

R S R
S

NEWSLETTER

No. 91

November, 1968

Winds of Change

The research programme of R.S.R.S. is under continual review, but an especially intensive examination has been made in recent months, particularly in the light of the S.R.C. policy as stated in its latest Annual Report to devote an increased proportion of its effort (at least in the short term) to topics which are expected to have practical and economic benefits. It has been decided that one of the most promising fields of research meeting this criterion, is that involving the development of millimetre-wave techniques, and the understanding of the propagation mechanisms, with potential application to commercial communications. For the next two or three years, therefore, emphasis is being given to this work, and several possible projects have been discussed with the Post Office. New work which is being undertaken as a joint project with them involves the measurement of the effects of rain on short communication links at millimetre wavelengths. A proper understanding of the phenomena will be an important step towards the efficient use of this part of the spectrum for practical purposes, a use which is required to accommodate the ever-increasing demands for frequency allocations.

Useful practical information on millimetre-wave propagation is also expected to emerge from the programme of the solar physics observatory, and a study of the records will be made with this end in view.

Another way in which we aim to help communications is by studying ways of applying the considerable quantity of new ionospheric data which have been collected in the last few years. This work is proceeding well and it is interesting to note that efforts to apply the data to communications have already resulted in the uncovering of new scientific facts about the ionosphere.

/Now

Now that the Chilbolton aerial is back in commission the research which had been planned, much of which is applicable to both terrestrial and space communications, can proceed and will be in line with the general philosophy which is being followed.

In present circumstances, the additional effort to carry out this programme must be at the expense of other projects. Some activities have already been stopped during the past year, to concentrate our effort, and others, such as the preparation of the ESRO I payload, are naturally coming to an end. In addition, we are not accepting the ESRO invitation to have the TD 2 particle experiment reconsidered for another vehicle, and the development of the programme of magnetic field measurements, using rockets, is being stopped and cannot be resumed in the foreseeable future. On the other hand, we intend to continue a vigorous programme of space research and the changes will include some expansion of the rocket measurements of electron densities and ionising agents in the D-region, a programme which is well-integrated with our theoretical and other experimental work on the D-region.

These changes are occurring at a time when some reorganisation is necessary in any case, owing to the retirement of Mr. Wilkins, the appointment of Professor F. G. Smith as part-time Deputy Director, and of Dr. Horner as Assistant Director (Admin.). This reorganisation should not be confused with the re-orientation of the programme, but their coincidence is opportune. The expanded work on millimetre waves is closely related to the existing work on radio-meteorology and together, these will form the major part of the Division which will be led by Mr. Lane. The Solar Physics group will also form part of this Division. Various individual staff changes will take place over the next few months to conform to the changing pattern of research.

J. A. SAXTON

Sorting Day at Atlas

Sorting is such a trivial operation that it comes as a shock to discover that whole books have been written on the subject and that it has its own jargon like Bubble-sort, Radix-sort and Merge-sort. But sorting is also a very valuable operation. If you doubt this, try playing your next hand of cards without sorting them first. When, instead of eleven cards one has half a million data records, each 160 characters long, the rewards to be gained by sorting are overwhelming. Just to save you working it out, if the volume of data just specified were printed by a line-printer using every available character position for information, the data would fit nicely onto 13334 pages. It would be unreadable of course, to spread it out properly one would need 20,000 sheets which would take nearly 17 hours to print.

This volume of data is the amount that has accumulated on the magnetic tapes holding the Low Speed data sent back by the UK3 satellite since it was launched in May 1967. This satellite is orbiting the earth at a height of between 500 and 600 km. Data such as electron density, electron temperature, and noise measurements at 5, 10 and 15 MHz., are tape recorded in the satellite and replayed to earth on command. Each time a ground station interrogates the satellite the tape inside is replayed and the contents recorded at the ground station producing what is known as a file. This is the origin of the sorting problem. The data leaving the satellite is immaculately sorted but it then finds itself distributed all over the world as files. These files are sent to R.S.R.S. for digitisation, but they do not arrive here in order; far from it. Files from Winkfield have a habit of arriving before files from Falkland Islands. When a suitable batch of files has arrived they are digitised, producing a tape called a Buffer Tape. This is sent to Aldermaston where, after further processing, another tape, called a Stage Tape, appears. The Stage Tape travels to the Atlas Computer Laboratory where, after more processing, five Bridge Tapes appear, one for each experimenter. Got it?

It was the R.S.R.S. Bridge Tapes that we wanted to sort.

The first reaction from Atlas was: "can't be done". However they agreed to let us try. We quickly ran into difficulties, for the data has some hidden weapons with which to confound the simple-minded programmer, for instance who would have thought that the file for day 123, hour 00 should be placed after the file for day 123, hour 23? What physicist would have anticipated an

/electron

electron density of $-1.23E + 02$? But ~~the~~ most serious difficulty was the fact that the sorting operation placed such heavy demands on the magnetic tape decks that tape errors were occurring with alarming frequency and threatened to jeopardize the entire project, in fact it soon became clear that the operation just was not practicable using magnetic tape. The saviour turned out to be the new fixed-disc store that has recently been installed at Atlas. This offered us about 24,000 blocks of fast access store (that is 750 times as large as our 1905's core store) which meant that we could sort the data to the discs and, when this was finished, transfer the data from the discs to magnetic tapes. As we had only 24,000 blocks to play with we were forced to divide the job into two sections and sort the first six months data in the first run, and the remaining data in the second.

The whole job was done in one eight hour session on Sunday 6th October. Mr. Piggott and I drove up to Chilbolton on a bright sunny morning and by about 2 p.m. the job was underway. Until 10 p.m. that night we virtually monopolised the entire computing facilities of the Atlas system, but at the end of it we had 10 magnetic tapes containing 2,800 files all sorted into strict order, and a set of listings which indexed all the files stored and provided much valuable information such as the exact location of each file on the tapes, the times covered by the files, and the amount of data coverage for each of the 280 days for which data was recorded.

These Sorted Bridge Tapes, as we call them, are a very valuable repository of data and we have been very careful to make them battle-worthy. The first action after Sorting Day was to make a copy of each tape. We shall use only the copies for routine processing work; the originals are sacred. On each tape, one months data is stored in watertight bulkheads of 122 blocks. Each 122 blocks contains all the data for a single day. The first two of these blocks hold a "Day-Index" which enables the data to be addressed in strict order. Each file is stored in an integral number of blocks with no overlapping of one file into another's blocks. To read a specific file, a search is made for the block containing the appropriate Day-Index. This is then read and the storage location of the file identified. The file is then searched for and read.

The Sorting Day itself went off remarkably smoothly. After the frustrations of the development period, it was extraordinary how eight hours of program running went by almost without incident. It was simply a question of preparing the next card deck while the current one was running and stacking up the line-printer output in order. After the event Mr. Piggott and I retired to a cafe

/in Didcot

in Didcot to celebrate and enjoyed a meal of sausages and eggs with a depth that is only granted to those who have worked for eight hours without a break. Back at Atlas the staff (who were all most efficient and helpful to us during the whole day and during the long weeks of program development) were busy reinstating the precious software and private files they had, with some nervousness, taken off the discs so that we could have our Sorting Day.

The Day was an immense success. We can now produce, say, electron density maps for one day in just one minute of real time on Atlas, whereas before it would have been a week's work. The significance of our Sorting Day at Atlas is that before S.D. we were at the mercy of our data, after S.D. the data was at the mercy of us.

M. D. LAWDEN

Station News

On December 3rd it is hoped that about 60 visitors will come to R.S.R.S. to take part in a Symposium. The purpose will be to discuss present and future developments in high frequency communication, particularly from the point of view of ionospheric propagation.

Dr. Hall and some members of his group are at present at S. Uist preparing to launch D-region experiments in two Petrel rockets. Each of these will carry five experiments. Electron density will be determined from Faraday rotation and differential absorption of radio waves transmitted from the ground at 2.4, 3.8 and 7.2 MHz, and also by a Langmuir probe. The Solar X-ray spectrum will be measured in the range 2 to 10 Å using a proportional counter made at Leicester University, and instrumented at R.S.R.S. The intensity of Solar Lyman α (1216 Å) will also be observed. The payloads will include sensors to determine the attitude of the rocket relative to the direction of the sun.

Staff News

Congratulations to :

Mrs. I. M. Wells	Now Superintendent of Typists
Mr. A. B. Lowe	Now E.O. (non-perm.)

/Welcome to :

Welcome to :

P. M. Gondhalekar	S.O. (perm.)
W. M. Lawton	S.O. (perm.)
Mrs. D. M. Bellchambers	S.A. (non-perm.)
M. E. Cleverley	S.O. (perm.)
J. Smith	E.O. (perm.)

Resignations

W. M. Lawton	Sandwich Course Student (Course completed)
K. K. Tan	Tech. Officer (resigned from R.S.R.S. Singapore)
Mrs. F. V. Stanley	Canteen Assistant (part-time) resigned

Other Changes

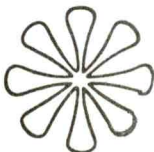
A. J. G. Moorat	S.E.O. Returned to duty at R.S.R.S. after 3 year tour in Singapore
V. J. G. Brown	E.O. Returned to duty at R.S.R.S. from Falkland Islands
M. R. Bowman	S.S.O. Transferred from Div. IV to Div. III
C. R. Carter	E.O. Transferred from Div. II to Div. I



CHRISTMAS DANCE



The festive season is very nearly here and our first big landmark will be the Christmas Dance, this year more festive than ever, with music by the Terry Silver Quartet, a buffet table and, of course, a bar. As usual the canteen will be miraculously transformed for the occasion. All this will be yours for the modest outlay of 7s. 6d. per person, so please come and make the evening a great success.

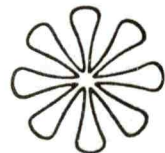


THE DATE?

SATURDAY DECEMBER 14th

THE TIME?

8 p.m. - 11.45 p.m.



/Sports &

Sports and Social Club News

Guy Fawkes Celebration

The "wooding" patrol made an early start this year and their efforts were amply rewarded by the magnificent bonfire that resulted. Truth to tell they were almost the same patrol as last year and it would be nice to see some new helpers.

We were lucky to have a fine clear night on the 5th and our team of driver-escorts conveyed our young guests to the scene which was all set in readiness.

When the flaming, oil soaked torch was touched to the massive mound of tree trunks and debris we were treated to a truly gigantic illumination, for that fire really burned well! Our little party, strategically placed at the nearest point to the bonfire, frequently had to move back in order to escape the heat. I heard many comments that this year's effort was the best for some time. The fireworks were started as soon as those responsible for safety were content that the bonfire was safe.

The display was very well done and much appreciated by the audience. My personal preference is for the "bangers" and "screechers" and in this respect I must confess I preferred last years assortment. The memory that sticks in my mind from last year was the "parachute" bangers, so enjoyed by all the boys whatever their ages, for the fun of chasing after them to retrieve the parachutes. The igniting of the last set piece which said a technicoloured "Good Night" was the signal for the happy stampede to the Green Elephant Shed where once again we were treated to a very welcome Sausage-in-roll and coffee or minerals. I am sure this event is as eagerly looked forward to as the fireworks.

May I convey to Veronica Lovell and Paul Dickinson the sincere thanks of all the children and grown ups present that night. Well done!

K. SHAND

General Thanksgiving

We would like to thank all those people without whose help the bonfire would not have been possible - Jack and Ivor; the garage staff; the telephonists; the canteen staff who gave up their free time to peel and chop (not without tears) 14 lbs. of onions; those who helped prepare food, those who served it and those who cleared up the mess; those who made the guy and those who provided its clothes; those who provided the posters; those who helped with the wooding and bonfire building; those who provided the 30 gallons of engine oil to set the bonfire alight; those who drove round Slough collecting and delivering nearly 70 visitors from local homes; and last but not least those who gave donations of money towards footing the extra bill.

VERONICA LOVELL
PAUL DICKINSON

Bridge Club

Three bridge evenings have been held to date this season, and attended by 12 or 14 players. New players will always be welcome at either evening or lunch-time bridge sessions - the latter in Spur E. Notice of bridge evenings is always given on the S.S.C. notice board a week in advance. As a change the next evening will probably be held at 7 p.m. rather than at 5.30 p.m. to satisfy those players unable to make the latter.

ROBERT PRATT

Camera Club

I should like to arrange a lunchtime showing of St. Albans and Shuttleworth colour slides. (A few extra slides of related subjects, not necessarily taken that day, could be included.) If you could contribute, please would you let me know as soon as possible? Please tell me of any days of the week you could not manage.

Black-and-white prints can be shown in the exhibition we will have in January or February 1969.

HENRY RISHBETH

Letter to the Editor

Sir,

I should be grateful if you would find space to publish this in your next edition. It is addressed to all of my ex-colleagues at the Station, whom I wish to thank very sincerely for their generous contributions to the tape recorder given to me as a retiring present, and recently very kindly delivered to me by Dr. Hopkins on his way to a holiday in Cornwall.

I am extremely grateful for and very pleased with the recorder; I am sure it will give me many hours of pleasure in the future.

To you, Sir, I would say I am glad to receive the "Newsletter" each month, particularly to read any news of the staff. Also I thank you for your kind remarks about me in your "Letter to the Outstations" in the September issue. The "gentleman of leisure" part was rather far-fetched perhaps, however I am very much enjoying my retirement.

Once again my thanks to all of you and my best wishes for your future. If any of you are ever around this way you are invited to call on

Yours sincerely,

C. W. Spencer

'Beechdene'
Hillside Road,
Sidmouth, Devon

Letter to the Outstations

Dear Colleagues,

November; fog, frost, and fireworks; he's going to go on about Guy Fawkes, you may think. Well, by way of a change, I won't. That decision narrows the field a bit; nevertheless there must be a few scraps of parish news. Come to think of it, parochial is the right word, for Datchet parish, suffering not so much a sea change as sewage change, is being main drained. The approaches to the village are filled with great pipes and greater machines for moving them, and those of us coming from the East know not, from day to day, where next the forces of progress will throw up the barricades. As a sort of amateur industrial archeologist I feel duty bound to salute - at a safe distance - the passing of those jolly green council wagons with the jolly green odour; but one is not, repeat not, required for the museum.

Moving slightly nearer to Ditton Park, to the main gate in fact, I have to report that one of the supporters of the armorial bearings has vanished. The lion rampant or, with shameful neglect of duty, has left the unicorn to carry on, as best it can, supporting the whole weight of harps and animals passant on a ground sable, or some such jazz. The omens are obvious; in the age of the permissive society the shy unicorn remains with us still; that unicorn which, the learned say, is tame and obedient only in the presence of virgins - well well, fancy that now. Yet, 'the unicorn is a mythical beast' recollects,

Yours sincerely,

The Editor

List of Reprints

- E. M. Bramley
Correlation of signal fluctuations at two frequencies
in propagation through an irregular medium
Proc. I.E.E. Oct. 1968 Vol. 115 No. 10
- H. Kohl, J. W. King
& D. Eccles
Some effects of neutral air winds in the ionospheric
F-layer
J.A.T.P. 1968 Vol. 30 pp. 1733-1744
- I. L. Freeston
Measurements of the radio frequency admittance of a
plane grid capacitor in a plasma
J. Plasma Physics 1968 Vol. 2 part 3 pp. 329-337
- R. Buckley
Radio frequency properties of a plane grid capacitor
immersed in a hot collision-free plasma
J. Plasma Physics 1968 Vol. 2 part 3 pp. 339-351

Internal Memoranda - nil