



## **Marconi, The Saga by Professor Roy Simons OBE.**

Roy based his presentation on a lecture, which he first gave in 1984. He admitted that despite more than forty years service in the Marconi Company, he knew very little of Marconi himself, or the origins of the technique of wireless communication. In common with many electronic engineers he had never heard of the terms 'syntony', 'coherer' and 'jigger'! His talk described events up to 1901.

In 1865 Maxwell had predicted the existence of electromagnetic waves in the aether and that these waves would have the same characteristics as light. About thirty years later Hertz was able to confirm his theories and demonstrated that 'electric waves' generated by a spark gap were able to be passed to an arrangement which operated as a detector which was placed at a greater distance than would be possible by induction if this was the coupling mode. He also demonstrated these 'waves' were capable of reflection and refraction and that an interference pattern of maxima and minima could be produced, allowing the measurement of wavelength. Hertz worked at about 30cm wavelength in 1887. In 1888 he demonstrated polarisation effects using two similar 1.2m x 2m parabolic dishes at wavelength of 66cm, these having 35 degree 3dB beamwidth horizontally and 80 degree vertical beamwidth.

D.E.Hughes (1831-1900), inventor of the microphone, in 1879 showed that a spark produced a current in a telephone receiver. He showed this work to some Fellows of the Royal Society, demonstrating transmission and reception from 50 yards to over 500 yards. One of them, Sir George Gabriel Stokes, said that all the results could be explained by known electromagnetic effects and he therefore could not accept the suggestion that electric waves existed. Hughes was so discouraged that he refused to pursue the matter. However he went on to make a large fortune out of his electro-mechanical telegraph.

The electric telegraph was patented in 1837 by Cooke, Wheatstone and Morse and thus was well established by the end of the century. In 1838 Steinheil proposed using the earth return as part of the circuit and by 1842 Morse had demonstrated that "wireless" communication was possible across a river using well separated plates on each bank opposite each other. These systems were eventually made to operate over several miles and by 1882 W.H.Prece, Chief Engineer of the GPO had installed a conduction system across the Solent when the submarine cable between the mainland and the Isle of Wight failed at Hurst Castle. The landlines between Hurst Castle via Southampton and Portsmouth completed the circuit with another pair of conduction plates between Portsmouth and Ryde. Morse signals were transmitted successfully between Southampton and Newport using a telephone receiver, there not being sufficient current to operate a paper tape inker. In 1895 Willoughby-Smith devised a conduction system at the Fastnet Rock, as it was impossible to maintain a fixed cable connection to the Rock due to the continuous battering of the sea. In this case an insulated cable was terminated on a copper anchor 100 feet offshore, and copper rods were inserted 20 feet into the north and south faces of the Rock, to intercept the currents flowing in the vicinity. The system worked well and reliably.

W.H.Prece experimented with Inductive Loops between Penarth and two islands in the Bristol Channel in 1892 with useful results over 3.3 and 5.35 miles respectively and in 1894 he set up loops between the Isle of Arran and the Mull of Kintyre, a distance of about 4 miles using wire rectangles about 6 miles long by 500 feet high. Removing the ground level return wire and replacing it with earth plates at each end gave much better performance as the return current now flows along a hemispherical surface and the effective size of the loop is doubled.

Coming now to Marconi. He had familiarised himself with the work of Hertz, Maxwell and Kelvin, and was also aware of results obtained by Branly and Onesti using detectors consisting of imperfect electrical contacts.

The early experimental work in 1895 took place at his home near Bologna. He repeated Hertz's experiments and eventually demonstrated communication over about one and a quarter miles using battery powered induction coils to generate sparks and a receiver employing a coherer. The transmit and receive antennas were short dipoles, sometimes with additional plates to increase the capacitance to ground. Marconi's coherer was developed from Branly's and after a great deal of experimentation eventually used an evacuated tube about two inches long, with a gap between slightly tapered silver plugs of about 0.025 inches. The plug faces were mercury coated and the filings were 95% nickel mixed with 5% silver. The coherer can be regarded as a specially constructed 'dry joint' with two states, high and low resistance. Application of an RF signal changes the state from high to low, with high resistance restored by mechanical shaking.

By January 1896 he was considering patenting his invention, offered it to the Italian Government who eventually advised him to make it available worldwide. His first wireless telegraphy patent No.12039, filed

June 2 1896, included the words "I believe that I am the first to discover and use any practical means for effective telegraphic transmission and intelligible reception of signals produced by artificially formed Hertz oscillations".

Marconi came to England in 1896 and through family connections was given a letter of introduction to W.H.Preece of the GPO and demonstrated his apparatus to him. Later on there was a further successful demonstration with signals of 2 metre wavelength on Salisbury Plain with the Army, Navy and Post Office present.

Concurrent with these activities many others such as Lodge and Rutherford had demonstrated similar results in detection of electric waves over significant distances but none of them had considered the possibility of long distance telegraphy. Popov, Minchin and Rutherford had also applied the methods to the study of lightning discharges.

By March of 1897 he was back for further tests on Salisbury Plain and achieved a range of 7 Miles, and Capt. Jackson, the Navy representative, commented that the Marconi apparatus consumed 13 W to communicate over 2 miles whilst the power required for a ships masthead lamp was 260 W. He also recorded the unattributed remark that "there is no possible market for the instrument, except for naval and military purposes". In May further trials across the Bristol Channel achieved 8.7 mile range using kite borne aerial at 300ft high and employing a 20 inch spark, this trial was reported by Preece to the Royal Institution on 4 June 1897.

The Wireless Telegraph and Signal Co. was formed on 20 July 1897, with Henry Jameson-Davis, Marconi's cousin, as first MD and Marconi as one of the five directors. The company name was changed to Marconi's Wireless Telegraph Co. Ltd on 24 March 1900. The Marconi's Wireless Telegraph Company of America was formed on 22 November 1899 and became the Radio Corporation of America in 1919. The Marconi International Marine Communication Co. was created on 25 April 1900, Marconi's 26th birthday.

October 1897 saw further Salisbury Plain trials with range of 34 miles to Bath. Marconi then decided to concentrate on communication with ships at sea and he established a coastal station at the Needles Hotel, Alum Bay, Isle of Wight, and soon demonstrated ranges of 18 miles to a steamer, always it seems in bad weather. A second station was set up at Bournemouth. Lord Kelvin sent the first paid radio telegram from the Isle of Wight to Bournemouth (he insisted on paying) and then via postal telegraph to Glasgow. By September 1898 Marconi had transferred his Bournemouth station to Poole which he continued to use until 1926. During the Naval manoeuvres of 1899 communication was established over a distance of 95 miles using an intermediate ship as a repeater (HMS Europa to HMS Juno to HMS Alexandra). Captain Jackson (HMS Juno) noted that the horizon distance from the 150 feet high aerials was 31 miles and that communication had been achieved over 60 miles between Juno and Europa. He said, "the induction must have passed through or over a mass of sea water about 600 feet high and 30 miles thick". During this period of intense demonstration the development of 'Syntonic Transmission and Reception' which resulted in the famous 7777 Patent was completed, it essentially allowed for control of the rate at which RF energy could be fed to the aerial circuit by loosely coupling the aerial to a high Q resonator excited by the spark gap, the beginnings of selectivity and the first steps in enabling many stations to operate simultaneously without mutual interference. The radio frequency transformers were called 'jiggers'.

Ambrose Fleming was appointed Scientific Adviser to the Company in 1900 having previously assisted Marconi on a part time basis. He set about designing the Poldhu transmitter which was tested in 1901. The input power was 20-25 kW from an alternator giving 2KV at 50 c/s. This was stepped up to 20KV into a closed oscillating circuit. Keying was achieved by shorting out chokes in the alternator. Aerials were initially constructed as an inverted cone supported by a ring of twenty masts each 200 feet high. However the gales of 1901 destroyed this arrangement and a 60 wire fan between two 150 feet masts was substituted. Marconi decided to go for a one way test and due to limitations in the transmitter design was only able to send dots, thus the test signal consisted of the letter S in Morse, three dots, continuously repeated to a previously agreed timetable. This signal had been received at Niton 186 miles, and at Crookhaven, Co.Cork 225 Miles from Poldhu by the end of June 1901. Full power had not been achieved at this time, and the estimated wavelength was 366 metres. These results encouraged Marconi to travel to St Johns, Newfoundland, with Kemp and Paget in early December 1901. A week later he had selected a site, flown kites to support the 500 feet long aerial wires, having lost his balloon equipment in gales. Signals were noted in Marconi's diary for the 12th and 13th of December 1901. Although, no doubt, a great relief to Marconi, but a result which is still subject to a great deal of discussion and argument! Thankfully, for many of us at this lecture, it has provided very satisfying careers for great many years.

Our thanks to Roy for an interesting and informative lecture.

*Report by Ken G7RFT*

## **A Beginner's Tale by Nick M3NIC.**

I had been a listener for a number of years but just didn't have the work pattern to support doing the RAE course nor, to be honest, the inclination to do Morse. The new Foundation Licence came as a breath of fresh air to me and I resolved to take the course as soon as it was available. I took my foundation at Colchester on the February weekend course run by Frank Howe G3FIJ and received my licence in the post ten days later on 23rd February.

Whilst waiting for the licence to arrive I started to set up my station. I have a Yaesu FT757GX Mk1 powered by an old Somerkamp FP-12 PSU and a borrowed Yaesu FC700 ATU. My aerial proved to be the main problem. I have a small difficulty with my neighbours who are suspicious of aerals! My wife, Ruth, prefers not to have yards of wire spoiling the look of her garden and house at the bottom of the Gipping Valley! After a series of emails and phone calls with a very patient Trevor M5AKA and Peter G0DZB, I decided to use a vertical antenna bolted to my garden shed. Cash however was the immediate problem so I borrowed a half size G5RV (to Ruth's dismay) from a pal and slung it East-West between the house and the shed (a distance of just under 60ft). To avoid attracting attention it is only 5 feet off the ground and the twin ribbon feeder cable is mostly dragging on the lawn. Some 30mtrs of cheap RG58 connect the aerial to my rig upstairs. The rig is not earthed as the ground is 20ft away and the plumbing is fed by plastic pipes. I promised Ruth the G5 was a temporary feature and the vertical would arrive as soon as we have the cash.

After listening for a while on 40m I plucked up the courage to send my first CQ at 10.30am Monday 25th February, it took a while to get a response but eventually my first 40m QSO was established with G2DOJ who's QTH was a few miles north of Marble Arch, the signal report was a good 59. Hooray! Proof at last that I was getting a signal out and for a reasonable distance (well, I thought so!). Encouraged, I tuned up and down the band and answered a CQ from Kevin M3VKD in Bath. Getting bolder I fired up again that evening and had QSO's with Wolf DF9YK in Frankfurt and Philip G10VAB in Belfast. These were hard to work as the continental operators had fired up and there was loads of QRM, but we made it. I have now had a number of QSO's including Croatia and Belorussia. I also worked Trevor M5AKA himself, who was testing a new mobile aerial. After some responses seen in the radio media, I had been a bit concerned that full licence holders may try to avoid M3's on air but so far I have nothing but praise for their help and encouragement, I have not encountered any animosity and have now worked a fair number of G's and M0/M5's.

I have been absolutely amazed at the quality of QSO's with an incorrectly hung G5 and 10watts output, so all you new M3's or folk contemplating the Foundation do not worry, it is great fun and the airwaves are full of very friendly folk who enjoy a nice chat.

*Comment from Trevor M5AKA: When Nick installed the half size G5RV he had never run across one before, it came from a friend without instructions and Nick was unaware that the twin ribbon 'feeder' cable actually radiates and should ideally be kept 15 feet from any nearby building and certainly not left lying on the ground. Even so with this less than ideal arrangement just 5 feet off the ground Nick is working all around Europe on 40 metres.*

### **Bargains For Sale.**

Daiwa Ps-300 30A 9-15V PSU. Large and bulky.  
£65. PSU 4A 13.5V £8.  
FT-736 R 50/144/430/1240 Multimode £750.  
Contact Trevor on 0794 103 9832 or Email on  
m5aka@amsat.org.

### **Club Nets.**

Held every Tuesday except first (Club night) at  
8-30 pm, local time. Frequencies +/- QRM.  
Second Tuesday is "VHF Night" on 145.375  
MHz.  
Third Tuesday is "Top Band Night" on 1945kHz  
This is provisional, to let newcomers join in.  
Fourth Tuesday is "HF Night" on 28.325 MHz  
Fifth Tuesday is "VHF Night" if there is one.  
Details of other Nets next time.

### **Morse Assessment**

Chris G0IPU has organised a Morse Assessment course to take place on the same day as IMD, that is Saturday 27th. April at Sandford Mill. This is to enable Class B License holders to graduate to M3, provided they have held a Class B for one year. The course will start at 10am. More details will be available at the next Club meeting or ring Chris on 01245-269207.

### **Newsletter Editors.**

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**Deadline for the May N/L is Wed. 10th. April.**

**Stop Press.**

**Due to shortage of space this item only appears in the Email edition and I have to admit that I forgot to find room for it in the postal version! Apologies to G3EDM.**

### **Can Anyone Help Me, Please? American Power Conversion UPS.**

From my late brother's estate I acquired this 280 VA uninterruptable power supply and whilst I have the handbook it has no diagram. It does not work properly as it interrupts the PC when there is no mains power failure and it brings up two red LEDs....one of these indicates a duff battery and the other indicates an overload. Even when the PC is not switched on, and the UPS has therefore no load, it does the same at various intervals...some as much as two hours apart. It will supply a 60 Watt light bulb for 45 minutes when I test it that way; and I have also tried a new 7Ah sealed lead acid battery in it to no avail. I believe some of our members have come across these UPS at their works. I have done a visual inspection of the PCB (PCB has software ICs on it so it is a rather complex circuit) but can see no dry joints etc and suspect perhaps one of the four relays is playing up. However, I would have to remove the rather large PCB to get at them and then I have not diagnosed them as definitely faulty. A circuit diagram would help me enormously.  
Can anyone in the club help me, please ?  
Geoff G3EDM.