

CONGRATULATIONS TO SHARON FOSTER

ELECTED AT THE AUGUST MEETING OF THE ATLANTA RADIO CLUB, SHARON FOSTER IS THE NEW PRESIDENT OF THE CLUB. SHE HAS PREVIOUSLY SERVED AS SECRETARY OF A.R.C. AND HAS BEEN A VICE-CHAIRMAN OF THE HAMFESTIVAL ON TWO OCCASIONS. SHARON IS THE FIRST YL TO HOLD THIS POSITION IN THE ATLANTA RADIO CLUB AND I MIGHT ADD SHE WAS ELECTED UNANIMOUSLY TO THE POSITION BY THE MEMBERSHIP. GIVEN HER EXPERTISE IN HANDLING PAST ASSIGNMENTS FOR A.R.C., I EXPECT TO SEE THE ATLANTA RADIO CLUB DO GREAT THINGS DURING HER TERM OF OFFICE. BY THE WAY, SHARON HAS INCREASED HER COUNTRY COUNT VERY RAPIDLY LATELY AND NOW HAS 175 TO HER CREDIT AS WELL AS UPGRADING FROM TECHNICIAN TO ADVANCE CLASS. WHERE DOES SHE GET THE TIME TO DO SO MUCH SO WELL?

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WANT LISTS

PLEASE MAIL YOUR UPDATED WANT LISTS NOW TO CARL HENSON, WB4ZNH AT THE FOLLOWING ADDRESS:

CARL HENSON, WB4ZNH  
8280 CHESTNUT DRIVE  
JONESBORO, GEORGIA 30236

OR...BRING THEM TO THE AUGUST CLUB MEETING. IT IS TIME TO PREPARE THE 1989 - 1990 CLUB ROOSTER SO BE SURE TO GET YOUR INFORMATION UPDATED FOR THE NEW ISSUE.

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CLASSIFIED SECTION (FOR SALE, ETC.)

PHILLYSTRAN FOR SAKE - I HAVE APPROXIMATELY 1,000 FEET OF 4,000 LB. PHILLYSTRAN FOR SALE AT SUBSTANTIALLY BELOW MARKET PRICE. IF INTERESTED, CALL ALLEN, WB4GNT, AT (404) 973-6251 BEFORE 9:00 EDT.

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CLUB VIDEO

OUR CLUB VIDEO MADE SEVERAL YEARS AGO DISAPPEARED, SO WE DECIDED ANOTHER ONE WAS CALLED FOR. HUGH, N4RJ, WAS KIND ENOUGH TO LOAN US A VIDEO CAMERA. I DID MOST OF IT ON ONE SATURDAY. AFTER 10 HOURS AND 200 MILES, I HAD SEVEN STATIONS ON TAPE. I GOT 3 MORE STATIONS LATER. ALLEN, WB4GNT SENT ME A TAPE OF SEVERAL OTHERS. I HOPE SOMEONE IN THE NORTH EAST SECTION CAN DO A SEGMENT, AND I CAN THEN PATCH THE TWO TOGETHER. ANY VOLUNTEERS??

MIKE, KP4I

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## From the Historian



**William C. Crowell**  
Historian  
625 Manor Place  
West Melbourne, FL 32904  
(305) 729-3110

### Some Notes on the History of Antenna Developments: 1913 through 1937

*Harold H. Beverage*  
Life Fellow, IEEE  
P.O. Box BX  
Stony Brook, NY 11790

[It is my pleasure to share a portion of the early history of radio described by a true pioneer in the field of antennas, Dr. Harold Beverage. The AP-S owes Dr. Bondyopadhyay a debt of gratitude for his dedication and help in obtaining this contribution. WFC]

#### FOREWORD

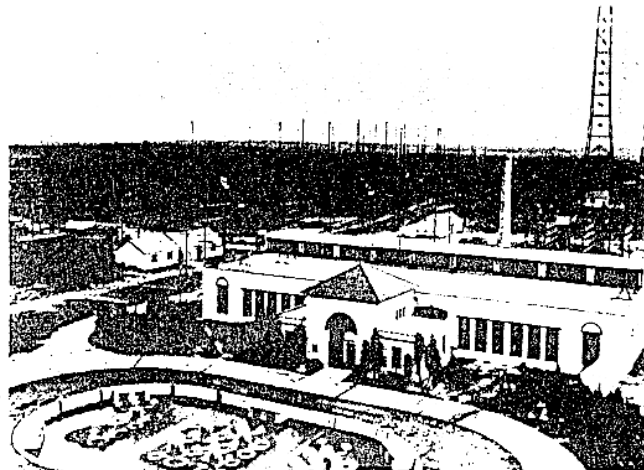
Antenna research and development in the past hundred years since the epoch-making experiment of Heinrich Hertz, verifying the existence of electromagnetic waves, have advanced in distinct surges. The first surge, the Marconi era, spurred by Marconi's famous transatlantic wireless communication experiment in 1901, saw the design, development and deployment of antennas for national and worldwide radio communication. This work spanned the long-wave region (10 kHz - 60 kHz) through the shortwaves (15 meters), with the discovery of ionospheric reflection and the pivotal role it played in shortwave propagation and reception - through the twenties.

The leader of antenna research and development in the Marconi area, besides Marconi himself, is undoubtedly Harold Henry Beverage, pioneer in the establishment of national and worldwide radio communication. In the following memoir, he gives us a rare glimpse of the pioneering days with interesting anecdotes. Some of the antennas he invented have operated in the heart of Long Island to the service of this nation and the world. The Long Island/New York Chapter of the IEEE AP-S is justifiably proud of his pioneering contribution to the progress of mankind.

Probir K. Bondyopadhyay  
Chairman, Long Island/New York Joint Chapter  
IEEE Antennas and Propagation Society

#### SOME NOTES ON THE HISTORY OF ANTENNA DEVELOPMENTS 1913 THROUGH 1937

When one arrives at the age of 95, he can recall events that happened 80 years ago, but has trouble remembering something that happened last year. It is



A panoramic view of the Rocky Point, Long Island Radio Transmitting Station of the RCA Communications in the early thirties.

difficult for me to establish dates, since the only reference book at hand is *History of Radio to 1926* by Gleason L. Archer. I can list some information concerning the development of antennas since I knew many of the people working on antennas, and I can only list general dates.

In 1914, Prof. Zenneck was constructing a long-wave station at Sayville, on Long Island, New York. It was a flat-top arrangement supported by several towers. It was similar to the antenna at Nauen, Germany, and was being constructed for commercial service with Germany. At the same time, another German engineer, named Emil Meyer, was constructing an antenna for French interests at Tuckerton, New Jersey. This antenna was supported by a tower about 800 feet high, standing on an enormous porcelain insulator. The antenna wires spread out like the ribs of an umbrella. The antenna cables also served as guys for the tower. After the war, I met Emil Meyer. He told me that when the United States declared war on Germany, he was arrested as a prisoner of war, and was placed on a train at Philadelphia bound for North Carolina. He was very upset until he saw that his friend, Prof. Zenneck, was also a prisoner of war on the same train. They were confined to a comfortable cottage in North Carolina. They were treated with respect, and were supplied with any books or other items that they needed. Emil Meyer qualified for his Ph.D. under Prof. Zenneck while they were prisoners of war. Prof. Zenneck wrote a book about wireless developments up to 1908. It is the "Bible" for that time. It still contains much information of use.

At approximately the same time that the Germans were building transmitting stations at Sayville and Tuckerton, the Marconi company was constructing stations at New Brunswick, New Jersey; Bolinas, California; Marion, Massachusetts; and at Kuhuka, Hawaii. Receiving stations were constructed at Belmar, New Jersey; Marshalls, California; Chatham, Massachusetts; and at Koko Head, Hawaii. The Marconi transmitting antennas were about a mile long, supported by triatics strung between two rows of six 400-foot-high tubular guyed towers. During the winter of 1918, the General Electric Company installed a 200 kilowatt Alexander-son alternator at New Brunswick. Downloads were brought down from the antenna at each of the six



The first RCA Antenna Laboratory at Wildwood Lake, Riverhead, Long Island, in the winter of 1919-1920. Dr. Beverage and P. S. Carter (one of the founding members of the IRE Antennas and Propagation Society) spent some cold days here in the tent working on the Beverage Antenna.

towers and extended through a tuning coil to ground. This reduced the ground losses six-fold, so 200 kW with a multi-tuned antenna was equivalent to 1200 kW with the original, single-tuned antenna. This made New Brunswick the strongest transmitting station in the United States (call: NFF), so it was taken over by the Navy for communication between Washington and the American forces in France.

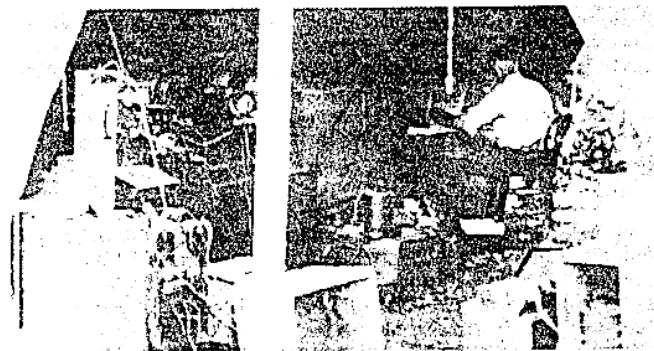
In the early days, we referred to "wavelength" rather than to "frequency". The wavelength of W1L, New Brunswick, New Jersey, was approximately 12,600 meters, or 23.81 kHz. The lowest frequency ever used was in a French station at Rio de Janiero, at 30,000 meters or 10 kHz. The most powerful station, to my knowledge, was a 1000 kW Poulson-arc station at Lyon, France, call letters "LY". The frequency was about 14.5 kHz. I could hear this station with the phones connected between the wave antenna and ground - no amplifier or tuned circuit. This was very interesting to Major Edwin Howard Armstrong.

In 1916, I was able to convince Dr. E. F. W. Alexanderson, inventor of the famous Alexanderson alternator transmitting system, that he needed someone on his staff versed in radio propagation and receiving system development. My first major assignment was to develop the Alexanderson Barrage Receiver system, an arrangement for directive reception. It was feared that the Germans might cut the transatlantic cables in France, thereby preventing communication between Washington and the expedition force in France. The barrage receiver, to be erected in France, would balance out any interference from transmitters in Germany. In addition, the French communication liaison officer, Lt. Patanoc, wanted an arrangement which would prevent the Germans from copying the American stations, a sort of "radio barrage". The antennas for the barrage receivers were insulated wires lying on the ground, extending two miles in opposite directions from the receiver. The first Barrage receiver was erected about four miles north of NFF, the powerful transmitting station at New Brunswick, New Jersey, using 200 kW Alexanderson alternators. This station was the main station used by the Navy for communication with France. The ground antennas extended two miles northeast and two miles southwest from the receiver, which was installed in an old farm house. The extremely strong signals from New Brunswick were readily balanced out while receiving weak signals from MUU in England at nearly the same wavelength. It was also found



Harold Beverage conducting experiments on the "wave antenna" in the spring of 1920 at Riverhead, Long Island. From left: Beverage (standing), Mr. Olsen of the American Marconi Co. (seated in foreground), Chester Rice, Edward W. Kellogg, and Mr. Greenman (seated).

that the Barrage receiver also balanced out most of the atmospheric static arriving from the South. This feature interested the Navy, so they asked that a Barrage receiver be erected at Otter Cliffs, their main receiving station near Bar Harbour, Maine. I installed this system in the summer of 1918. The NE wire extended two miles from Otter Cliffs to Bubble mountain. The SW wire extended two miles to Hunters Beach, but crossed Otter creek on the bridge. It was found that the signals from Europe were excellent on the NE wire, but nothing but static on the SW wire. I thought that perhaps the reception on the SW wire was poor on account of the "dog leg" routing to cross the creek on the bridge, so I extended the SW wire from a tower to a high tree on the opposite side of the Creek, in order to clear the masts of the fishing boats which used the creek. There was no improvement. Finally, I "horsed" a receiver and storage battery



Harold Beverage with the Barrage Receiver (inside the tent) in the spring of 1920.

down the cliff at Hunters Beach. To my astonishment, the signals on the SW wire were excellent, just like the NE wire at Otter Cliffs. The wire was unidirectional, that is, it received signals from the direction in which it was pointed. But why? To find out, I and Philip Carter laid out a wire six miles along an old sand road extending SW from Riverhead on Long Island, New York. By cutting the wire and inserting a receiver at intervals, we determined how the European signals increased, while the static from the SW decreased, as we progressed southwest along the wire. We found that the losses in the wire lying on the ground were so high that the static reflected from the NE end of the wire never reached the receiver at the SW end of the wire.

The obvious answer was to erect the antenna on poles to increase the velocity and decrease the attenuation. To prevent the static from being reflected from the NE end to the receiver at the SW end, a resistor equal to the "characteristic" resistance of the antenna would absorb the static and make the antenna appear infinitely long. A full-scale antenna on poles was constructed by the Long Island Lighting Company, extending nine miles from Riverhead to East Moriches. This was the first uni-directional aperiodic antenna. For the first time, it was possible to receive a wide band of frequencies, without adjustments to balance out the static and interference from stations south of Riverhead. For many years, all signals on long waves from Europe were received on this antenna, and the signals were sent to the message center at 66 Broad Street in New York, over wire lines provided by the telephone company. Actually, the nine-mile long- (14.484 kilometers) wave antenna at Riverhead was successfully used over the range of 5,000 meters, for reception from Germany, to 30,000 meters, for reception from the French station in Brazil.

In 1919, the General Electric Company installed a radiophone on the USS George Washington, for use by President Wilson on his return from Paris, to enable him to talk to Navy Secretary Daniels while the ship was at sea. John Payne installed and operated the transmitter; I installed the receiver and some of the radio equipment. I made many test calls from mid-ocean to the Navy Department in Washington. I was impressed by the excellent speaking voice of one person in Washington, so one day I asked, "To whom am I speaking?" The reply was, "This is the Assistant Secretary of the Navy, Franklin Delano Roosevelt." The USS George Washington made two trips to Brest, France. One day as I was dashing around the deck to meet a schedule with New Brunswick, I rounded a corner and almost ran into the President. I apologized most humbly, but the President did not appear to notice this humble person.

On July 4, 1919, the USS George Washington was in mid-ocean. The Navy station at Otter Cliffs, near Bar Harbor, Maine, was receiving signals from our radiophone. We heard that President Wilson was to address the troops, so we notified some 40 ships in the range to listen to the address. The troops were located on the open forward C deck. We asked the Captain of the USS George Washington, Captain McCally, as I recall it, where the President would stand. He suggested a spot on the B deck, overlooking the C deck, so we placed the microphone there. The President was unapproachable, so neither the Captain nor Admiral Grayson were able to tell the President about the position of the microphone. Accordingly, the President went down to the troops on C deck, about 25 feet from the microphone, so we could not modulate it. Some wag wrote an article about this entitled, "The voice that failed." After the President finished his address, we read it over the transmitter. Later we learned that it was heard as far away as Texas. I hope that at least God was able to hear this historic broadcast!

President Wilson thought that through his efforts at the League of Nations, there would never be another war between great nations. History records that the U.S. Congress did not approve the League of Nations charter. President Wilson practically collapsed physically and mentally.

In November, 1921, I sailed on the SS Aquitania, bound for London to discuss details of an expedition to Brazil with Mr. Marconi and others. Paul Godley was aboard, bound for Scotland to listen for American amateur stations ("Ham" operators) on 200 meters. Naturally, he asked about the "wave" antenna, so I

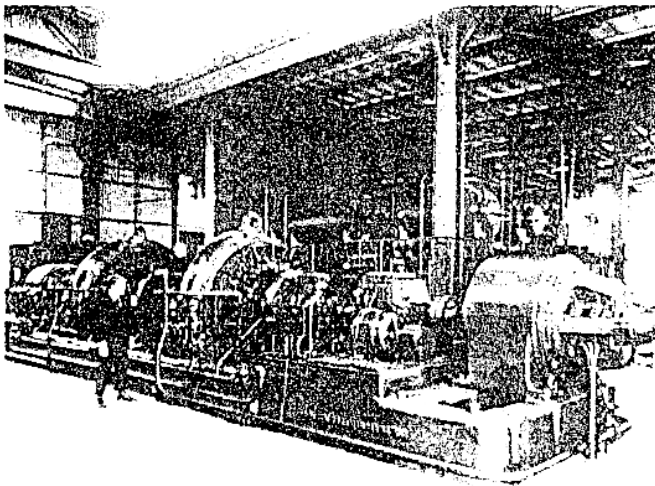


Rocky Point, Long Island Transmitting Station, one week after its formal opening by U.S. President Warren Harding on November 7, 1921.

designed an antenna which Godley used with great success in Scotland. He heard several American Ham stations, including my station, "2BML", at Riverhead, New York, operated by a fellow engineer, R. B. Bourne. Godley's write up in the Ham magazine "QST" mentioned the wave antenna as the "Beverage" antenna [1, 2]. It has been stuck with that name ever since. [In the wave antenna, a wire erected a short distance above the earth, the effect of the low conductivity of the earth would cause a current induced in the wire due to the wave tilt. However, the presence of the earth would add capacity, so that the current in the wire traveled at less than the velocity of light. If the antenna were too long, the current induced in the wire would lag in phase and eventually would decrease the current at the receiver. The wave antenna would not work in free space, however, because there would be no wave tilt to introduce a current in a horizontal wire!]

Marconi did not believe that the short waves were necessarily useless, so in 1924 he established a transmitter at Poldhu, Cornwall, England. This was the same location that was used for his successful transmission to Newfoundland in 1901. He started on 90 meters, then 60 meters. The signals were heard at great distances during the night, as expected. However, in October 1924, Marconi tuned the Poldhu transmitter to 32 meters. Much to the astonishment of everyone, including Marconi himself, the 32 meter signals were received over great distances at night but also in *daylight!* For the first time, here was an economical way to establish long-distance daytime transmission. Breit and Tuve in America, and Sir Edward Appleton in England, using different methods, simultaneously discovered the ionized so-called F layers above the Kennelly - Heaviside, or E layer. I knew Prof. Kennelly, and also met Sir Edward Appleton in London, in 1960. His greeting was, "Hell, I thought you were a statue!"

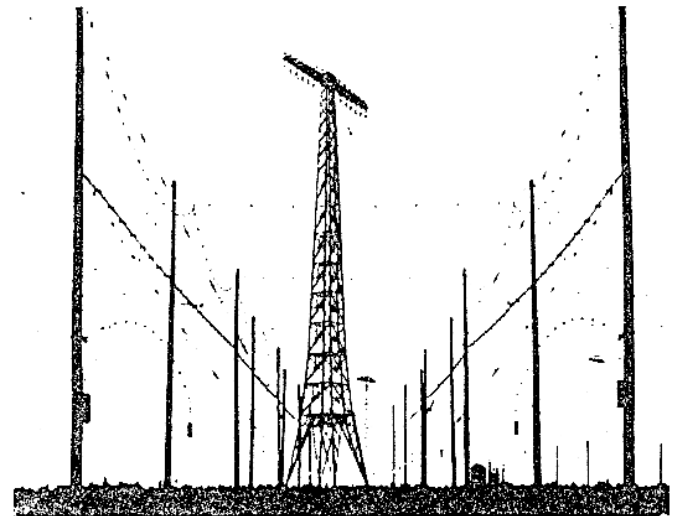
In 1921, America, England, France and Germany all wished to establish radio communication with Rio de Janeiro and Buenos Aires. Since there was not enough traffic to warrant four stations, America, England, France and Germany agreed to share a single station,



The 200 kiloWatt Alexanderson Alternator Transmitting System at Rocky Point, Long Island. One of the 410-foot multiple-tuned long-wave transmitting antenna towers is in the background.

so they formed an agreement, known as the "AEFG Consortium", to combine their service to South America. In 1922, I headed an expedition to Brazil to determine whether a service could be established due to the very heavy atmospheric static due to thunder storms. I found that the static was so strong at Rio that direct service on the low frequencies was not possible. I proposed that a relay be established at Recife, in the northern part of Brazil, where we found that the static could be overcome by directive reception. Before the relay could be established, Marconi's discovery of the daylight transmission on the short waves solved the problem. My assistant, C. W. Hansell, thought that if 32 meters was good during the daylight hours, 15 meters might be better. He constructed a "Rube Goldberg" transmitter, using pie plates for capacitors and a horizontal half wave dipole antenna about 25 feet long, supported at a height of 30 feet above the ground. For some time this transmitter was received so well, at Rio and Buenos Aires, that all traffic from Europe was relayed via New York. Later, of course, the European countries established direct communication on the short wavelengths. At first, they all crowded around the magic wavelength of 15 meters. For both transmission and reception, the Marconi Co. developed the "Marconi Beam" antenna. It consisted of arrays of vertical antennas, supported from triatics strung between towers 300 feet high. A reflector, consisting of similar wires, was erected behind the antenna wires. A separate array and reflector was required for each frequency. A Marconi Beam system for three frequencies was erected at the Riverhead receiving station. The Marconi Beam served on the basis that such strong signals were received that they seldom faded below the noise level. Dr. H. O Peterson and I discovered that the fading on the short waves was random between antennas separated by a few hundred feet. We established a system consisting of three antennas, separated by about 1,000 feet, with the signals combined in a system independent of phase differences. We called this the "Diversity reception system" [3, 4] It out-performed the Marconi Beam receiver at less than 10% of the cost. We used two types of antennas for reception. Philip Carter, a member of Dr. Hansell's staff at Rocky Point, Long Island, New York, invented the Rhombic antenna for transmission. It was efficient, but "frequency sensitive." Bruce, of the Bell Labs, added the terminal resistor, which made the rhombic antenna aperiodic so it could be used over a wide band of frequencies, although there was some loss of power in the terminal

resistor for transmission. However, this made the rhombic antenna ideal for reception. RCA used many rhombic antennas for both reception and transmission. Dr. Peterson developed the so-called "Fishbone" antenna for reception. It consisted of several horizontal dipoles, which were lightly coupled to a two-wire transmission line through capacitors, in order to keep the velocity of the currents high in the transmission line. The antenna was terminated in a resistance equal to the characteristic impedance of the two wire transmission line. Actually, it was equivalent to the wave antenna designed to work on the high frequencies. The fishbone antenna was somewhat more expensive than the rhombic antenna, but it had a better signal-to-noise ratio, since it had fewer side lobes than the rhombic. We used both types of antennas at all of the RCA receiving stations. Many terminated rhombs were used for transmission. Vertical antenna arrays similar to the Marconi beam were developed by the Bell Labs, France and Germany.

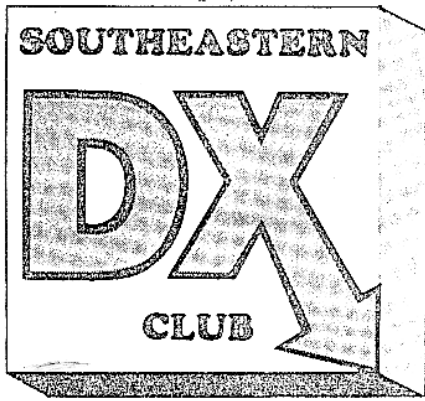


A view of three antenna systems together at Rocky Point, Long Island. One of the twelve 410-foot long-wave antenna towers is at the center, with the shortwave antenna systems, "Type A" (designed by P. S. Carter), on both sides of it. There are two Marconi Beam towers in the background on the right. The Marconi Beam towers, erected in 1927, fell in a hurricane in 1944.

Of course, when television and wide band frequency modulation became widely used, a different type of antenna was required. A popular antenna for television transmission is the "turnstile antenna", invented by George H. Brown of RCA. I was responsible for getting a job for Dr. Brown on the RCA payroll during the depression of 1933 [5] He was a winner, including serving on the RCA Board of Directors. George wrote a very interesting book entitled, *And Part of Which I Was - Recollections of a Research Engineer* [5].

A popular antenna for reception is the "Yagi" antenna. I met Professor Yagi in Tokyo many years ago. You will find most of the antennas which I have mentioned in the *Proceedings* of the IRE and AIEE. According to my memory, the above describes most of the antennas used for international communication. Detailed information may be found in books by Zenneck, Terman and others. Satellites gradually took over the international traffic. All RCA stations were shut down in 1978.

Some of our inventions are still in use. In the far North, high frequencies are erratic and sometimes



# SOUTHEASTERN DX CLUB

## W4NT

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AUGUST 1989 NEXT MEETING AUGUST 15 AT DAYS INN 7:30 PM LOCATED AT WINDY HILL ROAD AND I-75. COME EARLY AND HAVE DINNER WITH THE GROUP

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President:	Ken Byers, K4TEA	955-5800
Vice President:	Jim Streible, K4DLI	993-1767
Secretary:	Sandi Jorgenson, KL7JAR	476-1374
Treasurer:	Neil Foster, KC4MJ	449-3340
Activities Manager:	Dave Thompson, K4JRB	448-0588

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### WELCOME NEW MEMBERS

Member	Sponsor
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DENNIS PARKER, KD4BY	KN4B
GENE CLARK, WA4FRY	K4PI
J. MICHAEL CAMPBELL, N0CQL	KL7JAR

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### ELECTION OF NEW CLUB OFFICERS

IT IS TIME TO PRESENT A NEW SLATE OF NOMINEES TO SERVE AS CLUB OFFICERS FOR THE UPCOMING YEAR. ACTUALLY IT WAS TIME TO DO THIS TWO MONTHS AGO IN JUNE. THE PRESENT OFFICERS HAVE SERVED THEIR ORIGINAL ONE FULL YEAR PLUS AN ADDITIONAL 8 MONTHS DUE TO A CHANGE IN THE CLUB'S FISCAL YEAR. AS OF THIS WRITING THE NEW SLATE OF NOMINEES HAS NOT BEEN PRESENTED. WE WILL TRY TO HOLD ELECTIONS AT OUR SEPTEMBER MEETING. IN THE MEANTIME, I WANT TO THANK EVERYONE WHO HAS SO GENEROUSLY HELPED ME WITH ARTICLES FOR THE BULLETIN DURING THE 20 MONTHS I HAVE EDITED THE NEWSLETTER. IT SIMPLY COULD NOT HAVE HAPPENED WITHOUT THE TEAM EFFORT (AND TIMELY RESPONSES) I HAVE BEEN GIVEN BY YOU ALL. THIS IS MY OPPORTUNITY TO SEND YOU ALL A **BIG THANK YOU**. I HAVE ENJOYED MY TENURE OF OFFICE AND WISH SUCCESS TO NEXT YEAR'S SECRETARY/EDITOR.

SANDI, KL7JAR

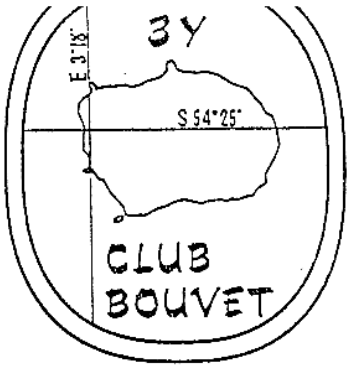
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I am going to order some new QSL Cards from W4MPY. I need my new cards to have the place for the mailing label. Wayne (W4MPY) said if there were at least 5 people wanting the same format he would make another SEDX Club Master. Below is about what the card would look like. The bottom line of the card could have anything, I used DXCC etc. as an example. If anyone is interested or has any suggestions as to the format give me a call. I am not sure at this point about price. If there is enough interest I will let the club know the price.

Bob Smith, K4PHE (963-9078)

<b>SOUTHEASTERN</b> <b>DX</b> <b>CLUB</b>	<b>JC</b> <b>AA</b> <b>H</b> <b>YOUR CALL</b>
	<b>NAME</b> <b>ADDRESS</b> <b>CITY, STATE ZIP</b> <b>USA</b>
<b>DXCC</b> <b>WAZ</b> <b>WAS</b>	<b>COUNTY</b>

	<b>YOUR CALL</b>	
<b>TNX QSL</b>	<input type="text"/>	<b>PSE QSL</b>



Expedition to Bouvetøya  
1989/90

Oslo 3 July 1989  
News Release # 1

WELCOME TO CLUB BOUVET!

The opening night is planned for Christmas eve this year. We shall do our best to put on a good show. We hope you are going to like it. Your hosts at Club Bouvet will be Kaare, Erling and Einar. We were doing another DX-show together in '87, remember?

This new show is independent, backed by LA-DX-GROUP which provides the starting capital of approx 12,000 USD, on top of 1.000 USD each by your three hosts. CLUB BOUVET budget estimate is 200,000 USD, half of which is to be borne by the Ham World, not excluding yourself. We shall not be riding piggyback on a governmental expedition.

The stage this time resembles that of '87, with its isolated and remote location and surrounded by a virtually endless, cold ocean. Sea and air temperatures are near the freezing point. Visibility is poor most of the time.

But many things are different: Strong, frightening gust winds on the lee side of the island, "impossible" landing conditions with worst case ocean wave heights up to 10 m (30 ft) making landing and especially departure very difficult. Multitudes of living creatures, weighing up to 5 tons, will be guarding the shore. They are savage, do not love DX'ing and will attack us during the landing. The smell of penguin colony is disgusting. We may have to carry 1-2 tons of fuel and equipment about half a mile from landing to camp site. Local freshwater will not be available.

Special precautions will be taken to safeguard the welfare of the actors en route and on stage as well as the interests of the local "population", which is protected by national law. We also wish to take good care of you, as audience and participant, without favouring any particular nation, club or group.

We wish you a warm (cold) welcome to CLUB BOUVET, paradise of philanthropists. In our club, each individual will contribute with donations according to his or her desire and ability, to make sure the show is a success. Members may request to be on the mailing list for future, important information.

Will you join now and become a supporter?

CLUB BOUVET, Box 88, 1361 Billingstadsletta, Norway.

Einar Enderud	Erling J Wiig	Kaare Pedersen
LA1EE	LA6VM	LA2GV
member #1	member #3	member #2
Project Manager	Treasurer & QSL Manager	Logistics Manager

Den Norske Creditbank, Oslo, account no 7085.05.07382

*Einar*      *Erling*      *Kaare*



Club Bouvet  
Box 88  
N-1361 Billingstadsletta  
Norway

Telex 74459 levah.n  
Telefax +47 2 683715  
Bank account: DNC Oslo 7085.05.07382  
File: c:\wpfil\nrh01ec.3yb



## THE FORGOTTEN ALERT SYSTEM

By Jim Streible, K4DLI

It seems that these days, with everyone on Packet, our most elementary DX alert system has all but been forgotten. I am on Packet and think it is great and would feel lost without it. However, it seems that the good old telephone call to alert someone that something they need is on has been left by the wayside. Also, 147.500 Mhz is not as busy as it used to be. We still have the "Needed List" in the club roster and it should be checked now and then when something simi-rare shows up.

Now I am as guilty as any one else of not doing this and that is the point of this little reminder. We all need to remember that there are a lot of new DX'ers in the club and need countries that some of us may think of as old hat. These people need to be thought of and more things put out on .5 and the "Need List" checked now and then and announcements made on voice and by phone calls.

Remember that many people on packet can't set there looking at the screen all the time but do have 147.500 on and can hear the DX put out when they might otherwise miss seeing it on the screen.

Let's

This all support the new systems but don't forget the old tried and true methods either.

73 & DX  
Jim, K4DLI

SEDXC AT THE ATLANTA HAMFEST

RECEIVED A CARD FROM DON SEARCH, W3AZD. DURING THE ATLANTA HAMFEST HE CHECKED 57 ENDORSEMENT APPLICATIONS AND 1,278 CARDS. THANKS DON FOR YOUR HELP.

NEIL, KC4MJ

IT WAS NICE TO MEET AND TALK TO SO MANY OF OUR CLUB MEMBERS. WE HAD A LOT OF OUT-OF-TOWN MEMBERS PRESENT. I PERSONALLY SAW W3NL, K3KG, K3NN, K4BAI, WD4ARY, W6OKX, WA4FVT, AND AA4GA.

I ALWAYS ENJOY TALKING WITH OUR OUT-OF-TOWNPP MEMBERS SINCE THIS IS USUALLY THE ONLY TIME WE MEET TOGETHER. WE'D LIKE TO THANK ALL OF OUR OUT-OF-TOWN MEMBERS FOR THEIR SUPPORT OF THE CLUB AND IF WE CAN HELP THEM IN ANY WAY, I HOPE THEY WILL LET US KNOW. WE SIGNED UP SEVERAL NEW MEMBERS AND MANY RENEWALS. ONE NEW MEMBER IS A FRIEND OF KN4B AND MYSELF. HIS CALL IS KD4BY, DENNIS, IN COLUMBIA SOUTH CAROLINA.

WE ONLY HAD HALF OF A TABLE TO OPERATE FROM WHICH MADE THINGS CRAMPED. MANY THANKS TO ALL WHO HELPED IN THE BOOTH. SPECIAL THANKS TO COOPER, (WA4PZD), SANDI (KL7JAR), TAD (WA4CUG), AND NEIL (KC4MJ). THEY ALL WORK WITH THE ATLANTA RADIO CLUB AND THE SEDXC. THEY HELPED US THROUGH SOME ROUGH SPOTS. TAD LOANED US A VCR TO RUN OUR CLUB VIDEO ON.

THE SATURDAY NIGHT BANQUET WAS GREAT. ERIC, K3NA DID A GREAT JOB WITH THE 3D2XX SHOW WITH THE AID OF K4DLI, MASTER OF CEREMONIES. MANY AWARDS WERE GIVEN OUT FOR CLUB CONTEST BY K4JRB. KX4R WAS THE YEAR'S WINNER.

IT WAS A FUN FEST. SEE YOU NEXT YEAR.

MIKE, KP4I

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AUGUST PROGRAM

TO BE ANNOUNCED.

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DXPO 1989

WE ARE IN NEED OF SPONSORS FOR OUT-OF-TOWN GUESTS COMING TO DXPO 1989. IF YOU CAN PROVIDED LODGING FOR ANY OF OUR GUESTS PLEASE CALL CARL, WB4ZNH, IF YOU CAN HELP OUT.

DXPO IS FAST APPROACHING. MANY PEOPLE WILL BE NEEDED IN OUR EFFORTS TO PUT ON A FIRST RATE DX GATHERING. THERE WILL BE LOTS OF JOBS TO PERFORM, SOME TAKING VERY LITTLE OF ANYONE'S TIME. VOLUNTEER BEFORE YOU ARE ASKED TO DO SOMETHING TO HELP.

\*\*\*\*\*

TEN COMMANDMENTS  
of Electronics

1. Beware of the lightning that lurketh in an undischarged capacitor, lest it cause thee to be bounced upon thy buttocks in a most ungracious manner.
2. Cause thou the switch that supplies large quantities of juice to be opened and thusly tagged, so thy days may be long on this earthly vale of tears.
3. Prove to thyself that all circuits that radiateth and upon which thou worketh are grounded, lest they lift thee to high frequency potential and cause thee to radiate also.
4. Take care thou useth the proper method when thou taketh the measure of high voltage circuits so that thou doth not incinerate both thee and the meter; for verily, though thou hast no account number and can be easily replaced, the meter doth have one, and, as a consequence, bringeth much woe to the Stock Room.
5. Tarry thou not amongst those who engage in intentional shocks, for they are surely nonbelievers and are not long for this world.
6. Take care thou tampereth not with interlocks and safety devices, for this will incur the wrath of thy seniors and bringeth the fury of the safety expert down about thy head and shoulders.
7. Work thou not on energized equipment, for if thou doeth, they buddies will surely be buying beers for thy widow and consoling her in other ways not generally acceptable to thee.
8. Verily, verily I say unto thee, never service high-voltage equipment alone, for electric cooking is a slothful process and thou might sizzle in thine own fat for hours on end before thy Maker sees fit to end thy misery and drag thee into His fold.
9. Trifle thou not with radioactive tubes and substances, lest thou commence to glow in the dark like a lightning bug, and thy wife be frustrated nightly and have no further use for thee except thy wage.
10. Commit thou to memory the works of the prophets, which are written in the instruction books, which giveth the straight dope and which consoleth thee, and thou cannot make mistakes.

-Unknown\*

Thanks to KOCS who picked up the above words of wisdom from a co-worker.

CONGRATULATIONS TO SHARON FOSTER

ELECTED AT THE AUGUST MEETING OF THE ATLANTA RADIO CLUB, SHARON FOSTER IS THE NEW PRESIDENT OF THE CLUB. SHE HAS PREVIOUSLY SERVED AS SECRETARY OF A.R.C. AND HAS BEEN A VICE-CHAIRMAN OF THE HAMFESTIVAL ON TWO OCCASIONS. SHARON IS THE FIRST YL TO HOLD THIS POSITION IN THE ATLANTA RADIO CLUB AND I MIGHT ADD SHE WAS ELECTED UNANIMOUSLY TO THE POSITION BY THE MEMBERSHIP. GIVEN HER EXPERTISE IN HANDLING PAST ASSIGNMENTS FOR A.R.C., I EXPECT TO SEE THE ATLANTA RADIO CLUB DO GREAT THINGS DURING HER TERM OF OFFICE. BY THE WAY, SHARON HAS INCREASED HER COUNTRY COUNT VERY RAPIDLY LATELY AND NOW HAS 175 TO HER CREDIT AS WELL AS UPGRADING FROM TECHNICIAN TO ADVANCE CLASS. WHERE DOES SHE GET THE TIME TO DO SO MUCH SO WELL?

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WANT LISTS

PLEASE MAIL YOUR UPDATED WANT LISTS NOW TO CARL HENSON, WB4ZNH AT THE FOLLOWING ADDRESS:

CARL HENSON, WB4ZNH  
8280 CHESTNUT DRIVE  
JONESBORO, GEORGIA 30236

OR...BRING THEM TO THE AUGUST CLUB MEETING. IT IS TIME TO PREPARE THE 1989 - 1990 CLUB ROOSTER SO BE SURE TO GET YOUR INFORMATION UPDATED FOR THE NEW ISSUE.

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CLASSIFIED SECTION (FOR SALE, ETC.)

PHILLYSTRAN FOR SAKE - I HAVE APPROXIMATELY 1,000 FEET OF 4,000 LB. PHILLYSTRAN FOR SALE AT SUBSTANTIALLY BELOW MARKET PRICE. IF INTERESTED, CALL ALLEN, WB4GNT, AT (404) 973-6251 BEFORE 9:00 EDT.

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CLUB VIDEO

OUR CLUB VIDEO MADE SEVERAL YEARS AGO DISAPPEARED, SO WE DECIDED ANOTHER ONE WAS CALLED FOR. HUGH, N4RJ, WAS KIND ENOUGH TO LOAN US A VIDEO CAMERA. I DID MOST OF IT ON ONE SATURDAY. AFTER 10 HOURS AND 200 MILES, I HAD SEVEN STATIONS ON TAPE. I GOT 3 MORE STATIONS LATER. ALLEN, WB4GNT SENT ME A TAPE OF SEVERAL OTHERS. I HOPE SOMEONE IN THE NORTH EAST SECTION CAN DO A SEGMENT, AND I CAN THEN PATCH THE TWO TOGETHER. ANY VOLUNTEERS??

MIKE, KP4I

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## From the Historian



**William C. Croswall**  
Historian  
625 Manor Place  
West Melbourne, FL 32904  
(305) 729-3110

### Some Notes on the History of Antenna Developments: 1913 through 1937

*Harold H. Beverage*  
Life Fellow, IEEE  
P.O. Box BX  
Stony Brook, NY 11790

[It is my pleasure to share a portion of the early history of radio described by a true pioneer in the field of antennas, Dr. Harold Beverage. The AP-S owes Dr. Bondyopadhyay a debt of gratitude for his dedication and help in obtaining this contribution. WFC]

#### FOREWORD

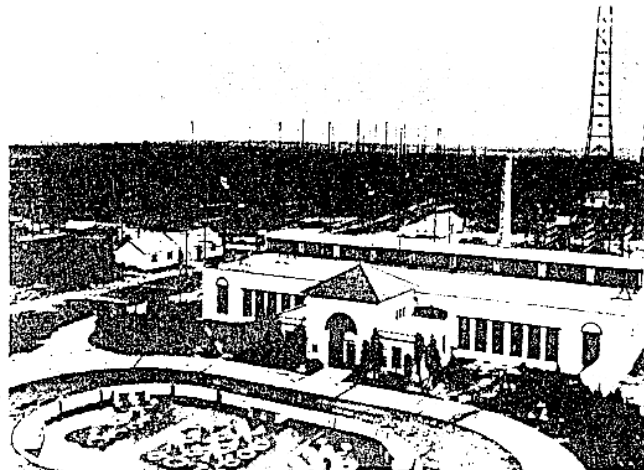
Antenna research and development in the past hundred years since the epoch-making experiment of Heinrich Hertz, verifying the existence of electromagnetic waves, have advanced in distinct surges. The first surge, the Marconi era, spurred by Marconi's famous transatlantic wireless communication experiment in 1901, saw the design, development and deployment of antennas for national and worldwide radio communication. This work spanned the long-wave region (10 kHz - 60 kHz) through the shortwaves (15 meters), with the discovery of ionospheric reflection and the pivotal role it played in shortwave propagation and reception - through the twenties.

The leader of antenna research and development in the Marconi area, besides Marconi himself, is undoubtedly Harold Henry Beverage, pioneer in the establishment of national and worldwide radio communication. In the following memoir, he gives us a rare glimpse of the pioneering days with interesting anecdotes. Some of the antennas he invented have operated in the heart of Long Island to the service of this nation and the world. The Long Island/New York Chapter of the IEEE AP-S is justifiably proud of his pioneering contribution to the progress of mankind.

Probir K. Bondyopadhyay  
Chairman, Long Island/New York Joint Chapter  
IEEE Antennas and Propagation Society

#### SOME NOTES ON THE HISTORY OF ANTENNA DEVELOPMENTS 1913 THROUGH 1937

When one arrives at the age of 95, he can recall events that happened 80 years ago, but has trouble remembering something that happened last year. It is



A panoramic view of the Rocky Point, Long Island Radio Transmitting Station of the RCA Communications in the early thirties.

difficult for me to establish dates, since the only reference book at hand is *History of Radio to 1926* by Gleason L. Archer. I can list some information concerning the development of antennas since I knew many of the people working on antennas, and I can only list general dates.

In 1914, Prof. Zenneck was constructing a long-wave station at Sayville, on Long Island, New York. It was a flat-top arrangement supported by several towers. It was similar to the antenna at Nauen, Germany, and was being constructed for commercial service with Germany. At the same time, another German engineer, named Emil Meyer, was constructing an antenna for French interests at Tuckerton, New Jersey. This antenna was supported by a tower about 800 feet high, standing on an enormous porcelain insulator. The antenna wires spread out like the ribs of an umbrella. The antenna cables also served as guys for the tower. After the war, I met Emil Meyer. He told me that when the United States declared war on Germany, he was arrested as a prisoner of war, and was placed on a train at Philadelphia bound for North Carolina. He was very upset until he saw that his friend, Prof. Zenneck, was also a prisoner of war on the same train. They were confined to a comfortable cottage in North Carolina. They were treated with respect, and were supplied with any books or other items that they needed. Emil Meyer qualified for his Ph.D. under Prof. Zenneck while they were prisoners of war. Prof. Zenneck wrote a book about wireless developments up to 1908. It is the "Bible" for that time. It still contains much information of use.

At approximately the same time that the Germans were building transmitting stations at Sayville and Tuckerton, the Marconi company was constructing stations at New Brunswick, New Jersey; Bolinas, California; Marion, Massachusetts; and at Kuhuka, Hawaii. Receiving stations were constructed at Belmar, New Jersey; Marshalls, California; Chatham, Massachusetts; and at Koko Head, Hawaii. The Marconi transmitting antennas were about a mile long, supported by triatics strung between two rows of six 400-foot-high tubular guyed towers. During the winter of 1918, the General Electric Company installed a 200 kilowatt Alexander-son alternator at New Brunswick. Downloads were brought down from the antenna at each of the six



The first RCA Antenna Laboratory at Wildwood Lake, Riverhead, Long Island, in the winter of 1919-1920. Dr. Beverage and P. S. Carter (one of the founding members of the IRE Antennas and Propagation Society) spent some cold days here in the tent working on the Beverage Antenna.

towers and extended through a tuning coil to ground. This reduced the ground losses six-fold, so 200 kW with a multi-tuned antenna was equivalent to 1200 kW with the original, single-tuned antenna. This made New Brunswick the strongest transmitting station in the United States (call: NFF), so it was taken over by the Navy for communication between Washington and the American forces in France.

In the early days, we referred to "wavelength" rather than to "frequency". The wavelength of W1L, New Brunswick, New Jersey, was approximately 12,600 meters, or 23.81 kHz. The lowest frequency ever used was in a French station at Rio de Janiero, at 30,000 meters or 10 kHz. The most powerful station, to my knowledge, was a 1000 kW Poulson-arc station at Lyon, France, call letters "LY". The frequency was about 14.5 kHz. I could hear this station with the phones connected between the wave antenna and ground - no amplifier or tuned circuit. This was very interesting to Major Edwin Howard Armstrong.

In 1916, I was able to convince Dr. E. F. W. Alexanderson, inventor of the famous Alexanderson alternator transmitting system, that he needed someone on his staff versed in radio propagation and receiving system development. My first major assignment was to develop the Alexanderson Barrage Receiver system, an arrangement for directive reception. It was feared that the Germans might cut the transatlantic cables in France, thereby preventing communication between Washington and the expedition force in France. The barrage receiver, to be erected in France, would balance out any interference from transmitters in Germany. In addition, the French communication liaison officer, Lt. Patanoc, wanted an arrangement which would prevent the Germans from copying the American stations, a sort of "radio barrage". The antennas for the barrage receivers were insulated wires lying on the ground, extending two miles in opposite directions from the receiver. The first Barrage receiver was erected about four miles north of NFF, the powerful transmitting station at New Brunswick, New Jersey, using 200 kW Alexanderson alternators. This station was the main station used by the Navy for communication with France. The ground antennas extended two miles northeast and two miles southwest from the receiver, which was installed in an old farm house. The extremely strong signals from New Brunswick were readily balanced out while receiving weak signals from MUU in England at nearly the same wavelength. It was also found



Harold Beverage conducting experiments on the "wave antenna" in the spring of 1920 at Riverhead, Long Island. From left: Beverage (standing), Mr. Olsen of the American Marconi Co. (seated in foreground), Chester Rice, Edward W. Kellogg, and Mr. Greenman (seated).

that the Barrage receiver also balanced out most of the atmospheric static arriving from the South. This feature interested the Navy, so they asked that a Barrage receiver be erected at Otter Cliffs, their main receiving station near Bar Harbour, Maine. I installed this system in the summer of 1918. The NE wire extended two miles from Otter Cliffs to Bubble mountain. The SW wire extended two miles to Hunters Beach, but crossed Otter creek on the bridge. It was found that the signals from Europe were excellent on the NE wire, but nothing but static on the SW wire. I thought that perhaps the reception on the SW wire was poor on account of the "dog leg" routing to cross the creek on the bridge, so I extended the SW wire from a tower to a high tree on the opposite side of the Creek, in order to clear the masts of the fishing boats which used the creek. There was no improvement. Finally, I "horsed" a receiver and storage battery



Harold Beverage with the Barrage Receiver (inside the tent) in the spring of 1920.

down the cliff at Hunters Beach. To my astonishment, the signals on the SW wire were excellent, just like the NE wire at Otter Cliffs. The wire was unidirectional, that is, it received signals from the direction in which it was pointed. But why? To find out, I and Philip Carter laid out a wire six miles along an old sand road extending SW from Riverhead on Long Island, New York. By cutting the wire and inserting a receiver at intervals, we determined how the European signals increased, while the static from the SW decreased, as we progressed southwest along the wire. We found that the losses in the wire lying on the ground were so high that the static reflected from the NE end of the wire never reached the receiver at the SW end of the wire.

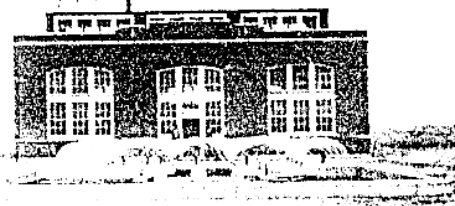
The obvious answer was to erect the antenna on poles to increase the velocity and decrease the attenuation. To prevent the static from being reflected from the NE end to the receiver at the SW end, a resistor equal to the "characteristic" resistance of the antenna would absorb the static and make the antenna appear infinitely long. A full-scale antenna on poles was constructed by the Long Island Lighting Company, extending nine miles from Riverhead to East Moriches. This was the first uni-directional aperiodic antenna. For the first time, it was possible to receive a wide band of frequencies, without adjustments to balance out the static and interference from stations south of Riverhead. For many years, all signals on long waves from Europe were received on this antenna, and the signals were sent to the message center at 66 Broad Street in New York, over wire lines provided by the telephone company. Actually, the nine-mile long- (14.484 kilometers) wave antenna at Riverhead was successfully used over the range of 5,000 meters, for reception from Germany, to 30,000 meters, for reception from the French station in Brazil.

In 1919, the General Electric Company installed a radiophone on the USS George Washington, for use by President Wilson on his return from Paris, to enable him to talk to Navy Secretary Daniels while the ship was at sea. John Payne installed and operated the transmitter; I installed the receiver and some of the radio equipment. I made many test calls from mid-ocean to the Navy Department in Washington. I was impressed by the excellent speaking voice of one person in Washington, so one day I asked, "To whom am I speaking?" The reply was, "This is the Assistant Secretary of the Navy, Franklin Delano Roosevelt." The USS George Washington made two trips to Brest, France. One day as I was dashing around the deck to meet a schedule with New Brunswick, I rounded a corner and almost ran into the President. I apologized most humbly, but the President did not appear to notice this humble person.

On July 4, 1919, the USS George Washington was in mid-ocean. The Navy station at Otter Cliffs, near Bar Harbor, Maine, was receiving signals from our radiophone. We heard that President Wilson was to address the troops, so we notified some 40 ships in the range to listen to the address. The troops were located on the open forward C deck. We asked the Captain of the USS George Washington, Captain McCally, as I recall it, where the President would stand. He suggested a spot on the B deck, overlooking the C deck, so we placed the microphone there. The President was unapproachable, so neither the Captain nor Admiral Grayson were able to tell the President about the position of the microphone. Accordingly, the President went down to the troops on C deck, about 25 feet from the microphone, so we could not modulate it. Some wag wrote an article about this entitled, "The voice that failed." After the President finished his address, we read it over the transmitter. Later we learned that it was heard as far away as Texas. I hope that at least God was able to hear this historic broadcast!

President Wilson thought that through his efforts at the League of Nations, there would never be another war between great nations. History records that the U.S. Congress did not approve the League of Nations charter. President Wilson practically collapsed physically and mentally.

In November, 1921, I sailed on the SS Aquitania, bound for London to discuss details of an expedition to Brazil with Mr. Marconi and others. Paul Godley was aboard, bound for Scotland to listen for American amateur stations ("Ham" operators) on 200 meters. Naturally, he asked about the "wave" antenna, so I

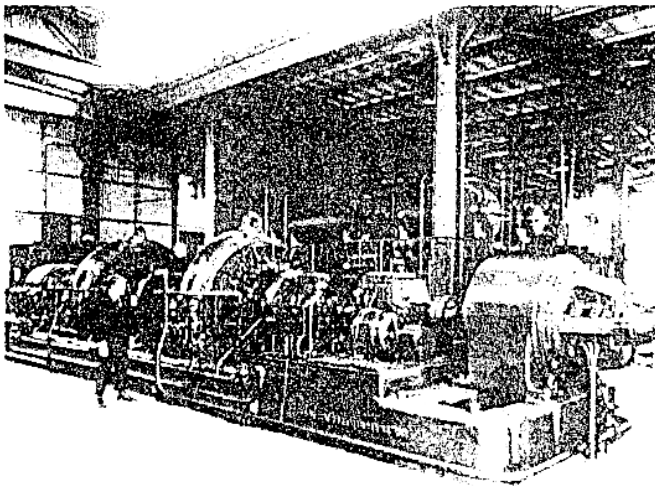


Rocky Point, Long Island Transmitting Station, one week after its formal opening by U.S. President Warren Harding on November 7, 1921.

designed an antenna which Godley used with great success in Scotland. He heard several American Ham stations, including my station, "2BML", at Riverhead, New York, operated by a fellow engineer, R. B. Bourne. Godley's write up in the Ham magazine "QST" mentioned the wave antenna as the "Beverage" antenna [1, 2]. It has been stuck with that name ever since. [In the wave antenna, a wire erected a short distance above the earth, the effect of the low conductivity of the earth would cause a current induced in the wire due to the wave tilt. However, the presence of the earth would add capacity, so that the current in the wire traveled at less than the velocity of light. If the antenna were too long, the current induced in the wire would lag in phase and eventually would decrease the current at the receiver. The wave antenna would not work in free space, however, because there would be no wave tilt to introduce a current in a horizontal wire!]

Marconi did not believe that the short waves were necessarily useless, so in 1924 he established a transmitter at Poldhu, Cornwall, England. This was the same location that was used for his successful transmission to Newfoundland in 1901. He started on 90 meters, then 60 meters. The signals were heard at great distances during the night, as expected. However, in October 1924, Marconi tuned the Poldhu transmitter to 32 meters. Much to the astonishment of everyone, including Marconi himself, the 32 meter signals were received over great distances at night but also in *daylight*! For the first time, here was an economical way to establish long-distance daytime transmission. Breit and Tuve in America, and Sir Edward Appleton in England, using different methods, simultaneously discovered the ionized so-called F layers above the Kennelly - Heaviside, or E layer. I knew Prof. Kennelly, and also met Sir Edward Appleton in London, in 1960. His greeting was, "Hell, I thought you were a statue!"

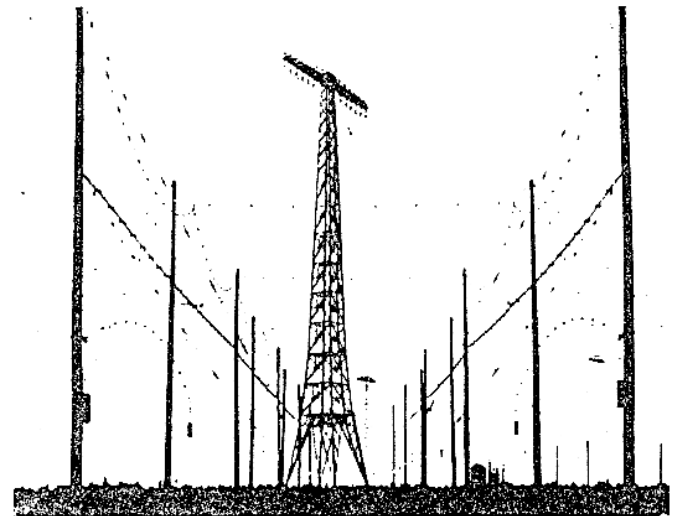
In 1921, America, England, France and Germany all wished to establish radio communication with Rio de Janeiro and Buenos Aires. Since there was not enough traffic to warrant four stations, America, England, France and Germany agreed to share a single station,



The 200 kiloWatt Alexanderson Alternator Transmitting System at Rocky Point, Long Island. One of the 410-foot multiple-tuned long-wave transmitting antenna towers is in the background.

so they formed an agreement, known as the "AEFG Consortium", to combine their service to South America. In 1922, I headed an expedition to Brazil to determine whether a service could be established due to the very heavy atmospheric static due to thunder storms. I found that the static was so strong at Rio that direct service on the low frequencies was not possible. I proposed that a relay be established at Recife, in the northern part of Brazil, where we found that the static could be overcome by directive reception. Before the relay could be established, Marconi's discovery of the daylight transmission on the short waves solved the problem. My assistant, C. W. Hansell, thought that if 32 meters was good during the daylight hours, 15 meters might be better. He constructed a "Rube Goldberg" transmitter, using pie plates for capacitors and a horizontal half wave dipole antenna about 25 feet long, supported at a height of 30 feet above the ground. For some time this transmitter was received so well, at Rio and Buenos Aires, that all traffic from Europe was relayed via New York. Later, of course, the European countries established direct communication on the short wavelengths. At first, they all crowded around the magic wavelength of 15 meters. For both transmission and reception, the Marconi Co. developed the "Marconi Beam" antenna. It consisted of arrays of vertical antennas, supported from triatics strung between towers 300 feet high. A reflector, consisting of similar wires, was erected behind the antenna wires. A separate array and reflector was required for each frequency. A Marconi Beam system for three frequencies was erected at the Riverhead receiving station. The Marconi Beam served on the basis that such strong signals were received that they seldom faded below the noise level. Dr. H. O Peterson and I discovered that the fading on the short waves was random between antennas separated by a few hundred feet. We established a system consisting of three antennas, separated by about 1,000 feet, with the signals combined in a system independent of phase differences. We called this the "Diversity reception system" [3, 4] It out-performed the Marconi Beam receiver at less than 10% of the cost. We used two types of antennas for reception. Philip Carter, a member of Dr. Hansell's staff at Rocky Point, Long Island, New York, invented the Rhombic antenna for transmission. It was efficient, but "frequency sensitive." Bruce, of the Bell Labs, added the terminal resistor, which made the rhombic antenna aperiodic so it could be used over a wide band of frequencies, although there was some loss of power in the terminal

resistor for transmission. However, this made the rhombic antenna ideal for reception. RCA used many rhombic antennas for both reception and transmission. Dr. Peterson developed the so-called "Fishbone" antenna for reception. It consisted of several horizontal dipoles, which were lightly coupled to a two-wire transmission line through capacitors, in order to keep the velocity of the currents high in the transmission line. The antenna was terminated in a resistance equal to the characteristic impedance of the two wire transmission line. Actually, it was equivalent to the wave antenna designed to work on the high frequencies. The fishbone antenna was somewhat more expensive than the rhombic antenna, but it had a better signal-to-noise ratio, since it had fewer side lobes than the rhombic. We used both types of antennas at all of the RCA receiving stations. Many terminated rhombs were used for transmission. Vertical antenna arrays similar to the Marconi beam were developed by the Bell Labs, France and Germany.



A view of three antenna systems together at Rocky Point, Long Island. One of the twelve 410-foot long-wave antenna towers is at the center, with the shortwave antenna systems, "Type A" (designed by P. S. Carter), on both sides of it. There are two Marconi Beam towers in the background on the right. The Marconi Beam towers, erected in 1927, fell in a hurricane in 1944.

Of course, when television and wide band frequency modulation became widely used, a different type of antenna was required. A popular antenna for television transmission is the "turnstile antenna", invented by George H. Brown of RCA. I was responsible for getting a job for Dr. Brown on the RCA payroll during the depression of 1933 [5] He was a winner, including serving on the RCA Board of Directors. George wrote a very interesting book entitled, *And Part of Which I Was - Recollections of a Research Engineer* [5].

A popular antenna for reception is the "Yagi" antenna. I met Professor Yagi in Tokyo many years ago. You will find most of the antennas which I have mentioned in the *Proceedings* of the IRE and AIEE. According to my memory, the above describes most of the antennas used for international communication. Detailed information may be found in books by Zenneck, Terman and others. Satellites gradually took over the international traffic. All RCA stations were shut down in 1978.

Some of our inventions are still in use. In the far North, high frequencies are erratic and sometimes



Harold Beverage with John Marshall Etter (on the left), the Radio Engineer in charge of both the Rocky Point Transmitting Station and the Riverhead (Long Island) Receiving Station at the time of their final closings in the late 1970s.

fade out for days at a time, due to sunspot activity. Low frequencies are used in the far North, using wave antennas. This includes use by the Signal Corps and Coast Guard in Alaska and Greenland. The Russians use wave antennas on their long-haul arctic circuits.

The diversity receiving system is still used for reception from satellites, to correct for the phase shift due to the "Faraday effect", when the signals pass through the ionosphere.

When I graduated from the University of Maine in 1915, I was offered two jobs. The first, playing trombone in Loews theatres, at \$22 per week, and the second, testman for the General Electric Company, at Schenectady, New York, for 20 cents an hour per week



Probir K. Bondyopadhyay (standing) visiting Harold Beverage on the occasion of Beverage's ninety-fourth birthday in October, 1987.

of 56 hours, which amounts to \$11.20 per week or \$560 per year. I understand that the "kids" with a BS in EE now start at \$29,000 per year, which is considerably more than I received after 43 years of work with GE and RCA. While it was difficult to become a millionaire on my salary, I am happy to have been employed during the pioneering days of wireless communication development. It was easy to make useful inventions, and to meet many of the old pioneers [6]. I was privileged to meet Marconi, Steinmetz, Langmuir, Coolegge, H. J. Round, Yagi, Sir Watson Watt, Sir Edward Appleton and many other famous people.

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Thanks to Dale Nordin, K4HGG, for contributing this article to the SEDXC Newsletter.

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