

THE DIRECTOR'S FOREWORD

It has been decided that the R.R.S. Newsletter should be re-started for the purpose of keeping all members fully informed about the affairs of their station, and Mr. Kift has undertaken to act as editor. In re-starting this Newsletter we have had the outstations very much in mind, and we hope that these letters, which will be produced at monthly intervals, will be of especial use to them and will keep them in touch with what is being done back at home.

It will be our aim to give an account of station policy, matters of scientific or technical interest, matters concerning the social and sports activities, and any matters of a personal nature which would interest the staff as a whole.

In this first number I would mention, in outline, some of the policy matters which have arisen since I came here on October 1. The most important has been the decision to equip us with a radio telescope having a parabolic mirror of 85 ft diameter capable of being traversed so rapidly that it can follow an earth satellite. This will be erected about twelve miles away at an outstation to be known as the "Camberley" outstation named after the nearest town. The estimated cost of the telescope and the associated site and buildings is £250,000. Although the most important use of the telescope will be to receive telemetry from earth satellites transmitting on ultra high frequencies, it will be useful for several other lines of work. In preparation for work with the telescope a small group has been formed to start work on low-noise amplifiers.

It is part of our policy to make experiments with the help of rockets and artificial satellites. An experiment is being performed, in collaboration with the University of Sheffield, in which a receiver is to be carried in a rocket to a height of about 120 km near a transmitter working on a frequency of about 200 kc/s. The rocket will explore the radio-wave pattern which this sets up in the ionosphere and from the nature of this pattern deductions will be made about the electron distribution in the ionosphere.

The old "transistor" group is engaged in making the light-weight receivers for the rocket. The design of the rocket aerial is being done by the Sheffield group. R.R.S. is providing the ground-based transmitter at the rocket range at Woomera, in Australia, where the experiment will be carried out. The results of the experiment will be recorded by telemetry in Australia and sent to R.R.S. for analysis.

A small group which we have called the "rocket and satellite panel" has met frequently to discuss what other experiments the station should try to do in rockets and satellites, and as a result of their deliberations we have recently proposed two more rocket experiments and two experiments to be made in one of the "Scout" series of satellites made available by the U.S.A.

Radio Research Station is to collaborate with the Americans and Canadians in two experiments in which "topside sounders" are carried in artificial satellites. These sounders will be similar to the ionosphere sounders in use on the ground, but they will explore the upper part of the ionosphere, above the peak of the F-region, by sending pulses downwards to be reflected upwards by the ionosphere back to the sounder. A "command" transmitter will be used to switch the apparatus on as it passes over Slough, Singapore, and Port Stanley, and telemetry will be used to record the results of the inverted soundings on magnetic tape at these three places. Apparatus is being prepared for extracting the information from these tapes.

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The Minitrack station at Winkfield is now fully operational. It is provided, on indefinite loan, by the National Aeronautics and Space Administration (N.A.S.A.) of the U.S.A. and it is part of a worldwide system set up for tracking artificial satellites and for receiving the telemetry from them. R.R.S. is responsible for running it. Up to the present time there have been no satellites using the frequency (136-137 Mc/s) for which the station is constructed, but some are expected soon and then we shall man the site on a 24-hour basis. Up to now the main activity has been the recording of telemetry on a frequency of 108 Mc/s from the "Explorer VIII" satellite which is concerned with measuring densities of ionisation in the ionosphere and obtaining information on the incidence of micro-meteorites.

We are to use the large American radar at Hillhead, near Aberdeen, in an experiment in which a powerful beam of radiation will be sent upwards on a frequency (400 Mc/s) so great that it will penetrate the ionosphere. As the beam traverses the ionosphere each electron will scatter a small amount of power back to the ground, and by measuring the total power received the number of electrons in a known volume of the ionosphere will be deduced. This "incoherent scatter" method of investigation has been successfully employed in the U.S.A.

In addition to the new experiments which I have mentioned above we shall, of course, continue with several of our older ones, and particularly with those that provide direct assistance to the users of radio for communication purposes.

I should next like to mention one or two matters concerning Senior Staff: other staff matters are mentioned elsewhere in this letter. We have been fortunate in obtaining the services of Mr. R. Dalziel who has joined us as an S.P.S.O. He is to be a Division Leader in charge of the work concerned with measuring the Doppler and Faraday effects on waves received from satellites, the deductions from satellite orbits, the new theoretical group and the new high vacuum group. Mr. Dalziel comes from S.R.D.E. Christchurch (Ministry of Aviation) where he has had experience in a variety of modern radio techniques, in telemetry for guided weapons, and in studies of satellite communications.

We have also been fortunate in obtaining the help of Mr. V.A. Hughes who has joined us as a P.S.O. from R.R.E., Malvern, where he has worked on Radio Astronomy and has used radio telescopes and low noise receivers. He is building up a group here to work with low noise receivers preparatory to using them with our new telescope when it is built.

We are all pleased to know that Mr. Kift has been promoted to P.S.O.

We have been honoured by visits from the Minister for Science (Lord Hailsham) and from the Secretary, D.S.I.R., Sir Harry Melville. We have also had visits from a considerable number of scientists, both from this country and from overseas, who are interested in our work. The discussions which a number of members have had with these visitors have been most stimulating. Some of the most valuable have been those in which one or two "consultants", usually from universities, have visited us for a day to join in detailed scientific discussions of some of the problems with which we are concerned.

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#### EDITORIAL NOTE

This first issue has had to catch up with the past to some extent, and therefore includes three reports of recent overseas visits. The next few issues will give accounts of some of the Station's scientific projects. Their object will be to answer Why, How, and When as clearly as possible and they will be aimed at the majority of readers, whose background is scientific but who may not have special knowledge of the subject. This is not an easy task and the editor will welcome criticism that helps him to achieve it. Will contributors please try to avoid the passive mood and strings of long words, both of which dull the readers.

The average issue will have about six pages, with a scientific/social ratio of about two to one. Correspondence and non-technical contributions should reach the editor in room 32 by the fifth of the month.

Room numbers are put against people's names in the text because the editor feels that this will be genuinely useful to the Station.

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#### THE COSPAR MEETING IN FLORENCE

COSPAR (the Committee on Space Research) was set up by the International Council of Scientific Unions, which is sponsored by UNESCO. It has thus the same parentage as URSI, with whose activities this Station has long been associated. Like URSI, COSPAR seeks to further international collaboration between scientists working in a particular field. To this end it brings people together at special conferences to read scientific papers and to transact, separately, its organizational business.

In April the Director and four of his staff attended the most recent of these conferences. Only the relatively few delegates appointed by their national space committees attended the COSPAR committee meetings, but some hundreds of people attended the symposium on space science. This symposium considered more than a hundred papers, dealing with radio and optical tracking, telemetry and data recovery, magnetic observations, "special events", recent results from instrumented space vehicles, and the international reference atmosphere.

With so crowded a programme some sessions had to be run in parallel, but even so it was a very busy week. Unfortunately the papers were not always available beforehand and often there was not even an abstract. Since there were also language difficulties one could seldom properly prepare for the meetings. This considerably reduced their value, but opportunities for informal discussions outside the meetings made up for the defect.

On the subjects of tracking and data recovery the emphasis was largely on techniques. Details of various radio and optical tracking systems were given, and also the design of systems for recovering data from space vehicles, particularly from probes at great distances. A few papers dealt with orbit determinations and the deductions made from them concerning, for example, the gravitational field of the earth.

Accounts of the results of rocket and satellite experiments were very interesting, particularly those concerned with phenomena occurring during a solar flare, and those dealing with the observations of radio noise and ionization density. The exploration of aurorae by means of sounding rockets is a valuable technique and results were presented covering the variation of absorption with height at around 13 Mc/s and the increase of cosmic ray particle flux during an aurora.

The announcement by the U.S.S.R. delegation of the first manned flight around the earth was an outstanding event of the conference. The news aroused great enthusiasm, but the meetings soon returned to the less sensational task of completing their agenda.

## SKYLARKING IN AUSTRALIA

### Mr. Horner's Visit to Australia

To reach Australia in an RAF Comet takes five days, one of which is spent in Singapore. The arrival point is Edinburgh field, next to the Weapons Research Establishment at Salisbury, near Adelaide. As a visitor one lives in Adelaide and is conveyed to WRE each day by car, a journey of 15 miles. The Establishment itself is large and well-dispersed, the perimeter being about 9 miles, so cars are again necessary for transport between the various laboratories. A visit therefore needs to be well-organized for efficient use of time.

Part of my task in Australia was to acquaint myself with the procedures by which experiments are carried aloft in Skylark rockets. Rocket heads arrive at WRE from the United Kingdom, with the experimental apparatus installed, and are fully checked. They are then transported to Woomera, some 300 miles to the north-west, in country otherwise occupied mainly by kangaroos and flies. The equipment is checked again here, attached to a rocket motor, mounted in a launcher and fired. This whole procedure is straightforward in theory but many snags can occur, and the firing does not normally take place until several weeks from the time the rocket head is received. Not the least of the snags is the weather, which prevented me from seeing a Skylark launched.

Woomera village itself has a permanent population of 4000, largely army personnel and their families. The scientific and technical staff concerned with trials (of which the Skylark programme forms only a small part) usually travel from Salisbury as required, by air. A large contingent arrives each Monday and returns on Friday, and there is a daily service in between.

Rocket firings take place at the range head, 25 miles from the village, and for this journey, and for travelling between the various sites there are buses and a fleet of cars. Even a short journey on foot can be very trying in a temperature of 100° F and with a retinue of flies.

The range itself extends for 1250 miles and many observing posts, distributed over a wide area, are used for radio and optical tracking of missiles. One of these sites 20 miles down-range has been selected for a Union Radio ionospheric recorder and the ground equipment for the first R.R.S. rocket experiment. Mr. Page, who has worked at Slough on a number of recent occasions, will be living in Woomera village for the next two years and will travel to this site daily to operate the recorder. There are a number of farms on the range itself. The farmers receive warning of each trial, and have been provided with concrete shelters, on top of which they stand to obtain a better view of the proceedings.

Woomera is also the location of the satellite and space-probe tracking facilities. A Baker-Nunn camera and an 85 ft dish aerial are in use, and a minitrack system similar to that at Winkfield is being installed, following several years observations with a simpler arrangement.

The excellent facilities in Australia, insofar as they are used for space research, are at present mainly a service to research workers in other countries, the United Kingdom and the United States being the principal users. However, this situation may change in the next few years, as an increasing number of Australian research workers, in the Universities and in Government establishments, are interested in carrying out their own experiments in rockets and satellites.

My two weeks in Australia were followed by an equally interesting fortnight in Singapore where I was well looked-after by the RRS staff.

## INTERNATIONAL CO-OPERATION ON THE TOPSIDE SOUNDER

Mr. E.D.R. Shearman's visit to the U.S.A. and Canada

Since early last year the Radio Research Station has been taking an active part in the NASA Topside Sounder Satellite programme, whose scientific aims are outlined by the Director on page 1.

N.A.S.A. is providing the rocket vehicles and launch facilities to put two satellites, one Canadian (sweep-frequency) and one U.S. (fixed frequencies), into orbit next year.

The Radio Research Station's part in the programme began in April 1960 when Mr. Shearman joined for five months the team at the Defence Research Telecommunications Establishment in Ottawa which is designing the Canadian satellite. His especial responsibility was the electrical design of the ionospheric sounding aerial.

This aerial, which is being built by Canadian de Havillands, is perhaps the most unusual feature of the satellite. It is to take the form of four poles, two of them 75 ft long, which will be erected from the satellite while in orbit by the method used in a carpenter's steel tape. A difference is that the steel ribbon as it unrolls from the storage bobbin, curls into a complete overlapping and rigid tube.

The future part of the Radio Research Station in the project is to set up and operate three ground telemetry stations to acquire telemetry data from the satellite, recording the data on magnetic tape, and to process these tapes at Slough to obtain ionograms on film. The three ground stations will be at Winkfield (already in existence) and at Falklands and Singapore. The planning and equipping of these stations and of the Slough processing centre is now in progress.

As in other NASA satellite projects, the work of all the participants is co-ordinated by a Working Group which meets at two-month intervals to review progress and find solutions to organizational, technical and scientific problems.

The Topside Sounder Working Group has representatives from the rocket vehicle, Minitrack, environmental testing and telemetry systems divisions of the NASA headquarters, from the Canadian experimenters, from the U.S. experimenters (Bureau of Standards, Boulder Laboratories) and from the firm building the U.S. satellite.

The latest meeting was in April at NASA Goddard Space Flight Center in Washington. Mr. Shearman attended as the U.K. representative.

These day-long meetings with 25-30 participants converging from all parts of the U.S., and sometimes from Canada and Britain, have become a feature of satellite programmes. In a project demanding the close co-operation of so many teams they appear to be essential. A great deal is achieved in the meetings themselves and in the sub-committees, informal discussions and visits which follow them.

Following the meetings, Mr. Shearman was able to see how the NASA staff of Goddard Space Flight Center, at their new laboratories in Green Belt, Maryland, had solved data processing problems similar to those presented by the Topside Sounder. On a visit to Ottawa immediately afterwards he was also able to see the progress made by the Canadian group both in the satellite payload itself, and in the ground telemetry reception and tape processing installations.

NEWS FROM THE OUTSTATIONS

Singapore

On 7 May Cecil Clarke and his wife landed at Tilbury from S.S. Orsova (Orient Line) at the end of a two year tour of duty. The voyage lasted three weeks. They expect to return to Singapore next August for a further two years. Mr. Wright and Mr. Fletcher recently returned to this country, and Mr. Mortimer is motoring home across Europe, having left the home-bound Oranje at Genoa. The many staff changes due at Singapore are listed at the end of this note.

Other staff news from Singapore is that Mr. Tyler is settling down happily and has started to organize cricket matches, and that the accommodation is generally agreed to be good. The Singapore outstation is at present divided into two, a "parent" station in the grounds of the University of Malaya, and a "quiet" site at Trafalgar, which is a Cable & Wireless Station about twelve miles from the University. To these will soon be added a third site at Sembawang, an RNAS station about three miles south of the Singapore Naval Base.

The equipment for all space research projects will be housed at Sembawang, where new air-conditioned offices, a large laboratory, and a dark-room are expected to be ready in December, in time for observations on the first U.K. Scout satellite. The new projects at Sembawang include the use of a greatly modified Ferguson interferometer for tracking, the reception of telemetered signals, and the measurement of Doppler shifts and Faraday rotation. As Mr. Ratcliffe mentions on page 1, the station will also be equipped to acquire data from the topside sounder due in 1962.

The staff have already obtained valuable data on satellites from the University site, including optical measurements of the Echo balloon and the Sputniks, telemetry records (for the Americans) from Vanguard III, and various measurements of the signals from Explorer VII. They have also built up a very full set of data on ionosphere drifts, work which ended last March.

Work which will continue for some time includes vertical incidence recording of ionosphere conditions, the measurement of the field laid down by relatively local broadcasting transmitters and by distant BBC transmitters, required by CCIR, and the measurement of changes in declination of the earth's magnetic field using a magnetometer similar to the one at Slough.

Future atmospheric radio noise work will be carried out entirely at Trafalgar, where CRPL equipment is already installed, and a programme has now started for the measurement of noise on the highly directional rhombic aerials used operationally by Cable & Wireless Ltd. This combination of R.R.S. and C.R.P.L. equipment makes Singapore one of the best equipped noise measuring stations in the world.

Provisional staff changes are as follows:-

(a) Now returned home, or due to leave Singapore within three months:-

Mr. Clarke, Mr. Harrison, Mr. Wright, Mr. Mortimer, Mr. Legge,  
Mr. Reader, Mr. Fletcher.

(b) Due to return to U.K. in the second half of 1962:-

Mr. Bonvini, Mr. Tyler, Mr. Carter.

(c) Leaving U.K. this year for Singapore:-

Mr. Clarke, Mr. Greenan, Mr. Goodyer, Mr. Chivers, Mr. Hale,  
Miss Labitzke, Mr. Purvis, Mr. Gaynor, and Mr. Tracy.

Falkland Islands and Inverness

News from these stations will be in the next issue.

R.R.S. SPORTS AND SOCIAL CLUB NEWS

Tennis

Contractors should start work on the hard court in 2-3 weeks. It should be ready in early July.

The grass court is now ready.

Datchet hard court session start at 6 p.m. each Tuesday and Wednesday. Turnout averages 9 on Tuesdays and 15 on Wednesdays. Richard Smith(4) organizes.

Amateur Radio Society

This Society is now being formed. Those interested should see Mr. Flavell(25) or Mr. Froome(21) as soon as possible. It will operate from the old Station buildings.

Cricket

All those wishing to play during the evening should contact Mr. Owen(2).

Theatre Royal, Windsor

15 May "We Must Kill Toni" by Ian Stuart Black. "Comedy Thriller"  
29 May "Waiting in the Wings" by Noel Coward.

For organized visits see John Reed(63) early, with preferred dates.

Festival Hall

The LSO International Series of Concerts are listed on the Notice Board. For visits, see Jeanette Biggs(34) by Thursday 18 May at the latest.

The Secretary of the Sports and Social Club is Mr. J. Pearson(22). 78% of the staff are members. The subscription is 8/8d. per year.

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STAFF NEWS

Congratulations to David Smith(17) on his promotion to E.O.

Station Staff On 1 May 1961 the total number of staff, including outstations but not those on extended leave or long visits, was 180, as follows: Scientific-30. Experimental-70. Assts.(Sci.)-25. Industrial-32(inc. 5 part-time). Others-23(inc. 2 part-time).

Recent Arrivals (since 3 April 1961) Welcome to:

Mr. R. Dalziel(108) S.P.S.O. Mr. L.C. Lawrence(12) A.E.O.  
Miss M.J. Horwill(37) A.E.O. Mrs. F.M. McCreery(56) Typist Mr. R.H. Wolfe(58)  
Mrs. H.G.O'Grady(8) Asst.(Sci) Miss J.A. Wallis(16) Student Telephonist

Departures after four years on the staff as a Scientific Officer Michael Vickers left on 12 May to join Ferranti's at Bracknell, where he will be working on the logical design of computers. We wish him success in his new job.

Movements Mr. W.R. Piggott left on 1 April for a six months' tour of the U.S.A. and Canada on consultant work.

Mr. Brackstone and Mr. Aria are due to leave Ascension Island for Durban on 5 June. They leave Durban for Bombay on 10 July and then travel across India to New Delhi, the new site of the oblique incidence h.f. sounder.

Mr. Kift(32) will visit Malta on 6 June for a few days to advise the Army on aerial siting problems there.

CALENDAR

- Thurs. 18 May - 6.30 at I.E.E. Mr. Ratcliffe's lecture: "Experimental Investigation of Space"
- Fri. 19 May - Civil Service Holiday (Queen's Birthday)
- Mon. 22 May - Public Holiday (Whit-Monday)
- Wed. 31 May - Visit from Radio Research Board and members of Committees
- Thurs. 1 June - Open Day. About 200 visitors.
- Sat. 3 June - Car and Motorized Vehicles Rally. 7.30 p.m. Datchet Green.

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