

RRS

Newsletter

(For the Use of R.R.S. Staff Only)

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ROYAL SOCIETY SOIREE

The R.R.S. contributed a display on topside sounder work to the Royal Society's annual *Conversazione* at Burlington House on the 16th May. This display was one of twenty-seven exhibits selected to illustrate scientific work in progress at various Universities, Government Establishments, Research Laboratories and Hospitals throughout the country.

Other D.S.I.R. Establishments represented included the Road Research Laboratory, who presented work on the problem of road area required by traffic in towns and its relation to various road systems. The National Physical Laboratory showed a method of obtaining infra-red spectra by replacing the usual prism or grating with an interferometer and using a high speed digital computer to produce the spectrum from the 'interferogram'. Other items of topical interest, such as a study of the effect of toxic chemicals on wild life and a demonstration of a gallium arsenide laser, show the diverse nature of the field covered by the Soirée. There was an interesting display of C.T.R. Wilson's cloud chamber and some of his notebooks and records. Mrs. Wilson has recently presented all C.T.R.'s notebooks to the Royal Society.

The R.R.S. exhibit was made by headquarters and consisted of four display cabinets describing the topside sounder experiment on the satellite *Alouette*, emphasis being laid on the field-aligned strata of ionization found in the topside of the ionosphere and the equatorial geomagnetic anomaly. It was hoped that comment would be evoked, indeed the various guests asked many searching questions of the demonstrators, but a totally unexpected comment came when Sir Lawrence Bragg, at the press preview, described topside sounding of the ionosphere as 'rather fun'!

P.A. Smith.

ANOTHER ROCKET SUCCESS

Skylark 127 was successfully fired from Woomera to a height of 207 km. on 29th May at 1405. Preliminary reports indicate that both R.R.S. experiments, one to measure D region electron density - the other to measure E region electron temperature, functioned satisfactorily. The firing of Skylark 126 the twin of 127, is being delayed because of mechanical trouble with the launcher. Further details will be given in next month's magazine.

R.W. Smith.

A CRYSTAL SET AND THE IONOSPHERE

God, it was once said, is on the side of the big battalions. This may or may not be true, but it is certainly a fact that in recent years scientific success has, in general, allied itself in this fashion. It is refreshing, therefore to look back not so very far, to a time when elementary apparatus, and hard thinking, produced results of great interest.

The writer recently came across a paper by Eccles¹ in Proc. Roy. Soc. for 1912 in which he arrived at useful hypotheses concerning the nature of the ionosphere, at a time when its existence was by no means taken for granted. The concept of a conducting shell surrounding the earth can be traced, in germinal form at least, to the mid-eighteenth century, when such workers as Eberhard, Frisi and Mairan sought to explain auroral phenomena in terms of electric currents in the rarefied upper atmosphere.

In the next fifty years or so the idea must have been fairly current, for Gauss, seeking an explanation for some terrestrial magnetic phenomena is at pains to discount 'baseless fancies': but makes a point of considering the flow of electricity in the upper atmosphere to be a possibility. Kelvin, characteristically, had calculated the layer height to be about 100 miles. This was in 1860, so that by the time Balfour Stewart, Fitzgerald, Kennelly and Heaviside had developed the hypothesis throughout the latter half of the nineteenth century, it was not the new-fangled flight of theoretical fancy which many reputable workers proclaimed it to be.

Eccles during the years 1909-1911 made many observations on the rate of occurrence of atmospherics, 'strays' in the language of the day, using the simplest of apparatus. This was a crystal receiver, inductively coupled to an aerial system of twelve wires, 170 ft. long and sloping at an angle of 45°. The frequency used was 50 kc/s and reception was by headphones, the number of crashes or clicks in a given time being noted.

Observations made during this period showed a minimum or null in the rate of occurrence of strays generally ten minutes before local sunrise, and ten minutes after local sunset. The effects of local storms were noted and, as far as possible eliminated from the results. The observations were made at various sites, over twenty degrees of longitude to show that the effect was certainly related to local sunrise.

/Consideration

Consideration was then given to contemporary theories of solar effects on propagation, particularly those of ionization near the aerial system, and changes in soil conductivity. These were both rejected on the ground that they would affect short range signals, which was known not to be the case. Minima at twilight were more easily observed on 50 kc/s than on 300 kc/s, an observation which the author related to the known fact that a frequency of 50 kc/s was more suitable to long distance communication, and inferred that the null effect is closely related to the propagation of waves round the earth. Eccles then examined Poincaré's work on the limits of diffraction of radio waves, and the investigations of Zenneck. Heaviside's hypothesis was found to give the most satisfactory explanation, when modified by the author. The paper may best speak for itself at this point.

[Heaviside] 'suggested that the attenuated gases of the upper atmosphere might provide a conducting surface concentric with the earth This hypothesis has not yet been supported or denied by any trustworthy experiments or observations ... this upper conducting layer might supply the explanation of the phenomenon [of minima at twilight] and thereby gain some support. On examination, however, it appears that the phenomenon cannot be explained by means of the bare hypothesis, and still less can the other recorded facts of long distance transmission be explained. The writer has therefore investigated another closely related possibility

[Here follows an examination of the velocity of electromagnetic waves in an ionized medium, and of the absorption losses related to frequency.]

'The very rapid rate of recombination of ions when the ionizing agent is removed, points to the possibility of the middle atmosphere being perfectly free from ions during darkness

'If we suppose, however, that the ions do, for the most part, recombine, the effect of the change from day to night is to remove a veil, as it were, of ionized air from between the upper conducting layer and the earth'

'The regions in which change from a day level to a night level takes place form a great circular band round the globe, and inclined to the meridians at an angle depending on the season. This region of the atmosphere since it is perpetually moving with the sun, will be in a highly disturbed electrical condition Hence it may be expected that the regularity of propagation through the steadily ionized horizontal strata of the daytime will be greatly disturbed by the twilight transitional banks and patches [of ionization] with the ultimate consequence

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that the sounds heard in the receiving apparatus will be greatly weakened.'

'During the day the electric waves travel in the relatively narrow shell of dielectric between some stratum in the middle atmosphere and the surface of the earth. At night they travel in the much wider shell of dielectric between the assumed high conducting layer and the earth. In England, in winter, day strays are much weaker than night strays. From this we might conclude either that the aggregate absorption in the thin shell of dielectric is greater than in the deeper night shell, or that the ionization of the middle atmosphere during the day is sufficiently non-uniform to hinder the propagation of the waves'.

Eccles then considers the impulsive nature of an atmospheric, and the consequences of propagation in a dispersive medium.

'The two assumptions on which discussion has so far been built are, first, that there exists in the atmosphere a permanently conducting upper layer which is somewhat sharply defined, and which therefore reflects waves of every frequency - we may call it Heaviside's reflecting layer; and second, that in the day (and only to a slight and erratic extent in the night) the atmosphere below this layer is ionized in nearly horizontal strata, the ionization diminishing as the earth's surface is approached.'

Here then, deduced from results provided by a few pieces of apparatus is a hypothetical structure and behaviour pattern for the ionosphere which is well in advance of its time. It is not without interest also that it was specified that the sources of the 'natural wave trains' were assumed to be terrestrial; of course this was necessary to Eccles' hypothesis, but it serves as a reminder that as far back as 1894 Lodge sought for 'long wave radiation from the sun, filtering out the ordinary well-known waves by a black-board or other sufficiently opaque substance'.

Poverty of apparatus (to modify Johnson's comment on the prospect of being hanged) stimulates the mind wonderfully. Other than in this sense, however, there is no virtue in string and sealing wax for its own sake. In its heyday it was an outward and visible sign of a sphere of knowledge expanding too rapidly for the employment of conventional devices. As such it is still to be welcomed; the use of a flying column living off the land, may well make the advance easier for the consolidating forces.

G.W. Gardiner

Horatian Ode Upon the Loss of Books from the Library
(with apologies to Marvell for the loan of his title)

Trees made to pulp and moulded, pressed
To knowledge, greatly loved and blessed,
The thirst of men to kill,
The hungry mind to fill.

Archimedes renowned by word
A sighted lord, no longer heard -
Pythagoras passed by,
His magic lingers nigh,

It lingers nigh indeed, with all
That unsigned bound and unbound haul
Of literature, sad lost
Among the genius host.

Come back! ye treasures of the soul,
Or have ye found some wanting goal,
Some brain wherein to root,
To blossom forth and fruit.

If so, then stay, but prithee tell
Just where ye rest, with whom ye dwell.
That so, perchance, another
May likewise truth discover.

S. Naylor.

ABSTRACTS AND REFERENCES

We regret that the name of the author, Mr. H.H.V. Owen, was omitted from this contribution last month

STAFF NEWS

Congratulations to:

Mr. D.G. Rees and Miss G.M. Cook who were married at Malvern on 11th May.
Mr. A.D. Johnstone and Miss J.M. Trumper on their engagement.
Mr. J.D.E. Beynon and Miss H.J. Hurley on their engagement.
Mr. D.M. Willis and Miss M.E.A. Barrell on their engagement.
Mr. and Mrs. P.P. Reader on the birth of a son, Mark Philip, on 23rd May.
Dr. J.W. King on his promotion from S.S.O. to P.S.O.
Mr. P.A. Bradley on his promotion from S.O. to S.S.O.
Mr. J.N. Tyler on his promotion from A.E.O. to E.O.
Mr. A.J. Rogers on his promotion from A.E.O. to E.O.
Mrs. Q.M. Sams on her promotion to T/Typist I.

/Welcome

Welcome to:

New Staff

Mr. D.J.F. Baxter	T/Specialist Teleprinter Operator
Mr. M.T. Narayanan	Labourer (Grade V(c)), Singapore.
Mr. S.S. Tan	Technical Assistant, Singapore.
Mr. S.K. Wee	Technical Assistant, Singapore.

Resignations

Mrs. A.R. Lowe	T/Clerical Officer (Sec.)
Miss G.B.M. Tucker	T/Photoprinter II.
Mr. R.W. Appleton	T/S.O.
Mr. T. Buckland	Labourer (Semi-skilled) (Retired)
Mr. C. Leaning	T/Instrument Maker.
Mr. J.H. Spencer	T/Labourer Messenger
Mr. N.B. Masood	Labourer (Grade V) Singapore.

Overseas Transfers

The following members of staff are leaving during June or July on an overseas period of duty.

Mr. R.G. Flavell	leaves on 5th June for Lerwick.
Mr. F. Kift	" " 6th June " Singapore
Mr. G. Douglas	" " 11th July " "
Mr. D.G. Rees	" " 11th July " "
Mr. J.B. Jones	" " 19th July " "
Mr. P.L. Ooi	" " 19th July " "

SPORTS AND SOCIAL CLUB NEWS

Presentation of the Smith-Rose Challenge Cup 1962-63

While on a visit to R.R.S. on Monday 10th June, Dr. Smith-Rose kindly agreed at short notice to present the Smith-Rose Cup to the winning team of the first year of the competition. At the presentation in the canteen, Dr. Dickinson received the cup on behalf of the 'North' team.

M. Williams.

The MIDSUMMER DANCE

will be held on June 22nd
in the canteen
at 8.00 p.m.

The band is that of Dereck Dawson

- you may remember his band played at the Christmas Dance.

I do hope YOU will be able to come,
if you have not yet bought your tickets (price 5/- each), you can obtain them from any member of the committee, or from John Cathrew at Winkfield.

M.J. Horwill.

Camera Club

At the Camera Club A.G.M. held on 22nd May 1963, the following officers were elected:

Chairman	Mr. S.J. Baker (Workshop)
Hon. Sec.	Mr. J.N. Tyler (Spur B)
Hon. Treasurer	Dr. P.H.G. Dickinson (Spur D).

At this meeting provisional arrangements were made to hold photographic outings and monthly exhibitions of members work. Will any staff interested in photography and not already Camera Club members please contact one of the officers listed above.

A party of members and their friends paid a very successful visit to Southampton Docks on 9th June - one of the finest days of the summer so far. The outing included a visit to the Ocean Terminal and the two dry docks and a launch trip round the harbour visiting both Old and New Docks.

Amongst future outings it is hoped to include a short river trip and visits to London Airport and Oxford.

J.N. Tyler.

Bridge

The Bridge Club played a match against an N.P.L. team on Friday 10th May at the R.R.S., and won by the convincing margin of 5,660 aggregate points. The members of the winning team were:-

Drs. Bramley and Harwood.
Messrs. Garner and Owen.
Mr. and Mrs. Gordon-Smith and
Messrs. Nicolson and Venables.

W.C. Bain

Tennis

Our mixed doubles matches against Road Research, at Harmondsworth, are now an annual feature and are always most enjoyable. The match on June 8th, played in near-tropical weather, proved no exception and a well-fought struggle, not resolved until the final match, ended in victory for us by 5½ to 3½. No.1. pair, Mr. and Mrs. Gordon-Smith were, as usual, in devastating form to win all three matches: Richard Smith and Margaret Williams, very good at times - shocking now and then, won two: Gordon Barnett and Margaret Peart, not yet at their peak, drew one match. A return match has been arranged for early September when, no doubt, our friends at Road Research will try to repeat their victory of last season.

R.W. Smith.

Amateur Radio Society

The society at present is almost dormant, its most active member having recently departed to the Shetland Islands. G3LTP (Ray Flavell) was largely responsible for obtaining the society's call sign G3RRS. Although this call

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sign has not yet been heard on the air, we hope that it will not be too long before CQ's are radiating. Ray hopes to be working on 2m band as well as running an S.S.B. rig on the h.f. bands. We wish him 73's at his new QTH.

D.G. Thorpe

LETTER TO THE OUTSTATIONS

Dear Colleagues

The month's weather has, so far, made some amends for winter's trials, at least for those of us enjoying the sunshine at R.R.S. However, Winkfield has found that it is possible to have too much summer sunshine. There, among the racks of warm equipment, their highest room temperature to date was well over 95°F, and the mid-eighties seem to have been a common experience.

As you will see from the staff movements list, four members of the Station have recently left. Tom Buckland who first came to Ditton Park in 1942 has done much to beautify our surroundings. He has also spoken for the good of our souls from time to time; reminding us in terse and lucid phrases of the proper place of physics in the harmony of nature.

Avis Lowe's pleasant and efficient manner has smoothed out many difficulties which have confronted Directors and staff throughout the last eight years. She is sure to find these qualities as valuable as ever in the role she is soon to undertake.

Gillian Tucker also has left R.R.S. to work for an industrial firm, and we shall miss her help with social activities. Certainly our advertising posters will now proclaim their message less skilfully.

Bob Appleton, who joined in 1961 was instrumental in the growth of the Amateur Radio Society, and an active participant in its work, only recently resigning from chairmanship.

To all these people we have extended on your behalf, as well as our own, the very best wishes for the future. No doubt we shall hear of their doings from time to time.

Yours sincerely,

The Editor
