ZS0AWA Southern African Antique Wireless Association

AWA Newsletter

#49

January 2010

A Member of the SARL

ZS6SRL

Antique Wireless Association of Southern Africa

Reflections:

At long last I have also now joined the ranks of the unemployed. I'm still trying to make up my mind whether or not this is a good thing.

I can think of all the little projects I've been putting off for so long. The Hallicrafters SX28, the Geloso Rx, getting the tower up in the air with the antenna's all moved over to it.

Then of course there is the allure to sell up everything, buy a caravan and go travelling around the country. The problem is then, what to do with all the Boatanchors ?

I am sure if I had to take the advice of some of my amateur colleagues, the consensus would be to probably send the wife away in the caravan and stay at home with the radio's.

But as you all know, this would not be very kosher. No matter how tempting it may seem.

During this festive season break I have had the opportunity to play a lot more radio than usual and it always amazes me when I find out how many people are still using valve equipment. The FT101 in all it's variations seems to be by far one of the most popular rigs amongst hams and there are just so many of them around. There are still a good few FT200's out there and of course the later versions of the Yaesu range. I think if one had to do a census on radio's in use, Yaesu would win hands down. (This of course is my opinion and I am sure there would be many who would disagree).

I do believe that if it came to the more modern plug and play black boxes, then Icom would be by far the more popular choice.

However, whatever your choice, I am sure you enjoy operating your rig and getting the most out of it.

My personal preference is always to my valve rigs which still have to be tuned for maximum power out and have the analogue readouts. No digital stuff there, which adds greatly to the frustration of the plug and play operator who takes delight in telling you how you are .03587 off frequency.

May the force be with you, and here's to a fantastic 2010.

Best 73

De Andy ZS6ADY

Wikipedia—The Resistor

Thick film resistors became popular during the 1970s, and most SMD (surface mount device) resistors today are of this type. The principal difference between thin film and thick film resistors is not the actual thickness of the film, but rather how the film is applied to the cylinder (axial resistors) or the surface (SMD resistors).

Thin film resistors are made by sputtering (a method of vacuum deposition) the resistive material onto an insulating substrate. The film is then etched in a similar manner to the old (subtractive) process for making printed circuit boards; that is, the surface is coated with a photo-sensitive material, then covered by a pattern film, irradiated with ultraviolet light, and then the exposed photo-sensitive coating is developed, and underlying thin film is etched away.

Because the time during which the sputtering is performed can be controlled, the thickness of the thin film can be accurately controlled. The type of material is also usually different consisting of one or more ceramic conductors such as tantalum nitride (TaN), ruthenium dioxide (RuO_2), lead oxide (PbO), bismuth ruthenate ($Bi_2Ru_2O_7$), nickel chromium (NiCr), and/or bismuth iridate ($Bi_2Ir_2O_7$).

The resistance of both thin and thick film resistors after manufacture is not highly accurate; they are usually trimmed to an accurate value by abrasive or laser trimming. Thin film resistors are usually specified with tolerances of 0.1, 0.2, 0.5, or 1%, and with temperature coefficients of 5 to 25 ppm/K.

Thick film resistors may use the same conductive ceramics, but they are mixed with sintered (powdered) glass and some kind of liquid so that the composite can be screen-printed. (Continued Page 4)

Inside this issue:

AWA Committee:

- President—Don ZS5DR
- Technical Advisor—Rad ZS6RAD
- Net Controller—Willem ZS6ALL
- Secretary/PRO— Andy ZS6ADY

CW Net:

Is CW really being relegated to the back burners of operating modes ? Maybe here in SA, but when I listen to the DX bands I begin to doubt CW will ever really disappear.

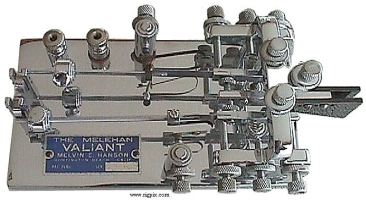
There is till so much activity in Europe, Asia and the US the mind boggles at it all. While here in SA, we battle to get more than 6 operators on a Saturday afternoon.

By the time the February issue comes out, it will be almost time for the AWA CW Activity weekend. Last year we had a total of 29 call signs logged for the weekend. I wonder what we will be able to log this year.

Surely there are more than 29 CW operators still on frequency in SA. Again I seem to be drawn back to the question of why are we not able to attract these guys to our cause. Cause ? Well yes, one could call it that. Just as we try to keep the old Boatanchors alive through the AWA, so too, we are trying to keep CW as a mode of communication in the Amateur Radio Fraternity. Surely there are more than 29 people who feel the same way ?

Listening on the bands the other day, I heard a ZR6 station calling CQ on CW, only to discover he was running a beacon, calling CQ on it ???

Which makes me wonder, how many ZR's are there who are willing to try getting their full ZS by doing the CW test ? I am sure there are still a few ZR's out there who are looking at different ways of upgrading to full ZS. What better way to do it than to write the CW test and pass. My only worry thereafter is, how many who do it that way, will actually still use CW as a mode after they get their ZS licence ?



Melehan Valiant

Then too, I wonder if any of my comments actually do anything to encourage the use of CW on the bands ??

De ZS0AWA/CW …-.-

SSB activity:

We all started to get excited at the reports of "sunspots". The bands have got to improve now, we all thought and hoped with wild excitement. As they say in the classics "Eish".

When oh when will the turn take place ? I must admit there have been times when I have become quite excited at 5/9 reports from Kzn and the Eastern Cape, only to hear the QSB come in and slowly erode the signals. Local skip conditions on 40 have been as bad as what they ever were.

While 80m is not proving to be much better, we can only wait in expectation for the change to come and the bands to improve.

Gratefully, we have not suffered any more losses to call in's taking place on the SSB nets. We still seem to stay around the 15 to 20 mark from both bands.

Conditions are not that great these days between Willem and myself sometimes affecting the relay on 80m, but yet we soldier on. The coffee breaks seem to come a lot quicker than what they used to as a result of this, but Willem doesn't seem to mind. In fact he encourages it more often than not.

Welcome back to those who have not been around for a while, we have sorely missed some of the regular callers and look forward to hearing the rest of them all back on freq sometime soon. It was good to hear Om Les ZS6NV and Pine ZS6GST during the month of December.

Gonset GSB100

AM:

AM has been an absolute disaster this last month or so due to the summer storms sweeping across the country and causing QRN of 9+20 at times. It's bad enough on 80m SSB never mind trying to do things on AM where the noise just seems to escalate.

Now I know why the US stations closed own their AM transmissions during the summer and only resume again at the end of the season.

Still, there have been times when the bands have been usable, mostly on Saturday mornings from around 06:15.

Please remember, for those of you who don't have AM transmitters, but do listen in to the AM net's, we have started taking call in's at the end of the net on SSB for any who may just want to come in and make any comments.

So if you want to report in as a listener, give some reports to the guys who have been transmitting or just call in for interest sake, please feel free to do so.

We still try to keep the AM nets going at the listed times, do listen out for us on 3615 on Wednesday evenings from around 19:00, Friday afternoon from around 16:30 and Saturday morning from around 06:15.

The Saturday net is still the best giving a quiet band most times with fairly good propagation. However, there are always the exceptions.

AWA Committee 2010

Don ZS5DR, President.

I recall having written the exam down in cape town in 1986 before I got transferred to Durban.

I did not bother with trying to get a ZS1 Call sign so once i got to Durban I applied for my ZR and got the call ZR5AAT.
My Old man tried really hard to get me to do the morse exam and eventually I did the Morse test in Pietermaritzburg in January 1991. A year later I got the call ZS5DR as I was too lazy to bother with CW and living in a Flat it was not easy trying to Get a station on the air.
I can remember having the Yaesu FR 100B and the FL 100 B on loan from my OM but it was not that successful in the flat.
I then got married to Jen in July 1991 and we moved to our Present QTH in Queensburgh.
My OM told me about a rig for sale by the PMB Club and I put in a tender for it and was successful. That was my Kenwood TS 820.
So with my old Icom IC 245E and The TS820 with a TR 28 in the mobile and a Zip Whip antenna that is how my station stayed for many years.

Later I got a FT80C for the mobile and used to join the ZS5RK net in the mornings and evenings to work and home.

Then i started my new business in 2003 and this gave me some time to do more Amateur work. I restored a TR15 and got it on the air after my Kenwood produced some black smoke.
By this time the Collins interest Group had been going for a while and the start of the AWA was being talked about.
Once it was up and running my OM gave me a Johnson Viking Ranger II and the KW Atlanta which used to belong to my Uncle Mike ZS5MC and that is how the bug began to bite for the Antique equipment.
Over the years I have collected a substantial amount of Antique rigs and when my OM Immigrated to ZL I inherited even more.

Andy ZS6ADY PRO/Secretary

Andy: Licensed in 1984, I wrote my license in Kimberley with Om Rad who had previously been licensed in the UK and decided to redo his license when we worked together on the Diamond Mines in the Northern Cape.

My First Call Sign ZR4AC I used for about 2 years playing around on 2m with homebrew 12 element Yagi's and upsetting the Bloemfontein repeater on a regular basis. Once I did my CW and got my ZS call sign (ZS4AC), my first 200 contacts were made on a Hallicrafters HT37 transmitter and SX100 receiver. I kept the rig for many years but sold it eventually to upgrade.

Collins have become my choice of valve radio's and I have some wonderful working examples of them, being very fortunate in being able to collect such fine specimens. I also have a few Hallicrafters receivers amongst the collection.

I joined the AWA at it's inception as I had a love for valve radio's having operated valves all my days as a ham. From the Hallicrafters I went to a Yaesu FT200 then to a FT901 then FT902 and eventually the Collins collection.

I served a year as AWA President for my sins in 2006, and it was during that time the Newsletter was created to become the mouthpiece of the AWA. This has now been going since January of 2006 and I hope to keep it going for as long as possible, with a lot of help from my friends and members of the AWA.

Rad ZS6RAD Technical Advisor

Licensed in 1984 as ZR4DY and upgraded to ZS4AAB in 1986. Relicensed as ZS6RAD in 1990. Member of the 1990 ZS0Z expedition to Penguin Island. Operated as a member of the 3DA0DX expedition. Active member of the SA Antique Wireless Association and restores valve equipment as a retirement hobby. Elected President of the AWA for 2008 and 2009.

Station consists of an 18 m tower with inverted vee's for 160m, 80m, 40m and 30m, and a KT43XA for 20m,15m and 10m. A M2 6M2WL is located above the KT34XA at 22m above ground, . The 12m VHF tower has 2 x M2 2M5WL stacked vertically and a wide-spaced 5 el 6m antenna between.

HF station is a combination of Kenwood TS-520S, TS-820S, Icom 735, Yaesu FT-200 and if he feels masochistic a Hallicrafters SX-117/HT-44 combo. A KW Electronics KW2000 is also available for the memory lane trips.
VHF equipment is all Icom. IC-575, IC-271 and IC-471 with linears capable of 150w on each band. Two PCs, one for digital coms and logging and the other for internet and home administration complete the shack which is a tad crowded!

A member of the Lions Club of Midrand and PDG and operate the Club's Hunting Lions contest station ZS6LCM. Also a member of the South African Radio League.

(From Page 1)
This composite of glass and conductive ceramic material is then fused (baked) in an oven at about 850 °C.
Thick film resistors, when first manufactured, had tolerances of 5%, but standard tolerances have improved to 2% or 1% in the last few decades. Temperature coefficients of thick film resistors are high, typically ±200 or ±250 ppm/K; a 40 kelvin (70 °F) temperature change can change the resistance by 1%.
Thin film resistors are usually far more expensive than thick film resistors. For example, SMD thin film resistors, with 0.5% tolerances, and with 25 ppm/K temperature coefficients, when bought in full size reel quantities, are about twice the cost of 1%, 250 ppm/K thick film resistors.

Edward George Bowen

(Continued from Issue 48)

AI (Air Interception)

Most of the early development of AI and ASV was done in parallel and they were able to share many of the same components. Nevertheless AI had its own peculiar problems; for example, the components had to work at higher altitudes, making it, among other things, more difficult to design a transmitter. Also AI is more complicated than ASV because it must guide the fighter to its target in three dimensions, and the range and relative direction of a fast moving target must be presented to the operator immediately and simply. Furthermore it must bring the night fighter so close to the target that the pilot can identify it visually before opening fire.

In early 1939 Bowen, together with his group, decided that the first AI radar would measure the relative direction of the target by four antennas mounted on the fighter; two 'azimuth antennas' would give overlapping lobes in the azimuth plane and two 'elevation antennas' would give overlapping lobes in elevation. Failing to devise a simple display on a single cathode-ray tube, Bowen had to accept that there must be two tubes and a separate radar operator. One tube would display the signals from the elevation antennas and the other the signals from the azimuth antennas. As in ASV, the signals would be distributed by a fast rotating switch. Following some tests on night vision made at the R.A.E. Bowen decided that AI must have a minimum range of 1,000 feet.

The first complete installation of AI was flown in a Fairey Battle on 9 June 1939. It gave a maximum range of 12,000 feet with a Harrow as a target; the minimum range was about 1,000 feet and in mock interceptions the display seemed easy to use. A week or so later Bowen gave the Commander in Chief of Fighter Command (Sir Hugh Dowding) a successful demonstration; within a few weeks the airborne group was committed to fitting AI into 30 Blenheims for trials by 25 Squadron at Northolt.

This programme at Northolt was premature; not only was the AI equipment inadequately engineered, no proper provision was made for training and maintenance. Nevertheless the trials did expose one important fact; they showed that in order to make a successful interception with AI, it was essential to control the path of the fighter with a precision that could not be achieved by the existing system of fighter control. In November 1939 I pointed this out in a memorandum written to Bowen from Northolt and suggested that a special radar should be developed for fighter control. Bowen immediately forwarded my memorandum to the Superintendent of AMRE at Dundee, adding the excellent suggestion that the solution to the problem was to build a radar with a narrow rotating beam, a 'Radio Lighthouse'. Bowen had in fact suggested such a radar in July 1938, but not specifically for the control of night fighters. Unhappily that suggestion was turned down and Sir Robert Watson-Watt (1957) tells us that the failure to follow it up may have been one of his greatest mistakes in the development of radar. However, this time it was followed up; a radar with a narrow rotating beam and plan-position-indicator was developed by AMRE and the first Ground Control Radar (GCI) was delivered to the RAF in October 1940.

While at St Athan, Bowen's group developed an improved version of AI (Mk III) and helped to fit it into the Blenheims of various night-fighter squadrons. Although the maximum range of AI Mk III was regarded as adequate, its minimum range was about 1,000 feet and this became the subject of considerable friction between Bowen and the main establishment at Dundee. AI was not proving successful in the hands of the RAF and the Superintendent (A.P. Rowe) and his Deputy (W.B. Lewis) had been persuaded that this was largely due to the minimum range being too great; it must, they insisted, be reduced as a matter of urgency. Bowen disagreed profoundly; he was convinced that the minimum range had nothing to do with the shortcomings of AI in service and that the 1,000 feet achieved by AI Mk III was adequate operationally. To Bowen's intense annoyance Lewis, acting on a request from Rowe, started a programme of experimental work on AI Mk III at Dundee (Lovell 1988). Fortunately one of the things Lewis did was to enlist the help of EMI; in due course A. D. Blumlein and his colleagues at EMI produced an excellent transmitter modulator that reduced the minimum range to 500 feet and was subsequently incorporated in AI Mk IV.

Nevertheless it is likely that in this controversy Bowen was right. The principal technical defect in AI Mk III was later shown by tests at Fighter Interception Unit to be a squint in the antenna system of the Blenheim which was cured by changing from horizontal to vertical polarization (Hanbury Brown 1991). The minimum range was probably not a serious defect; in an assessment of the combat reports of fighter pilots in 1940 and 1941, Bowen found that the median range at which enemy aircraft were tracked by AI and then seen visually was between 1,200 and 1,500 feet (Lovell 1988). Furthermore the subsequent success of AI in 1941 suggests that two operational factors contributed to the failure of AI Mk III, the inadequate speed and armament of the Blenheim and the absence of GCI (Ground Control Radar).

This controversy about minimum range is only worth mentioning because it greatly exacerbated the strained relations between Bowen and A. P. Rowe, which had never been good ever since Rowe had succeeded Watson-Watt as Superintendent at Bawdsey in 1938 and appointed Lewis as his Deputy. As his senior staff Rowe had inherited Wilkins and Bowen, old colleagues of Watson-Watt who had pioneered radar, and as Bowen (1987) tells us, Rowe *'never came to terms with them'*. The separation between Dundee and St Athan was a further strain and the friction with Lewis over the question of minimum range was, from Bowen's point of view, the last straw. When in May 1940 the main radar establishment (AMRE) moved from Dundee to Worth Matravers and the airborne group left St Athan to rejoin them, Bowen ceased to take an active part in their work and, as we shall see, he was soon to leave for the USA. [AMRE became TRE (Telecommunications Research Establishment) in November 1940.]

The final engineering of AI Mk III was undertaken at the RAE and introduced into service as AI Mk IV in Blenheims and Beaufighters in the autumn of 1940. AI Mk IV did everything that Bowen had originally visualised for a metre-wave AI set. It was the last and vital link in an elaborate and successful system of hunting enemy bombers that involved the coastal CH stations, inland GCI radars, radar beacons and transponders, VHF radio and AI-equipped Beaufighters with their Hispano cannons. In the hands of a skilled crew, AI Mk IV was remarkably effective, and in the heavy night raids of 1941 the AI-equipped fighter proved to be the principal weapon of air defence at night (Douglas 1948); thus in May 1941 over 100 enemy aircraft were definitely shot down at night using AI compared with 30 by anti-aircraft guns.

The Tizard mission

In August 1940 Bowen left the UK as one of seven members of a Mission, led by Sir Henry Tizard, to disclose recent British technical advances to the USA and Canada. Bowen's job was to tell them all about British radar He took with him not only information on all existing and projected equipment, but also an early sample of the cavity magnetron, the essential and highly secret key to the development of centimetre-wave radar that had just been invented by J. T. Randall and H.A.H. Boot at Birmingham University.

Following discussions with the Tizard Mission, the US made the important decision that the development of metre-wavelength radar should be the responsibility of the Armed Services, and that the development at centimetre wavelengths should be the responsibility of a special Microwave Committee of which Dr Alfred Loomis was appointed Chairman.

As far as metre-wave radar was concerned, Bowen, together with other members of the Mission, visited the various laboratories of the Armed Services telling them about developments in the UK; in particular he told them about airborne radar and arranged for demonstrations of ASV Mk II, AI Mk IV and IFF (Identification Friend or Foe) equipment in the air. However most of his considerable energy and enthusiasm was devoted to helping them develop centimetre-wave radar. Ever since the days of Bawdsey Manor he had urged that work should be done on shorter and shorter wavelengths so that radar’s could use narrow beams; an airborne radar, for example, might use a narrow beam to eliminate the returns from the ground that limited the maximum range of AI at metre-waves.

With remarkable speed the Microwave Committee set up a special laboratory, the Radiation Laboratory at MIT, for the development of centimetre-wave radar, and Bowen collaborated closely with them on their programme. His advice was particularly valuable in the early stages; for example, he wrote the first draft specification for the development of their 10cm AI.

So successful was the programme at the Radiation Laboratory that the first experimental airborne 10cm radar was tested in a Douglas B18, with Bowen on board, on 27 March 1941, only seven months after the Tizard Mission had arrived in the USA. Their first 10cm AI (SCR720), accompanied by Bowen, was demonstrated in the UK in August 1941 and later became known as AI Mk IX.

In the course of the next year the Radiation Laboratory grew in size and soon became the most important and productive radar laboratory in the USA; by the end of the war the staff numbered about 4,000. The Tizard Mission, in which Bowen played such a large part, was highly successful. It drew the attention of the Americans to the importance of radar as a weapon of war, introduced them to airborne radar, accelerated the development of centimetre-wave radar by giving them the cavity magnetron and, owing much to Bowen, helped them to set up the highly successful Radiation Laboratory.

The Australian years The radiophysics laboratory, Sydney

In the closing months of 1943 one of us (White) was in the USA and, when visiting the Radiation Laboratory at MIT, met Bowen again for the first time since King's College, London. Bowen seemed to be at a loose end. His work in the USA was virtually finished and the invasion of Europe by the Allies was imminent. In Australia, the Radiophysics Laboratory was still hard at work helping the Australian and American forces in the Pacific. It was proposed to Sir David Rivett Chief Executive Officer of CSIR, that an offer be made to Bowen to come to Australia to join the Radiophysics Laboratory. Rivett agreed and Bowen arrived in Sydney on 1 January 1944. In his book Radar Days Bowen tells how he consulted Tizard and received the reply: 'They seem to need help in Australia. Go there my man.' He flew by US Air Force through Hawaii, Canton Island and Noumea to Sydney, a route well known to many Australians.

When Bowen arrived in Sydney, security conditions on radar information were gradually being lifted. CSIR was planning

the return to peacetime work and within a year Fred White, who had been Chief of the Radiophysics Laboratory, had joined the Executive Committee in Melbourne. This was a period of great change; the Japanese surrendered in August 1945 after the atomic bombs had been dropped, and all hostilities in the Pacific ceased. In May 1946, when John Briton who had succeeded White returned to industry, Bowen was appointed Chief of the Division of Radiophysics. One of his first actions was to organise and edit *A Text Book of Radar*, a collective work by the staff of the Laboratory.
Radar was still unknown to most Australians and Bowen could now talk freely about the exciting secret effort that had helped to win the war for Britain and her allies. His first paper in Australia was a general account of 'Radar in War' (*Aust. Jour. of Science*, 1945, 8, 33-37) in which he spoke with personal authority of the way the Royal Navy had frustrated the U-boat attack on civilian shipping. He drew a moral from the extraordinary assimilation of civilian scientists, 'in *grey bags and green jackets'*, by the fighting forces of England, in contrast to the rigid military control of scientific warfare by the Germans and the Japanese. The 'boffin' was everywhere in evidence and accepted amongst the military men. Bowen addressed the Institution of Radio Engineers on the historical development of radar, its military uses and its potential peacetime applications to civil aviation, marine navigation and surveying.

Post war research

With the cessation of the war, the skilled staff of the Division began to look around for work of interest to themselves and of importance to Australia. The professional staff of Radiophysics had grown to 66 by 1945, with several important new-comers recruited from the British and Australian services and Bowen was conscious of his responsibility to them. Two lines of research grew up naturally and became the predominant interests of the Division: radioastronomy and cloud and rain physics. The first grew out of the curiosity of J.L. Pawsey who repeated the observations of J.S. Hey in England on the jamming of radar receivers by radiation from the sun. Research on cloud and rain physics was started by Bowen in 1946 when I. Langmuir and V. Schaefer in the USA reported that rain could be induced by seeding clouds with dry ice. These two programmes absorbed the attention of a considerable proportion of the staff until Bowen himself retired from CSIRO in 1971.

Navigational aids

Bowen had also undertaken two other research activities. These were the pulse method of acceleration of elementary particles, with Pulley and Gooden, and more extensive work on air navigation with V.D. Burgmann. The latter resulted in the Distance Measuring Equipment (DME) that was ultimately adopted for all civil aircraft flying in Australia on internal routes.

Cloud seeding and rainfall

While many reacted cautiously to the 1946 claims by Langmuir and Schaefer that clouds could be made to rain by creating ice crystals in them, Bowen immediately saw the potential importance of the technique for dry Australia. Within months, two members of his staff had investigated the work and, on their return, had carried out a trial in eastern New South Wales using RAAF aircraft. Success was immediate. When seeded with dry ice the selected cloud reacted with spectacular changes of shape and heavy rainfall. This striking result held such promise that a systematic programme of cloud seeding was set up in February 1947 and continued for the next twenty-four years.

As little was known about the properties of clouds in Australia or the mechanisms of rainfall, Bowen initiated a vigorous research programme of cloud studies. This included not only the effects of adding ice crystals to cold clouds, but also the effect of spraying water into warm clouds which are responsible for much of the rainfall in the warmer parts of Australia. Bowen took part in the latter work himself and during 1950-1955 published papers on the theory of coalescent rainfall and directed experimental trials.

The difficulty with both these methods of stimulating rainfall was that only a few clouds could be treated on any one day and large amounts of dry ice or water were required. This limitation was overcome by the discovery, again in the USA, that tiny quantities of silver iodide smoke could be used as a seeding agent. Unlike many of his contemporaries, Bowen saw the potential for seeding large areas from the air using silver iodide burners mounted on an aircraft.

The first experiments with this method were made in 1955 over the Snowy Mountains in south-eastern Australia. The first two years were so successful, with an estimated rainfall increase of 25%, that several more regions were quickly selected. There the early indications were also successful, but in many subsequent years all areas showed a gradual decay of the induced rainfall with time. Most people would have become discouraged by such a result and given up. Bowen, however, proposed a simple explanation, based on the idea that a persistence phenomenon in the seeding process had confused the statistical analysis. Although this concept failed to win much support at the time, Bowen insisted that the next experiment (in Tasmania) should use target and control areas rather than two randomly-seeded areas, which was the method most susceptible to persistence effects. Moreover there was to be a gap of one year between seeded years.

This experiment was a success but, Bowen having retired (1971), the result was not immediately attributed to the correctness of his persistence hypothesis. Some years later Bowen reopened the question and the outcome of the ensuing debate established the persistence phenomenon as a vital factor that must be taken into account when designing and analysing a seeding experiment. Subsequent work by E K Bigg has done much to explain the detailed mechanism of the phenomenon. With the continuing success of cloud seeding work by the Australian states of Tasmania and Victoria and the recognition of the role of persistence, there appears now to be a promising future for the rain making techniques that Bowen did so much to pioneer.

Bowen's remarkable energy and enthusiasm were evident also in other programmes. He was not afraid to speculate and presented his intuitive ideas with a persuasive and engaging optimism that was either inspiring or alarming to his colleagues, depending on their views of science. Two of his well known theories about periodic rainfall variations illustrate this.

The influence of meteor showers

From the daily rainfall records for Sydney over the period 1859 to 1952 and for stations elsewhere in New South Wales and in other countries, Bowen found well defined peaks of rainfall in January and February. These anomalies he correlated with the passage of the Earth, 30 days earlier, through specific meteor streams that orbit the sun. He suggested that the smaller particles fell through the atmosphere to cloud level in 30 days, where they induced the observed rainfall.

The apparent physical implausibility of this hypothesis attracted a wave of criticism: the number of particles was insufficient, the fall time would not be fixed, and the particles would not form ice crystals. Even the reality of the anomalies was vigorously questioned, but independent analysis showed that they were statistically significant. But Bowen was not impressed by purely statistical arguments and insisted that his staff probe crucial aspects of his hypothesis by empirical tests in clouds. Whether he was right to invoke meteor showers to explain the rainfall anomalies and if so, how they influenced clouds after a fixed time interval, has yet to be demonstrated.

Lunar effects

In 1962, following a paper published in the USA, Bowen and Adderley showed that there were similar lunar effects in the monthly rainfall records for fifty New Zealand stations with comparable magnitude and closely related phase. The reality of the effect was beyond doubt. Independent frequency analysis revealed an amplitude variation of 20% and a periodicity of 29.5307 days. The mean period between full moons is 29.5306 days.

Bowen suggested that the Moon, revolving about the Earth, could modulate the amount of meteor dust reaching the Earth, and later showed that meteor rates in both the northern and southern hemispheres varied similarly with lunar phase. He argued that the Moon could intercept the particles or alternatively could deflect them because of electrostatic charges on the Moon and particles. Modern studies by his colleague, E.K. Bigg, however, suggest that the Moon's influence on rainfall is more likely to be caused by the lunar tides in the Earth's atmosphere.

The cloud and rain physics group, under Bowen's leadership, worked in a most stimulating environment. Even his more speculative ideas sometimes drove his critics to discover truths that would otherwise have remained hidden. Over twenty-four years, the group established a high international reputation with its achievements and an impressive number of sound scientific publications.

Acknowledgements

We wish to acknowledge the generous and invaluable assistance received throughout from Miss Sally Atkinson BEM, secretary to E.G. Bowen from 1946 to 1971 and now Honorary Archivist in the Division of Radiophysics. For material on Bowen's family and early years in Wales, we are indebted to his sons Edward and David and to W.S. Evans now living in Nelson, New Zealand. Thanks are due also to Dr E.K. Bigg, who contributed materially to the account of Bowen's work on cloud seeding and rainfall.

References

Bowen, E.G., *Radar Days* (Adam Hilger, 1987).
Hanbury Brown, R., *Boffin* (Adam Hilger 1991).
Douglas, S., Supplement to the *London Gazette* No. 38404, 1948.
Lovell, A.C.B., *Biogr. Mem. Fell. Roy. Soc.*, 34 (1988), 472-474.
Watson-Watt, R.A., *Three Steps to Victory* (Odhams Press, 1957).
Watson-Watt, R.A., *The Battle of the Atlantic* (H.M.S.O., 1946).

R. Hanbury Brown, AC, FRS, FAA, (wrote the section entitled 'The war years'), Emeritus Professor of Physics, University of Sydney.
Harry C. Minnett, OBE, FAA, FTS, former Chief of the CSIRO Division of Radiophysics, 1978-1981. Frederick W.G. White, KBE, FRS, FAA, former Chairman of CSIRO, 1959-1970

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Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yester-days radio transmitters and receivers. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

Notices:

Hi Andy, I made a typo on the Duxford article and of course it would be the man's callsign. I would be grateful if you would include a small "Erratum" at the bottom of the next newsletter correcting Max's callsign to G3WEZ, not G3MEZ with my apologies.
Thanks for a good job
73
Richard
ZS6TF/9J2RD

AWA: I have 2 FR50B receivers needing a bit of attention and looking for homes for a donation to the AWA coffers. Thanks to Eddie ZS6BNE for the radio's. Also have a NC200 looking for a home.

AWA CW Activity Day: 6th and 7th February. Get practising on your keys, paddles, bugs, whatever you use. Flags are a bit slow and difficult to see over distances, so don't worry about them. More details in the February Newsletter. Please come up even if just to give away a few points to some of the active guys. Lets make this a good one for the AWA.