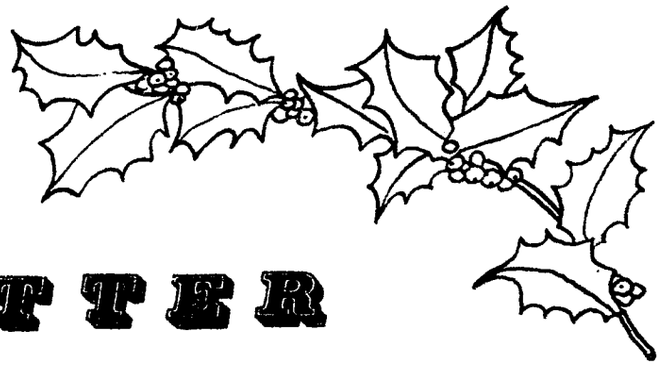
R.R.S.

NEWSLETTER



(For the use of R.R.S. Staff only)

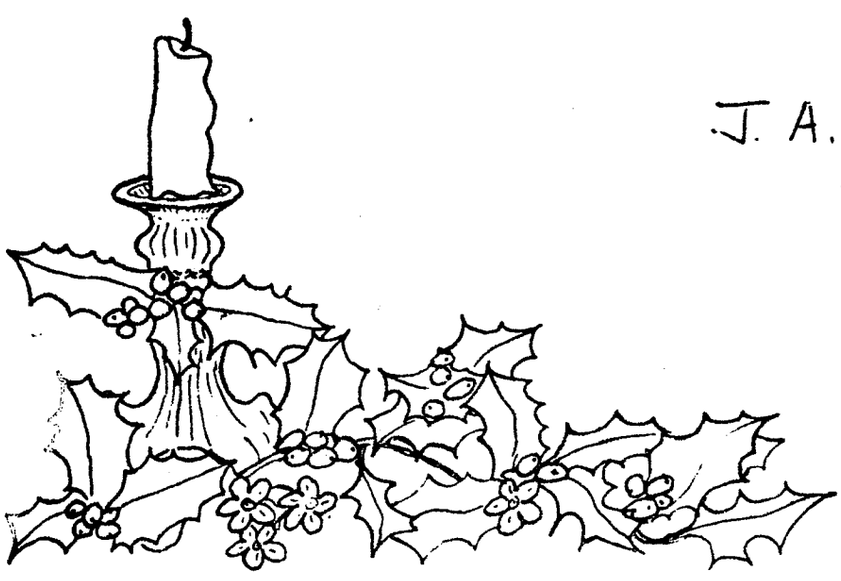
No. 32 Christmas Issue 1963

With this Christmas issue of the Newsletter I send my greetings to all members of the Staff and best wishes for a Happy Christmas and a Happy and Successful New Year. I wish, especially, to remember our staff overseas. I had the opportunity of meeting those in Singapore personally in September, I wish I could also have met those in Port Stanley.

This is the last issue of the Newsletter in 1963. I am happy to think that during the past year the Station has continued to do valuable work and has extended scientific knowledge in many directions. Several new lines of work are now going well and are reaching the stage where we may expect results soon. I look forward with confidence to a successful outcome of some, if not all, of these researches during the new year.

In the summer we plan to have an "Open Day" It will be the first for three years and we can expect, by showing what we have done during that time, to make it an unusually interesting and valuable one.

In the New Year we shall lose Dr. Saxton to the U.S.A. We all wish him every success in his new and important post of Director of the U.K. Scientific Mission and Scientific Attache to the U.K. Embassy in the U.S.A. I personally shall miss his wise help and great knowledge of the Station very much. We shall all want to send a particular message of good wishes for the New Year to him and Mrs. Saxton.



J. A. Ratcliffe.

THE SATELLITE PREDICTION SERVICE

After the launching of Sputnik 1 in October, 1957, a satellite prediction service was started at the Nautical Almanac Office of the Royal Greenwich Observatory. A few months later it was transferred to the Royal Aircraft Establishment at Farnborough and, finally, in September, 1958, the service became the responsibility of R.R.S.

Initially, all the necessary calculations were carried out on a desk calculating machine but since the installation of the computer in early 1961 this very laborious aspect of the work has been removed. The sources of data for these calculations are partly visual observations and partly orbital and prediction data issued by the United States. In February, 1961, a teleprinter circuit linked NASA Goddard Space Flight Centre in Maryland, Jodrell Bank, University College London, Winkfield and R.R.S. This facility enabled the prediction service to receive the most recent U.S. predictions and orbital data on all major orbiting objects.

In the first few years of operation the Satellite Prediction Service endeavoured to provide predictions on all objects which were suitably "visible" or "audible" but, even with the advent of the computer, the rapid increase in the number of objects in orbit forced predictions on many satellites to be discontinued. At the present time, newly launched satellites have to move in orbits considered to be of particular geophysical value before predictions are started. Predictions are currently issued on about fifty satellites.

Together with the predictions are issued the Satellite Observing Notes which contain information on visible satellites, new launchings, orbital data, satellite decays, observing priorities, etc. In addition, it is also necessary to issue corrections to the predictions. The accuracy of a prediction varies greatly from one object to another but the accuracy achieved for satellites in stable orbits is about one minute in time after six months and for satellites with lifetimes of about six months about five minutes after two weeks. For satellites likely to decay in a few days or a week's time it is very easy to be in error by up to one revolution.

The Prediction Service replies to numerous letters from members of the general public who think they have seen a satellite or space probe but in very many cases we believe the answer lies in their close proximity to an air field.

As a result of the predictions large numbers of optical observations of satellites are received by the Prediction Service and these are compiled into monthly lists for distribution to computing centres and the World Data Centres for Rockets and Satellites. The bulk of British optical observations of satellites have been made by amateur observers operating from their own homes with simple equipment consisting of binoculars or small telescope and a stop watch for timing. The accuracy obtained by these amateurs varies between 0.1 and 1 second in time and 0.03 and 1 degree in position. During 1962 amateur observers reported over 8,600 observations on 88 different objects.

In addition to the amateur observers there are three British professional satellite tracking stations situated at the observatories of Herstmonceux and Edinburgh, and in Malta. The stations are equipped with kinetheodolites capable of determining the position of the satellite to 0 005 degrees and about 20 milliseconds in time. Special "Look-Data" predicitions are provided for these stations giving the azimuth and elevation of the satellite with time and during 1962 these stations reported nearly 3,000 observations to R.R.S.

There are over one hundred recipients of the predictions and about twelve of these are on the Continent of Europe. Professional tracking stations in France, Finland and Sweden, equipped with theodolites, reported nearly 12,000 observations during 1962.

The main purpose of collecting all these observations on so many different satellites is for the furtherance of research using satellite orbits. Large numbers of observations from all parts of the world are required for accurate orbit determination and studies of the upper atmosphere and the earth's gravitational field require many well determined orbits covering many months and even years. Regular observations of all potentially useful objects in orbit are desired if research on these topics is to progress.

David E. Smith

RADIO FOR COASTAL SHIPPING

"The Dutch motor vessel Varik, 583 tons, with a crew of nine radioed last night that her deck cargo had shifted and she was listing badly in heavy seas seven miles off the Essex coast. The Clacton lifeboat stood by throughout the night."

With the arrival of winter, reports like this begin to be rather more evident in our newspapers. This year is no exception and the severe gales which raged in mid-November put many ships in difficulties in the waters around our coast. Unlike the mariners of seventy years ago, the Captain today is able to take advantage of many aids to safety, not the least of which is the ship's radio. Although most of us have a little to do with radio in our day to day labours probably not so many know much of the way in which radio at sea is used and organized. Obviously, a short article of this nature cannot hope to cover such a wide field which today includes radar, wireless telegraphy, radio telephony, direction finding systems, echo sounders, VHF radio and even closed circuit television. While all these are invaluable of course to the present day ship perhaps one of the most useful is the radio telephone system which utilizes the so-called 'trawler bands' and which enabled the unfortunate Dutch

coaster mentioned earlier to send out her distress call. The next few pages attempt to describe how this system is organized and the use to which it is put chiefly by trawlers, coasters and yachts.

Before we do this, however, it may be of interest to look back very briefly to the earlier days of wireless. The young Italian electrician Marconi, who came to England in 1896, first demonstrated in that year his 'system of telegraphy without wires' with the assistance of the Post Office and the next five years saw this bring the beginnings of a revolution in communication. The value of it for linking ships with shore stations was realised from the start. In fact Queen Victoria can fairly claim to have played a small but interesting part in this for in 1898 by Royal Command, Signor Marconi was requested to install his apparatus to link Osborne House in the Isle of Wight with the Prince of Wales' yacht which would be attending Cowes week. Much to Her Majesty's pleasure the system worked perfectly and she was able to have a daily report of the health of the Prince who was recovering from an accident.

By 1898 Trinity House was sufficiently interested to permit experiments to be carried out between the South Foreland lighthouse and the East Goodwin lightship. Wireless soon proved its worth here, not only in enabling prompt reports to be made of ships grounding on the sands but also in one case where the lightship herself had been rammed by an over-enthusiastic steamer during the height of a gale! During 1899 the Royal Navy provided many of its ships with radio equipment and by the turn of the century the number of vessels fitted multiplied almost daily. The first British ocean going merchant vessel to be fitted with Marconi wireless was the s.s. Lake Champlain in 1901. The equipment was crude and often unreliable but attracted considerable attention on both sides of the Atlantic. Of course 1901 is best remembered as the year in which Marconi made the first transatlantic transmission thus showing that there was something above the earth that reflected the wireless waves. The sequel to this is perhaps more familiar to the reader at R.R.S. than anyone else so we will not dwell upon it here any further.

From 1901 onwards wireless became more and more the rule rather than the exception in deep-sea ships and by the end of the First World War had become so widely used that in 1919 the Merchant Shipping (Wireless Telegraphy) Act was passed making it compulsory for all British ships over 1,600 tons to carry wireless. Equipment had improved by then and with the introduction of the thermionic valve and a fair standard of selective tuning, spark oscillators gradually became less common although it was not until 1939 that they were prohibited altogether. Between the wars came the development of other radio and electronic aids notably the direction finder, the echo-sounder and the radiotelephone. This latter, first introduced into the fishing fleets in about 1927, was particularly suited to short-distance communication and made it possible for the skipper to speak direct to the trawler's owner ashore through a coast station.

The Second World War brought with it radar and the navigation systems Loran, Consul and Decca and of course a general improvement in the efficiency and range of radio equipment as a whole.

But to return to the 'trawler bands', these got their name, not surprisingly, as a result of their great use in earlier years by the fishing fleets although more recently the tendency has been for them to use VHF radio-telephony. As mentioned already, the radio-telephone was introduced experimentally into fishing trawlers about 1927. The great attraction to trawler skippers (and owners) was that they could personally talk to each other without having to know and use morse. Other coastal shipping soon found the system useful and eventually sufficiently small and compact sets were developed for yachts.

The control and use is governed by the Post Office who operate a number of stations around the coasts of England, Wales and Scotland. The main stations are:-

Oban	(west coast of Scotland)
Portpatrick	(near Stranraer)
Seaforth	(near Liverpool)
Anglesey	
Ilfracombe	
Lands End	
Niton	(Isle of Wight)
North Foreland	(near Margate)
Humber	(near Grimsby)
Cullercoats	(near Newcastle)
Stonehaven	(near Aberdeen)
Wick	(near John O'Groats)

Each station maintains a 24 hour watch on 2182 kc/s which is the international radio-telephone call and distress frequency. The services available to ships within about 150 miles of a coast station are as follows:-

Interchange of Radio Telegrams
Radio-telephone calls with shore subscribers
Distress (MAYDAY) calls for reporting imminent danger
Urgency (PAN) calls for less serious reports of danger
Medical advice

Stations also broadcast safety (SÉCURITÉ) signals as necessary concerning navigational hazards, gale warnings, etc.

One great advantage of the system is its simplicity of operation. Perhaps this is best illustrated by an example. Say the trawler "Angel" fishing in the North Sea wishes to make a radio-telephone call to the ship's owners in

Grimsby through Humber Radio. The ship first establishes contact with Humber Radio by calling on the general call frequency, 2182 kc/s:-

HUMBER RADIO (repeats 3 times)
THIS IS THE GRIMSBY TRAWLER ANGEL (repeats name 3 times)
I HAVE ONE RADIO TELEPHONE CALL FOR YOU,
CHANNEL 2 OR 4,
OVER

Now in order to clear the call frequency (2182 kc/s) as soon as possible in case another ship wishes to call, the subsequent traffic is conducted on a number of working frequencies. The frequencies the ship should use to transmit to the coast station are designated by a number of channels (for working Humber Radio these are channels 2 and 4). The coast station has one or more working frequencies that it can use to transmit to the ship. It decides which of these to use and also which of the channels the ship will use. Humber Radio on hearing the "Angel's" call then replies on 2182 kc/s as follows:-

ANGEL (repeats 3 times)
THIS IS HUMBER RADIO
CHANNEL 2,
LISTEN 2684 kc/s,
OVER

The "Angel" then changes to channel 2 (2016 kc/s) and the coast station to 2684 kc/s and the remainder of the call proceeds on these frequencies as follows:-

"Angel":-

HUMBER RADIO,
THIS IS ANGEL,
ARE YOU RECEIVING ME, OVER.

Humber Radio:-

ANGEL,
THIS IS HUMBER RADIO
RECEIVING YOU WELL, GO AHEAD WITH YOUR TRAFFIC,
OVER

"Angel":-

HUMBER RADIO,
THIS IS ANGEL,
I HAVE A CALL FOR GRIMSBY 20733, GRIMSBY 20733,
OVER

Humber Radio:-

STAND BY

Humber Radio then obtains the Grimsby number and calls the "Angel":-

YOU ARE CONNECTED TO GRIMSBY 20733
GO AHEAD

The conversation between the skipper and the owners then proceeds, at the end of which the coast station informs the ship the duration of the call for charging purposes.

Though this may appear to be rather complicated, it is a lot more long-winded to write out than to do in practice. In fact once one has memorized the procedure it is almost as easy as telephoning your girl-friend down the road - with the possible exceptions that it costs 10s. 6d. for three minutes and you cannot reverse the charges!

This service is open to all vessels who carry equipment approved and licenced by the Post Office. The broadcasting of singing or music, abusive language and unecessary conversations are forbidden. If you feel you still have anything to say the licence costs £2 a year. Most ships, other than yachts and some trawlers, carry radio officers who hold either a Post Master General's First or Second Class certificate. It is obviously a rather tall order to expect a weekend yachtsman to have to take to sea a fully qualified radio officer or even worse to be one himself. Fortunately, the G.P.O. have realized this and to enable the yachtsman to be legally allowed to use the system all he is required to do is to take a simple test which only involves knowing how to operate the equipment, how to send and receive traffic and a knowledge of the regulations and procedures especially for distress calls. If he passes this, he is issued with the rather high-sounding "Post Master General's Restricted Certificate of Proficiency in Radio-telephony".

For distress calls the continental coast stations (such as Ostend and Scheveningen) operate in conjunction with the British system, all using the international radio-telephone call and distress frequency 2182 kc/s. Unlike ordinary traffic calls, these MAYDAY distress calls are conducted solely on 2182 kc/s and once a MAYDAY has been sent out all other traffic on that frequency must cease and no one else use it except the coast station dealing with the distress and other involved ships. It is a very comforting thing for the owner of the smallest radio equipped yacht to know that he will get the 'VIP treatment' if he runs into serious danger - and this service is entirely free.

However, before you all start building your own R/T set it is only fair to say that the G.P.O. specification is quite stringent, requiring spot frequency crystal tuning for both transmitter and receiver, the frequency stability being to within 0.02 per cent. Those who wish to buy a new set can do so for about £130. But perhaps most of you will be content just to know about the 'trawler bands'.

To the Captain, whose daily task is to ply the coasts of Britain, the radio is more than a novelty - it is his lifeline with the shore.

M. J. Weeden

Mr. Ratcliffe

Readers will join with us in congratulating the Director, who has recently been elected to the Vice-Presidency of the Institution of Electrical Engineers. This mark of distinction was conferred upon Dr. Smith-Rose in 1962, and the Station may well be proud that the ability of its leaders is thus acknowledged by their professional peers.

STAFF NEWS

Dr. Saxton leaves for the U.S.A. on 16th January, 1964. Mr. Wilkins will then become Deputy Director and Dr. Bain will fill the vacant position of S.P.S.O.

Congratulations to:-

Mr. R. F. Kelleher and Miss S. I. B. Wojcicka who were married at Krakow, Poland, on 17th October.

Mr. Norman P. Bates on his engagement to Miss Janet Hastings.

Welcome to:-

Visitor

Dr. J. W. MacDougall from Queen's University, Kingston, Ontario, who will be at R.R.S. for about a year.

New Staff

Mrs. F. M. Parker	T/Clerical Assistant
Mr. R. J. Hilliam	Specialist Teleprinter Operator (transferred from G.P.O.)
Miss P. A. Dannahy	T/A.E.O.
Mr. J. A. MacDonald	Specialist Teleprinter Operator (transferred from War Office)

Other changes

Mr. C. Clarke	P.S.O., transferred tc D.S.I.R.Headquarters
Mr. L. A. Brackstone	E.O., transferred to Ministry of Aviation
Han Sen Fong	Regraded to Labourer Grade V(a)(Singapore)

Overseas Transfers

Messrs. Pearson, Juleff and Hawkins have returned from the Falkland Islands.

British Antarctic Survey News

Despite the delivery of more than 300 cases of equipment from R.R.S., the "Kista Dan" was by no means fully loaded before she left Southampton for Halley Bay on 5th December. The occasion was marked by the appearance of Messrs. Bellchambers, Wright and Dicken in an interview given by West and Welsh services of B.B.C.-T.V. Whilst Mr. Wright and Mr. Dicken are travelling on the ship, Mr. Bellchambers is flying to the U.S.A. and will visit Boulder before joining the "Kista Dan" at Montevideo. They will then proceed to the Antarctic by way of Port Stanley and so to Halley Bay where a programme of observations have been arranged during the I.Q.S.Y.

SPORTS AND SOCIAL CLUB

The

CHRISTMAS PARTY

will be held on Saturday, 14th December

in the Canteen

from 8.00 p.m. to 1.00 a.m.

Bar Refreshments

Dancing to Derrick Dawson's Band

Tickets (5s. each) are available from members of the Committee or from Ralph Weston at Winkfield.

Amateur Radio Society

We welcome back John Juleff who operated as VP8GO from the Falkland Islands on the 20m, 15m and 10m bands. The P.M.G. willing, he hopes to be active as G3--T on the 2m and 70cm bands. Ray Flavell, GM3LTP, is now operating a KW Viceroy SSB Transmitter from the Shetland Islands.

D. G. Thorpe

Bridge Club

A very successful joint evening with the Road Research Laboratory Bridge Club was held in the canteen on 15th November; it was arranged as a pairs competition and was won by a handsome margin by one of the visiting pairs. The next evening will be on Monday, 16th December, and promises to have a record attendance.

Two matches have been played in the NPL team of four inter-divisional League. The first was on 12th November when a team consisting of Dr. Fooks and Miss Scott and Mr. and Mrs. Gordon-Smith were defeated by the National Chemical Laboratory team by six points to none. The same team were more successful against the Metallurgy Division of N.P.L. on 3rd December, winning by four points to two.

The Smith-Rose Cup bridge matches were played on 5th December with the following teams:

North	Dr. Bramley and Mrs. Bain
	Mr. and Mrs. Nicolson
South	Dr. Fooks and Miss Scott
	Mr. and Mrs. Venables
London	Mr. Garner and Dr. Hopkins
	Mr. and Mrs. Gordon-Smith

The result was decided on aggregate points, North winning with a total of +3040 points, London being a very close second with +2750 points and South a long way behind with -5790 points.

Jean Scott

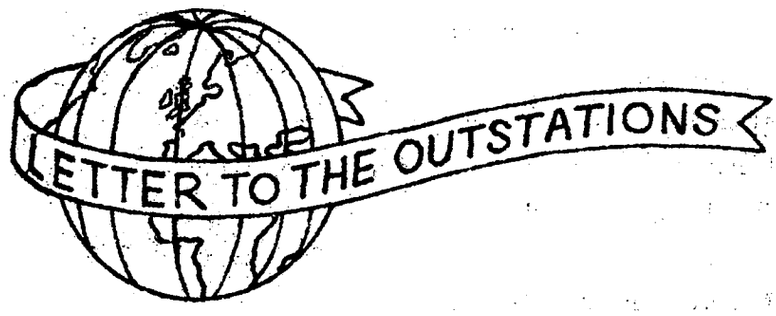
Snooker

The last matches in the Smith-Rose series have now been played resulting in a clean sweep for the North. London were second, beating South by a narrow margin. The result was in doubt until the black went down in the last frame.

There will now be a knock-out competition run on the same lines and a notice will appear shortly.

The table and balls are now in need of expensive attention and in order to raise a little money for this a small charge of 1s. per lunch hour will be made from now on.

P. P. Reader



Dear Colleagues,

Recent strange noises in the building might lead the timid to suppose that besiegers were making determined efforts to penetrate the roof of our laboratories. It is in fact the Ministry of Public Building who are at present busy with an ageless ritual. Their followers boil pots of tar with all the vigour of Jack Ketch expecting a rush of business, and shovel stuff off the roof with the sole apparent intention of shovelling it back on again shortly afterwards. When it rains, leaks long lost have gushed anew; but we are assured that, in the end, the tar will triumph.

A brief but raucous interruption was caused by a pneumatic drill in the building; the only solution to a problem posed by our drains, where the fluid dynamics had gone static. Sleep was efficiently murdered for two working days.

Soon Christmas will be upon us. Not such a statement of the obvious as might be supposed; for December's end is a fact that is only beginning to dawn on many. The wish to send greetings to friends overseas intermingles with a sense of guilt, it's too late to catch the boat: time will be has become time was. Nonetheless the newsletter will, we hope, eventually arrive, bringing with it's other good wishes those for a Merry Christmas and A Happy New Year from

Yours sincerely,

the Editor.

CHRISTMAS PUZZLES

In order that readers will not stagnate intellectually over the festive season, the Newsletter presents some puzzles and problems to keep you in form

1. A master entered the school staff-room to find six other masters present. Four of them were playing bridge, and the other two had their heads over a chess board.

   The Physics master was sitting on Reid's left and Clifford was on Morland's left.

   Wilson was lighting his pipe, and Morland was offering his partner a cigarette.

   The Chemistry master and the French master were sitting back to back.

   The Maths. master is a confirmed pipe smoker.

   Smith was just removing one of the Geography master's Knights.

   Reid was the Chemistry master's partner.

   The History master is the only bachelor on the staff.

   Clifford and Finlay were playing as partners.

   Problem Draw a plan showing where each of the six masters was sitting and what subject he teaches.

2. A pack of cards is divided by cutting into two unequal portions. If a card is drawn at random from Portion A, the odds are two to one against its being a red card.

   A red card is next transferred from Portion B to Portion A. Now the odds are two to one against a card drawn at random from portion B being black.

   Problem How was the pack originally divided?

3. If $A^3 \times B \times C^2 \times D^2 = AABAC$, find the digits A, B, C, D, given that they are prime.

These are so simple that there is obviously no real need to publish the solutions - but just in case you are not quite sure, these will appear in the January issue.

A DROP O' THE HARD STUFF

To flame harden or not to flame harden - that is the question
Whether 'tis nobler in the shop to bear
The amps and volts of the induction coil
Or to apply the flame directly to the part
And by heating harden it. To heat, to quench -
No more, and by a quench to say we end
The heat treat and the thousand thermal shocks
That steel is heir to. 'Tis a heating cycle
Devoutly to be wished. To heat, to quench,
To quench - perchance to crack. Aye, there's the rub,
For in that cracking what stresses may come
When we have finished this final quench
Must give us pause.

With acknowledgements to Production Engineering
4th January, 1960