



# Crystal Sets

**This month the Rev. George Dobbs takes many of us back to where we started in radio, by building a crystal set that looks like a crystal set!**

*"With electricity we were wired into a new world, for electricity brought the radio, a "crystal set" and, with enough ingenuity, one could tickle the crystal with a cat's whisker and pick up anything"*

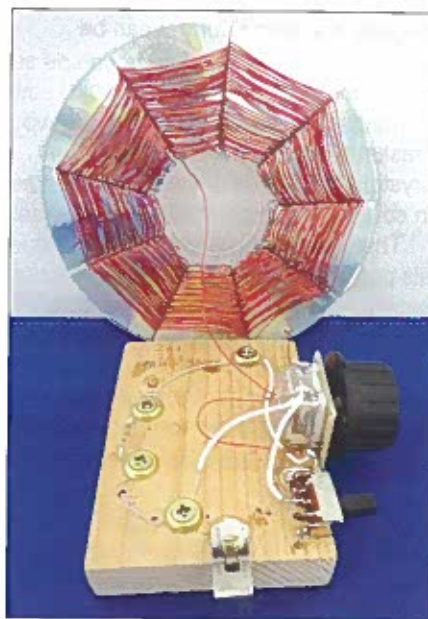
Theodore H. White. English Journalist and Novelist 1915–1986

Last month I mentioned the display of home-made equipment at the "Four Days in May" QRP symposium at the Dayton (Ohio) Hamvention last May. I described a small transmitter made by **Gary Davis KD9SB** who, in addition to being a Radio Amateur, is a keen sailing boat owner and sailor. His transmitter was used to replicate the working radio communication conditions of the Kon-Tiki expedition of 1947. A little further along the display table from KD9SB was an example of the crystal radios (crystal sets) used by **Dave Cripe NM0S** with groups of Boy Scouts.

Dave claims that he chose his novel callsign, NM0S, as a tribute to all the *n*-channel m.o.s.f.e.t.s that have met their demise at his hands. Dave is a member of the G-QRP Club and several other QRP radio groups. He does a lot of work with the Mount Vernon (Iowa) Boy Scout Troop 40, teaching the Radio Merit badge and setting up the Jamboree on the Air (JOTA) station.

What caught my eye was his version of the crystal radio, that essential teaching aid when introducing the science behind the radio receiver. The humble crystal set as an amplitude modulated (a.m.) receiver is a simple way into the theory and practice of radio reception.

Incidentally, while I was preparing this column, I had a visit from my old friend **Johnny Apell SM7UCZ** over here from his native Sweden to do some work in Knaresborough, North Yorkshire. When he saw me playing with crystal sets, he gave a sad look



This month's project – a crystal set that looks like a traditional crystal set!

and said there are no longer any working a.m. stations in Sweden. I wonder how long it will be before we can no longer share the pleasure of building and using the simplest of radios with young people?

Immediately I saw the NM0S crystal radio, I thought of the end of year edition of *PW*. For many years I have attempted to offer something for the beginner, or younger family member, at the end of each year to correspond with the (now) lengthy break between Christmas and New Year. The idea is to produce a few simple practical ideas for use in the time between Christmas and New Year and the most obvious issue to publish such ideas is November; with enough time to gather the bits to use in the workshop over the festive season.

When the Christmas specials and classic films have worn thin, it's time to switch on the soldering iron and introduce children or grandchildren to the pleasures of simple electronic

circuits. Over the years, for readers of this column, that has often meant permutations on the crystal set; there are plenty to choose from and they are all simple and inexpensive.

The novel feature of the NM0S crystal radio was that Dave used permeability tuning for the tuned circuit. A crystal set relies on the input tuned circuit for its selectivity; that is the ability to sort out a desired radio station from other adjacent stations. The tuned circuit in the typical crystal radio, **Fig. 1**, uses a capacitor and an inductor, designated C1 and L1 in **Fig. 1(A)**. Capacitor C1 and the inductor L1 are designed to form a parallel resonant tuned circuit at the frequency of the required station.

Usually the resonant frequency is adjustable by varying the value of C1, C1 being a variable capacitor. In permeability tuning the value of the inductance (L1) is varied by moving a core in and out of the wire windings that form the inductance. The material chosen for the core is dependent upon how much frequency shift is required and the rate of that frequency change. NM0S used an old fashioned type of coil in conjunction with some cooking foil from the kitchen, but more of that later.

It is worth pointing out the unique properties of the crystal set to young people who have not previously used one. The crystal set is novel in that it requires no battery or other external power source to receive radio stations. It relies on the power present in the radio signals picked up by the antenna so the larger the antenna, the louder are the received signals. Reception can also be improved by adding a physical earth connection, ideally a long copper pipe driven into the ground.

Simple crystal radios are designed to receive a.m. signals in which the audio (sound) signals are superimposed on a radio frequency (r.f.) signal. A detector (D1) is used to recover the audio frequency signal from the r.f. signal. Early crystal sets used cat's whisker detectors. This was a short length of springy wire moved over the surface of a certain type of crystal until a signal could be detected.

The crystal had to be a semiconductor. The commonest crystal used in the cat's whisker detectors was (and still is) galena although iron pyrites