. Yagi above it, if it has any effect at all. It is well known that the impedance of an antenna varies with height above ground, passing through the free-space value at a quarter wavelength and multiples thereof. At one-quarter wavelength and at the *odd* multiples thereof, ground also acts like a reflector, causing considerable radiation straight up. This effect is least at the half-wave points, where the impedance also passes through the free-space value. Preferably, then, the spacing *S* should be a *half* wavelength, or multiple thereof, at the frequency of the smaller antenna. The

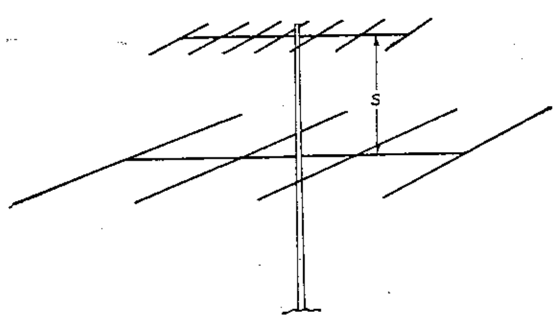



Fig. 3—In stacking Yagi arrays one above the other the minimum spacing between bays, S, should be about half the boom length of the smaller array. Wider spacing is desirable, in which case it should be a half wavelength, or some multiple thereof, at the frequency of the smaller array. If the beams shown are for 50 and 144 Mc., S should be 40 inches minimum, with 80 inches preferred. Similar conditions apply for stacking bays for a single band.

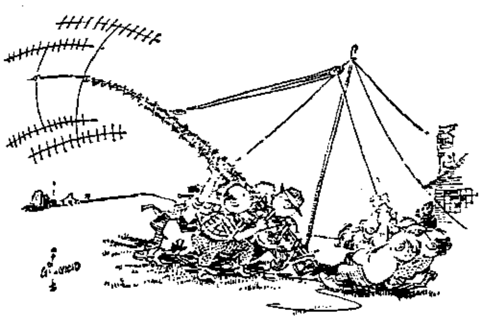
half-the-boom-length rule of thumb gives about the same answer in this example. For this length of 2-meter antenna, 40 inches would be the minimum desirable spacing, but 80 inches would be better.

The effect of spacing on the larger array is usually negligible. If spacing closer than half the boom length or a half wavelength must be used, the principal thing to watch for is variation in feed impedance of the smaller antenna. If the smaller antenna has an adjustable matching device, closer spacings can be used in a pinch, if the matching is adjusted for minimum s.w.r. Very close spacing and interlacing of elements should be avoided, unless the builder is prepared to go through an extensive program of adjustments of both element lengths and matching.

In stacking bays for the same band fed in phase, the minimum spacing for appreciable gain is a half wavelength for Yagis of up to four elements or so. For such small Yagis, and for dipoles and omnidirectional systems such as the Big Wheel [1] and the turnstile,[2] a spacing of 5/8 wavelength will give appreciably more gain. This is convenient in that an electrical full wavelength of coax may be used for phasing. We'll get into phasing and feed problems later.

As bay spacing is increased the main lobe becomes sharper, as already indicated, but minor lobe content also increases. This becomes self-defeating if carried too far. Small Yagis spaced a half wavelength show a beautifully clean pattern, but only moderate gain from stacking. For Yagis up to two wavelengths long, a bay spacing of one wavelength is good, though minor lobes are quite pronounced when individual bays have 6 elements or less.

For arrays of more than two wavelengths, keep that half-the-boom-length minimum in mind, but space them wider if you can. It can be seen from this that stacking of long Yagis makes for large



and ungainly structures, but gain never comes easily once you get into the upper brackets.

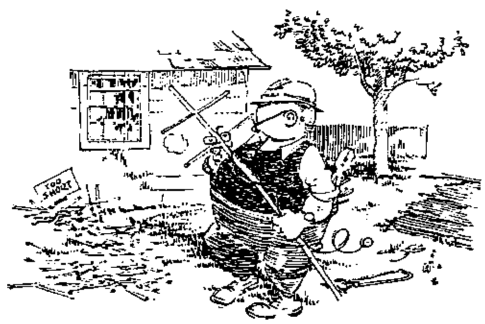
### *Element Length and Spacing in Yagi Arrays*

You don't have to delve very deeply into antenna literature before you observe that there is great diversity in the design of Yagi arrays.

[1] Mellen and Milner, "The Big Wheel on Two," *QST*, September, 1961.
[2] Campbell, "Turnstile for Two," *QST*, April, 1959.

Years ago, "close-spaced" arrays were all the thing. Today "wide spacing" is in. To complicate the picture, some designs use graduated spacing. Element length information seems equally confusing and contradictory.

The air is cleared somewhat when we realize that there are many ways to make an effective parasitic array. Since it is all but impossible to design even a short Yagi mathematically, let alone a *long* one, anyone can become an expert if he has an open back yard, a stock of aluminum, and plenty of perseverance. This sort of thing



has been going on for at least 25 years, and the end is not yet in sight. However, some guidelines are fairly well established.

The fellow who doesn't have the facilities and fortitude to undertake an involved experimental program can relax and take the *Handbook* and *Antenna Book* information for granted. It works. In small Yagis, element spacings of 0.15 to 0.25 wavelength make no great difference in gain, though some change in element lengths is needed to give optimum results over this range of element spacing.

If you make your driven element from the 5540/freq. (Mc.) formula, for the length in inches, add 5 per cent for the reflector and subtract 5 per cent for the director, and use 0.2 wavelength spacing, you'll be very close to optimum for a 3-element beam. Closer spacings require a shorter reflector and a longer director, and wider spacings just the opposite, but dimensions are by no means so critical as some would have you believe. Substitute 4 per cent for the previously-stated 5 for a Yagi with 0.15-wavelength spaced parasitic elements.

Adding directors, you can make them all the same length for optimum gain at one frequency, or taper them slightly for increased bandwidth, with hardly-measurable gain reduction. Directors progressively shorter by about 0.5 per cent is the usual practice. Optimum spacing for Yagis of up to 4 or 5 elements is about 0.2 wavelength.

With four or more elements, graduated spacing begins to pay off. Recommended spacings (in wavelengths) are given in the *Antenna Book*, Table 4-11. If you don't have the book handy, this information shows that director spacings for medium or long Yagis should increase gradually with each additional director. The first should be about 0.15 wavelength from the driven element. The spacing between directors 1 and 2 shoul[illegible] 0.18λ, between 2 and 3 0.25λ, and so on [illegible] 0.35λ to 0.42λ is reached at the sixth. From then on, all are the same wide spacing. Reflector spacing can be anything from 0.15 to 0.25 wavelength. In fact, director spacings are not too critical, either. There is no need to measure to the last sixteenth of an inch in laying out a Yagi array, even on 420 Mc.

Spacings other than those quoted above are given, even in our own publications. W2NLY and W6QKI worked out a highly successful long Yagi, and described it in a now-classic *QST* article.[3] They used 0.1 wavelength for the first two directors, slightly more for the third, 0.2 for the fourth, and 0.4 for all thereafter. There probably is no better Yagi than this, but the graduated spacing above is equally effective, if all matching and measuring factors are taken into account.

There are many other ways to do the job. One well-known beam manufacturer uses a system that looks strange to the casual observer. Element spacings vary at a seemingly random rate throughout the length of his long Yagis — and *so do his element lengths.* The writer has checked these beams carefully, and has also run through many variations of the first two systems, finding little on which to base a choice between them.

Changes in appearance, in antennas as well as the yearly output of certain Detroit stylists, are not always of earthshaking importance. There is probably enough leeway in design factors to provide entirely satisfactory new models in [illegible] antenna field for some time to come.

### *Evaluation*

When the writer put up his first 16-element beam,[4] he encountered a condition that has confused antenna experimenters since time immemorial. The first two on-the-air checks were made with nearby stations, both shielded by intervening hills but near enough so that strong signals always prevailed over the paths, regardless of antennas used. The 16 was tested against a comparison dipole mounted nearby. To our dismay there was hardly any difference in signal strength. When the 16 was rotated we got the impression that it was a total loss, as the pattern seemed to be full of minor lobes. If we had not been worn out from the day's efforts, we'd probably have torn the whole thing down right then.

Fortunately, we decided to let it stand for a while, and that evening we had another go at it. We'd been enjoying a mild early-spring day, and as evening wore on a nice inversion developed. To our delight, we began to hear signals from Fall River, Providence and the Boston area, 75 to 100 miles away. This was real DX on 144 in 1946, and lo and behold, most of the stations were inaudible on the comparison dipole. Further more, our 16-element array had to be right-on

[3] Kmosko and Johnson, "*Long* Long Yagis," *QST*, January 1956.
[4] "World Above 50 Mc.," *QST*, May, 1946, p. 56 and cover.

for direction to bring them in readably. There were no troublesome minor lobes in evidence on these distant signals.

Reflections from local hills, trees and buildings were the cause of our unsatisfactory earlier results with the locals. Their signals were bouncing all over the place, and since the direct paths were obscured, the reflected signals were about as strong as the direct ones. Our dipole picked up a composite of the reflections; the beam picked them out one at a time. Reflections were not a factor in the distant reception, so the true pattern of the antenna showed up on them.

Reflections can fool you in other ways, too. Experience with the 48-element, 432-Mc. collinear mentioned earlier is a case in point. One of our first checks on it in actual use was made by comparing it with a 16-element collinear we'd had in use for several months. By this time we knew fairly well what the 16 would do. The two feed lines were hooked up to a coaxial switch to permit instant comparisons on reception. The first signal heard was W1QWJ, in Springfield, some 25 miles away. He was beamed away from W1HDQ, and was barely audible on the 16. Switching over to the new 48 gave us the shock of a lifetime — Dick's signal jumped up by about 20 db.!

Any long-time antenna experimenter will recall experiences like these, when first checks indicated either huge success or complete failure of a new beam. These two true-life extremes are fairly typical, and they point out a moral: *never* judge an antenna on the basis of one or two checks. We called W1QWJ and had him rotate his beam while both of ours remained lined up on him. Just turning *his* antenna caused the apparent gain of our 48 over the 16 to vary between 20 db. and zero. The average was about 6, which is in line with our expectations, taking into account the greater size and better feed line of the new array.

Tests conducted under varying propagation conditions are highly unreliable, and many a 10-, 15- or 20-meter array has achieved distinction because it delivered a tremendous apparent gain under certain ionospheric conditions. Very short 50-Mc. skip may involve a high radiation angle, and under such conditions a simple dipole may look very good, while a fine stacked-Yagi array is delivering relatively low signal strengths. Tropospheric bending can confuse the issue in much the same way. The gist of all this is that we cannot tell by a few random comparisons with a dipole or other reference antennas how a new beam is doing. We have to use it over a considerable period, taking data under all manner of conditions, and then draw our own conclusions. There is a lot more to what constitutes "the best antenna" than a manufacturer's figures for gain and front-to-back ratio! QST

Part II of this series, "Choosing the Right Transmission Line," will appear in an early issue. — *Editor*

*QST* for January 1964

# GBARC 80M Net Schedule

Sundays, 9:30 am local time, 3.783 MHz

| | | | |
|---|---|---|---|
| VE3FFN | Feb 9 | Apr 6 | Jun 1 |
| VE3BFV | Feb 16 | Apr 13 | Jun 8 |
| VE3HXX | Feb 23 | Apr 20 | Jun 15 |
| VE3RHJ | Mar 2 | Apr 27 | Jun 22 |
| VE3DIQ | Mar 9 | May 4 | Jun 29 |
| VE3DXO | Mar 16 | May 11 | Jul 5 |
| VE3JMK | Mar 23 | May 18 | Jul 12 |
| VE3DLH | Mar 30 | May 25 | Jul 19 |

## WANTED - NEWSLETTER EDITOR

As you may be aware, I would like to pass on the duties of bulletin editor to another. Just incase you are hesitant, I wanted to make a brief outline of the job. To start off with, I am willing to supply blank newsletter cover sheets (first page). These will include the proper month and year in the top right corner and the GBARC logo just like we have now except the rest of the page is blank, ready for the minutes or whatever you want to put there. I can also supply blank sheets for the rest of the newsletter which have the header and footer on them. The new editor will just have to cut and paste whatever articles seem appropriate at the time, no fancy computer scanning is required unless that's what you want to do. I also have a bunch of suitable articles which have not yet been published in Feedback.

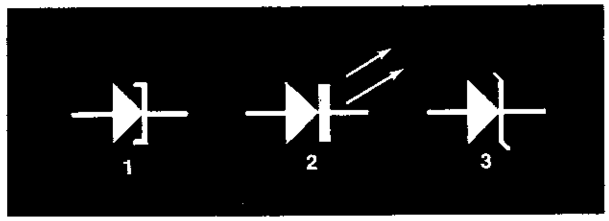
After you are satisfied with the newsletter it's simply a matter of having them duplicated, stuffing envelopes and sending them on their way. Ofcourse, I will remain avaiable should any questions arise. So how about it, Any takers? It would be nice for the new editor to join me in producing a couple of issues, just to get up to speed.

best 73 Tom VE3TSA

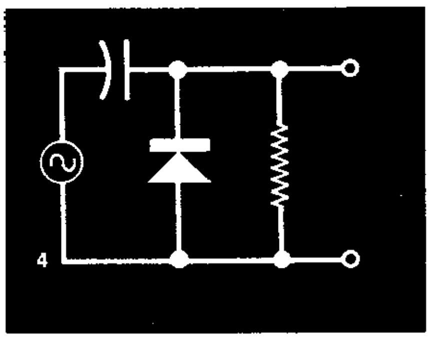
# WHAT DO YOU KNOW ABOUT DIODES?

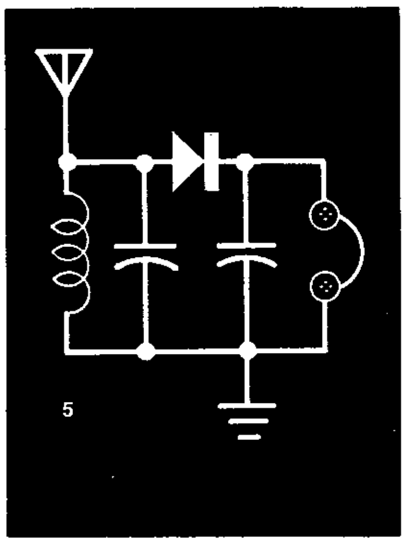
BY ROBERT P. BALIN

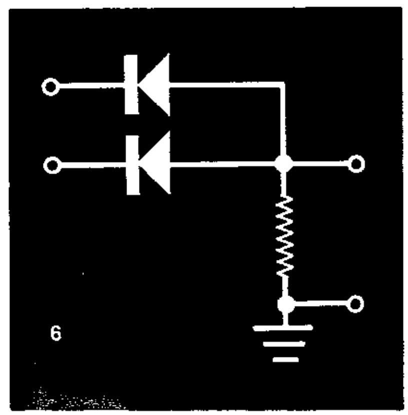
Diodes are deceptively simple electronic components. Even though they consist of just two elements (anode and cathode), their proper application requires a good understanding of how they work. See how many of the following questions you can answer. Numbers of questions refer to numbers on diagrams. Answers are below.



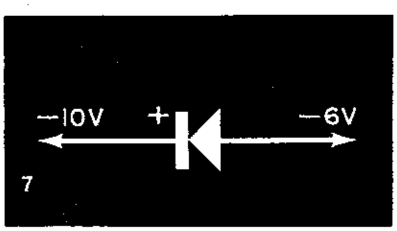

*1. 2. 3. What types of diodes do these symbols represent?*



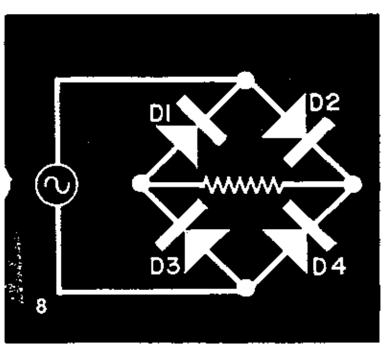



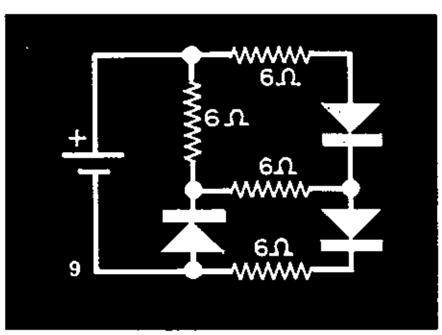

*4. 5. 6. What are the functions of the diodes in these circuits?*



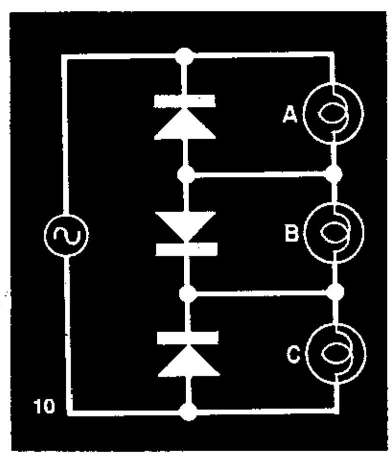

*7. Is this diode forward or reverse biased?*




*8. Which of the diodes in this full-wave bridge has been wired incorrectly.*




*9. What is the total resistance across the battery if the diodes have zero forward resistance and infinite reverse resistance.*




*10. Which lamp will be the brightest?*

Answers: 1. Tunnel. 2. Light-emitting. 3. Zener. 4. Clamp. 5. Detector. 6. Digital gate. 7. Forward. 8. D3. 9. 10 ohms. 10. B (On the positive half cycles, lamp B is shorted out and A and C in series each receive half of the line voltage. On the negative half cycle, lamps A and C are shorted out and B receives full line voltage.)