

# R. S. R. S.

## Newsletter

No. 65

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### ARECIBO IONOSPHERIC OBSERVATORY

by

H. K. Bourne

(U.K. Scientific Mission in N. America)

The Arecibo Ionospheric Observatory in Puerto Rico contains the world's largest radar and radio telescope, and research facilities for astronomers and atmospheric physicists.

The telescope is situated in a natural bowl in a mountainous region away from sources of interference, protected from strong winds and not subject to violent extremes of temperature. The horizontal spherical reflector of  $\frac{1}{2}$  in mesh wire weighing 207 tons, 1000 ft. in diameter, is supported by concrete pillars in the mountains. A line feed 96 ft. long, mounted 435 feet above the reflector, can move along a curved track half the radius of the main reflector. The beam can be swung  $20^\circ$  each side of zenith and through  $360^\circ$  in azimuth. The site is at  $18^\circ$  N, so that the sun and planets pass nearly overhead for part of the year.

Two transmitters can be used for radar operating on 430 and 40 Mc/s respectively, with a peak power of 2.5 MW and a pulse length of 2  $\mu$ s to 10 ms. A maser receiver is used with correlation techniques to provide maximum sensitivity. Frequencies of 195, 608 and 1420 Mc/s are used for radio astronomy.

The installation was proposed by Professors Gordon and Booker of Cornell University in 1957. A contract was placed by A.R.P.A. in 1959, and construction was completed in 1963. The installation, which cost \$9 million, is operated by Cornell University under a U.S.A.F. contract, and forms a part of the Cornell-Sydney University Astronomy Center. The first director was Professor W. E. Gordon.

/Ionospheric

Ionospheric radar backscatter at 4.30 Mc/s provides information on the electron density-height profile, and doppler measurements give data on the temperature of the positive ions over an altitude range from 100 to 10,000 km.

The radar measurements of the range of the moon and planets are made to an accuracy of 1 in  $10^8$ . Doppler broadening gives accurate measurements on the rotation of Venus and Mercury. The instrument has increased the precision of prediction of orbits of these planets and that of the determination of the Astronomical Unit. It can also provide very accurate satellite orbit prediction. The radar telescope is also used to map and measure features about 20 km in size on the surface of the moon and planets.

As a radio telescope the instrument has a very large collecting area, a high resolution, and can operate over a wide frequency range. It is being used to measure the emission from weak radio stars. The technique of lunar occultation is employed for determining the position, sizes and shapes of radio sources. The scintillation of radio sources caused by clouds of ionised gases ejected from the sun is used to give data on these gases and on the sizes of radio sources.

The instrument has also been used on the amateur frequency band of 14.4 Mc/s, and signals have been exchanged between Puerto Rico and Europe by moon bounce.

The information in this report was given in a paper by G. Pettersgill of the Arecibo Laboratory, at the American Radio Relay League National Convention in Boston, Mass., in April 1966.

H. K. Bourne. U.K.S.M.

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#### OBITUARY

Everyone associated with the Station will be very sorry to hear that Mr. T. Buckland died suddenly on 29th August.

Although he had been retired for some three years, Tom Buckland's name was still one to conjure with even among some who had never met him. To those who knew him this fact is no surprise, his was a character which left an impression on all who knew him. In the more than twenty years he was at Datchet one aspect of his work became evident to even the least imaginative; his flowers were a treat to look at. He was a regular prizewinner at horticultural shows and we may count ourselves fortunate to have had the benefit of his skill and advice.

Our regrets and sympathy were expressed in the form of flowers and a gift and we were represented at the funeral by the Deputy Director and a number of the staff. We at Ditton Park remain Tom's debtors - the roses still bloom.

G.G.

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STAFF NEWS

Congratulations to:

Mr. & Mrs. B. R. May on the birth of their son, Philip Jonathan,  
on the 24th August.

Mr. A. J. Hall, now S.E.O.

Mr. D. R. Madden, now A.M.I.E.R.E.

Welcome to:

Mr. R. H. Slater	S.O.
Mr. R. A. McKenzie	T/C.O.
Mr. J. H. Scott	Sandwich Course Student
Mrs. D. E. Louch	T/Typist (I)
Mrs. E. Brown	T/Cleaner

Resignations:

Mr. M. O. Tyler	T/S.A.
Mr. D. G. Gray	T/A.E.O.
Mr. C. W. Chapman	T/Labourer

LETTER TO THE EDITOR

Dear Mr. Editor,

While I am always pleased to read the R.S.R.S. Newsletter, the last two issues (62 & 63) have been of more than usual interest to me.

The article on the Leclanche cell has made me realise how "time marches on". As you suggest, many of the present staff will never have heard of Leclanche and Daniell cells; yet in my earlier days these were a very convenient source of small electrical power. Even later, when I joined the staff of the N.P.L. we used hundreds of Leclanche cells - pint size - as the anode current supply for early work on thermionic valves.

The article on the "Total Eclipse" seen in Greece reminded me of the experience of Lane, Meadows and myself in acting as "professors" at a NATO summer school at Lagonissi, near Athens, a few years ago. The sun and the swimming were very good, but I share your contributors views on mixing lobster with retsina or ouzo. I never acquired the "taste like lemonade" which is mentioned, but I appreciate exactly the "slightly queasy" feeling.

I note from issue No. 63 that quite a party of you have been to Wallops Island; but under different conditions apparently from the pioneering days of - how many years ago?

Anyway, thank you Mr. Editor for two very interesting issues of the News.

R. L. Smith-Rose

SPORTS AND SOCIAL CLUB

CONCERTS

The new season of Industrial Concerts, given by the Royal Philharmonic Orchestra at the Albert Hall, begins on October 21st. As all seats are 6/6 (3/- for under 18's), these concerts are quite popular. Watch the notice board for details and sign early to ensure a ticket.

In addition to the Industrial Concerts the Sports Club also has four books of 5/- vouchers for the current period at the Royal Festival Hall. Each 5/- voucher is exchangeable for one ticket of not less than 10/- in value for one of the concerts listed. As the number of seats allocated to vouchers for any one concert is limited several choices must be given. It is not always the people who sign first who get the tickets. Again watch the notice board for details.

Veronica Lovell

BADMINTON

The Badminton season starts on Thursday 29th September. Meetings are held each Thursday throughout the Winter months in the Austin Leigh and Baldwin Institute in Eton from 7.00 p.m. until 10.30 p.m. There is a charge of 3/6 per head per week to cover the cost of shuttles and of hiring the hall (and the cup of tea brewed in the middle of the evening). Racquets may be hired at 6d. per person per evening. New members are welcome. For further information please contact Malcolm Chivers or myself.

Veronica Lovell

RETURNS AT THE A.C.O.

Following on the visit of A.C.O. teams here last month, R.S.R.S. were represented in cricket, bowls, tennis, darts and table tennis at a joint sports and social evening at the A.C.O. on 7th September. Though the cricket match was lost in terms of runs scored over 15 overs, the R.S.R.S. batting averages were more than double those of the A.C.O. At bowls we met rather stiff opposition from the A.C.O. team which included county players, but our tennis team triumphed without losing a set.

Once the outdoor games were completed all made for the bar and refreshments. In impromptu matches R.S.R.S. lost at darts, but won at table tennis, though by this stage the social aspect of the evening had dominated and scores were unimportant. The 50 people present enjoyed their evening, and this seems likely to remain a popular annual event.

It is hoped that a joint dance can be arranged with the A.C.O. this autumn. The last one here was some two years ago, and, though not well supported from R.S.R.S. the A.C.O. members filled the dance floor, and all had a very lively evening.

Martin Hall.

BRIDGE CLUB

The Bridge season is on us again; we shall be holding club evenings every few weeks when we hope to see new faces as well as the familiar ones. Don't be put off if you have not played much, or at all; if you think you would like to play Bridge please just sign the list which will be appearing on the corridor notice board and come along. It would be a help if these who have not played before would get in touch with me before the club evening, to arrange initiation into some of the mysteries of the game.

As during the last two winters we shall be taking part in the National Physical Laboratory teams-of-four competition, which will mean two pairs playing at N.P.L. every few weeks. There will be matches against other establishments and next spring we have to hold the tournament for the ex-D.S.I.R. cup, at present on display in the canteen.

Jean Fooks

TENNIS

Our return men's doubles match against Old Windsorians at Windsor on Saturday 20th August provided plenty of excitement with our opponents clinching victory by five matches to four after a closely fought struggle.

R. W. Smith

LETTER TO THE OUTSTATIONS

Dear Colleagues,

You will have seen elsewhere of Tom Buckland's death; he had something of the single-mindedness of the artist where gardens were concerned. It is a pity that the most famous Tom story, that of his anglo-saxon reproof to a V.I.P. who plucked a rose, cannot be faithfully rendered in print; it is worth getting someone to tell you if you don't know it. One cannot help feeling that, if there are coaxial cables in the Elysian Fields, Mercury had better look sharp and keep 'em tidy.

A week or so back, not far from D Spur, cattle were seen to be acting in a very disturbed manner with reference to a point source. This proved, on a closer inspection, to be a hedgehog not rolled up into a ball. After a certain amount of sniffing and bellowing the cows retreated in disorder when it made a leisurely move. Is there something in the old tale of hedgehogs stealing milk? Had the cattle previous encounters with sharp quills, or was it that it was a new thing and therefore to be feared. We all feel this on occasion, even

Yours sincerely,

The Editor

WE HEAR THAT .....

"A certain group at R.S.R.S. has bought extra large size insulators for their outdoor aerial because they are afraid they will shrink in the rain".