R.S.R.S. Newsletter

No. 59 March, 1966

Mr. J. A. Ratcliffe

Mr. Ratcliffe retired from the Directorship of the Station on 28th February.

He came to the Station in September 1960 after a distinguished career in teaching and research at Cambridge where, at the Cavendish Laboratory, he built up a school of radio research of high repute. It is not surprising that he brought with him something of the university atmosphere and, during his period of office, we have seen a widening of our relations with universities both by co-operation in experiments and by the employment of university teachers from home and abroad as advisors on various aspects of our work.

Under Mr. Ratcliffe's direction the scientific work of the Station has flourished greatly. Not only has he encouraged the continuation and extension of some of the research which was in progress on his arrival but he has introduced new lines of work such as those on lasers, millimetre waves, cosmic rays, plasma physics, experiments in rockets and satellites and the Space Science Services. By Progress Reviews, Advisory Panels and Working Groups but, above all, by his own energy, drive and enthusiasm he has ensured the

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efficient conduct of the scientific work and, indeed, the well-being of the whole Station.

When, in October last, he announced his forthcoming retirement Mr. Ratcliffe mentioned that he had before him a programme of engagements which would keep him busy for some time to come and that he was, in addition, proposing to continue the writing of books. We were happy to hear that he has recently been appointed to membership of both the Astronomy, Space and Radio Board and the Space Policy and Grants Committees of the Science Research Council and will thus be able to continue helping us in our work. We wish him success in all these pursuits, and to himself and Mrs. Ratcliffe we offer our best wishes for their health and happiness in the years ahead.

A. F. Wilkins

The Radio Telescope *

A number of people having expressed interest in the work going on in Hut 6, for the Radio Telescope, it was felt that the time had come to "take the lid off", as it were, and to make known some of the more recent work which has been done there.

Most people nowadays will know something about parametric amplifiers, sometimes known as "Mavars" (Microwave Amplification by VAriable Reactance). Some further extension of these ideas has been incorporated into a device known to the Radio Telescope group as the Havar, or more crudely, "the up-down-up-down convertor". Here the signal to be amplified is applied to a parametric diode, together with a high-frequency pump signal, and the output taken at the upper side-band frequency. This gives a power gain approximating to the ratio of the signal and upper frequencies, in accordance with the Manley-Rowe relations. This signal is then Heterodyned in a similar device, using the same pump frequency, and once again following Manley-Rowe, a signal is obtained at the original level and frequency, but now the device has a very low noise factor, and the great advantage that should the pump frequency tend to drift, the output frequency is always the same as the signal frequency. This is done twice, still using the same pump, to further reduce the noise contribution from the later stages, and the final stage is a normal negative-resistance type amplifier giving a gain of some 20 db. Some very remarkable results have been obtained from the device.

There is also a new type of balanced radiometer which a number of people may care to know about. Here the input signal is split into two channels, which

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are switched at different rates by means of ferrite switches, and hence to two independent receiver channels using the same local oscillator. The signals are demodulated, and after audio amplification applied to (a) two synchronous detectors, which derive a D.C. from each channel, (b) two amplifiers whose gain is controlled by the D.C. voltage from the alternate channel but whose input comes from the square-wave generators used to drive the ferrite switches. The two square waves, now "clean", are differentiated, amplified, the positive going spikes limited, and the negative ones clipped off. This is repeated but with reversed phase, and a recorder rends the difference in average D.C. level between the two channels. Easily the most outstanding feature of the radiometer is its zero stability.

A receiver and feed system has also been designed to give an "auto-follow" facility. In order to make the system fairly versatile it was decided to use a rotating feed rather than a "mono-pulse" feed, as this could be adapted to changes of frequency more easily. The feed revolves at 3000 r.p.m. The output is taken via the usual receiver to a detector which provides an A.G.C. voltage. Filtering is kept to a minimum, so that the A.G.C. will follow fast fading as well as the scanning output. The A.G.C. voltage is amplified, and applied to two synchronous detectors, whose reference voltages are derived from a two-phase alternator driven by the rotating feed. This gives two D.C. voltages which are indicated on two centre zero meters on the console, proportional to the altitude and azimuth pointing error. The output of the receivers is first filtered to remove all traces of 50 cycle hum, and then passed through a further low-pass filter with a cut-off at about 5 c/s. It is then amplified in a chopper type D.C. amplifier to a fairly high level, for transmission to the tower, and then "potted down" to about 900 mV maximum (the specification is 5 mV per second of arc error) for application to an operational amplifier, incorporating a high-pass filter (with a cut-off this time at about 10 c/s) to finally eradicate any fluctuation due to violent slow-speed fading, and hence to the error input terminals. It is necessary only for the duty operator to ensure that the two centre-zero meters are indeed central, using the normal controls.

And finally a work about aerial feeds. As is well known, the maximum gain is obtained when the aperture is uniformly illuminated, but in practise this is difficult, and it is more usual to use a tapered distribution. This also gives lower sidelobes. Precautions are usually necessary to ensure that the illumination is the same in both the E and H planes, and one way of doing this is to incorporate metal plates normal to the E field, which intercept a small amount of power from the rear and distribute it over a larger proportion of

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the mouth area, thus giving some kind of binomial distribution. The author has experimented with brass plates .08" thick in an S band horn, and found that even a pair of plates gave quite good correspondence in a horn some 3" square, expanded from waveguide 10. In spite of considerable assembly difficulties, a horn has now been made with 17 places, equally spaced and of the same length as the horn, and this has given identical polar diagrams in the E and H planes.

* Those requiring more detailed information should know that it is proposed to submit this in full, for general circulation, early next month.

F. V. Bale.

Obituary

Frank Adcock M.B.E., D.Sc.

Some of the staff will be aware of the death of Dr. Frank Adcock, as an obituary appeared in the February edition of the N.P.L. News. Those connected with radio direction finding will all have heard of an "Adcock System" but probably few people realised that the man himself was still active in the radio field until a short time ago.

Frank Adcock was born in Ipswich round about 1890 and attended what was then called the Municipal Secondary School and which now rejoices in the title of Northgate Grammar. This was the writer's own school and although there was 30 years difference in our ages we had a common bond in a number of masters, old and cantankerous in my days, young and cantankerous in Adcock's school days.

For the benefit of those who have only been brought up on microwaves and radar, the Adcock System was a means of overcoming "night error"; so called because at night when ionospheric absorption was low, down-coming, horizontally-polarised waves caused large errors and fluctuating bearings when using a loop direction finder. Adcock used spaced, vertical aerials, connected by finders for which the horizontal pick up could be eliminated or cancelled out. He devised the system when serving with the Royal Engineers during the first World War and later patented the idea. The patent never brought him any money but he was awarded the M.B.E. for his work.

After the first World War he graduated from Kings College London and then went to Sheffield to study metallurgy. In 1922 he joined the Metallurgy

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Division, N.P.L., where he worked until 1939. At the outbreak of the Second World War Adcock volunteered his services to the Radio Division and remained there until 1946; during the later years of this period the writer worked as his assistant.

Despite the gravity of the war years it was impossible not to enjoy life with Frank. He was a person who never really grew up and even in 1963, when I last saw him in Australia, his sense of humour was as great as ever. Those of us who knew him during the war will remember his eccentricities. Long before 1939 he constructed an elaborate underground air raid shelter in his garden, which stood him in good stead during the blitz. In those days he was never to be seen without his haversack containing gas mask, torch and other essentials. I well remember firewatching with him at N.P.L. and seeing his ritual on retiring to sleep. For this he changed into an old pair of grey flannels, a roll-neck sweater and then crowned it all with a woollen night cap complete with tassel.

Adcock brought with him to Radio a large roll top desk, so vast that he could sit behind it invisible to those in the room. For this reason we had to be cautions of making some unguarded comment in case the subject under discussion put his head round the corner of the desk to make appropriate replies. His good humour never wavered, even when we put a slowly smouldering fuse in the bottom drawer of the desk so that smoke was percolating gently from the louvres, just as Adcock entered. His actions were amusing and his comments colourful.

He at first spent a large part of his time at Slough in connection with building and setting up the C.R.D.F. network used to locate thunderstorms. Later at Teddington, where I joined him, we developed new equipment for this purpose and finally changed from V.L.F. C.R.D.F. on 30,000 metres to V.H.F. D.F. on 50 centimetres. In 1946 Adcock was seconded for 2 years to the Indian Science Institute at Bangalore where he occupied the Chair of Metallurgy and set up a new Metallurgical Department. Finally he went to Australia as Research Manager of the Broken Hill Propriety at Newcastle N.S.W. I visited him there in 1953 and again in 1963 after his retirement. Even then he was very active and was developing a process for the non-destructive estimation of the thickness of steel plates such as the hulls of ships, as well as doing some lecturing and taking an interest in the Australian Institute of Radio Engineers.

C. Clarke.

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William Ruddle

It is with deep regret that we record the death of William Ruddle on 14th February, after a brief illness. He was more familiarly known to Winkfield staff as Bill. Everyone at Winkfield knew Bill, he was part of the place and in his daily round of cleaning and gardening, gathered up most of the news. If Bill knew nothing about it, then it was not worth knowing. The care of roses was his great love and the two standards at Winkfield were hedgerow briars which he budded himself. The satellites which are our bread and butter became familiar names to Bill and he would enquire after their welfare as much as after any member of the staff. In the many financial crises of the Tea Swindle, Bill's well worn note book became a daily sight as he gathered in the revenue from argumentative subscribers. If it wasn't in the book, Bill was an awkward man to avoid! He made no boast to be a skilled workman but he would have a go at most things and he left his mark on Winkfield in a way that would not disgrace a craftsman. We are missing Bill - no-one else knew his system for hiding useful bits and pieces, and every day someone says, "Bill would know".

We offer Mrs. Ruddle our very sincere sympathy in the loss of a fine man and for many of us, a good friend.

H. Bevan.

Staff News

Welcome to:

Mr. F. E. Graham	T/Clerical Officer
Mr. A. E. Whittaker	T/Experimental Officer
Mrs. H. G. Rix	T/Assistant Experimental Officer
Mr. D. R. Howard	Senior Experimental Officer (transfer from M.O.D.)
Mrs. E. Paterson	Part time Typist II

Resignations:

Mr. A. H. Manners	Labourer/Messenger
Mr. D. E. Jones	T/Scientific Assistant
Miss B. Kaiser	Assistant Experimental Officer
Mrs. R. E. Ditcher	Clerk/Typist, Singapore
Mrs. E. Brown	Cleaner
Mr. J. A. Ratcliffe	Chief Scientific Officer

/Other changes

Other Changes:

Mrs. M. E. Richards — regraded from part time cleaner to part time industrial messenger.

Sports and Social Club

Nominations for New Committee

There are six vacancies on the committee. Nominations of people to fill these vacancies should be entered on the list on the Sports Club Notice Board before 31st March.

Table Tennis Tournament

The table tennis section held a tournament on 8th March, 1966. This was very well attended, although some last minute absences caused havoc with the timetable. Two members of the Spur A and B group were seconded to play for Spur C and D, so although Spur D scored a technical triumph, it is difficult to assess the true winners. At the time of writing I'm still not sure which team the two visitors from Winkfield were playing for.

Despite these hazards it was a very successful evening and everyone managed to get three games.

M. Powell
and J. Willsher

Snooker

Smith-Rose Cup

The Smith-Rose Cup match ended in a draw, 5 pts. being awarded to each team. Many thanks to all those who took part.

K. Slater

The Things They Call Us

The Radiant Space Research Station

The Radio and Spark Research Station

These titles have recently been used in connection with our establishment.

LETTER TO THE OUTSTATIONS

Dear Colleagues,

A prolonged anticyclone; temperatures a little above average, as they say, and the willow tree near the entrance is green again. Spring is here.

Also here is a powerful field generated by whatever it is our farmer neighbour uses to encourage his lettuces, R.S.R.S. has been in the main lobe for the past week or so. This disturbance correlates well with the appearance of the largest sunspot for some years and a good chance of the first magnetic storm after muck-spreading. A good example of a solar-terrestrial relationship.

It is a pity that, since our Newsletter cannot reproduce half tone pictures, you cannot see those which appeared in the Times the other week. They show the preparation, in a N. Ireland factory, of 'A village for the Falkland Islands ..... ten prefabricated bungalows, ten garages and other buildings' for housing the S.R.C.'s 'Technical experts'.

You can't actually see a bungalow, as such, in the pictures; but there are a lot of walls and windows and suchlike all stacked in the factory yard. I expect that the right quantity of everything will turn up, however, should a bit be missing, surely a replacement will be contrived with the Kelper ingenuity recollected by

Yours sincerely,

The Editor

BESPOKE SPEAKERS

Extract from U.R.S.I. information for Jan./Feb. 1966 regarding next General Assembly.

"The National Committees of the U.S.A. and U.S.S.R. have agreed to design one invited speaker each."
