



APPLETON LABORATORY NEWSLETTER

No. 176

January/February 1976

New Year's Honours

We are pleased to report that a member of the Staff has been named in Her Majesty's New Year's Honours List.

Our warmest congratulations go to Mr H F Lovesey, the value of whose work in Government Service has been recognised by his being appointed a Member of the Order of the British Empire.



EISCAT. A purpose-built Ionospheric Observatory

Since 1958, when Bowles made the first incoherent scatter observation of the ionosphere, several installations have been built in various parts of the world, including one (now alas, no more) in the UK, to make use of this very valuable technique. Of the remaining western world radars, only one is in the southern hemisphere (Jicamarca, Lat 12°S) and the others are distributed between 18°N and 65°N . Chatanika in Alaska is the most northerly station and is currently the only one capable of observing auroral phenomena. The results obtained at Chatanika show that a great deal of exciting science could be done with a more powerful and sophisticated incoherent scatter radar at high latitudes.

In 1970, when the original Stamford incoherent scatter radar was moved to Chatanika, scientists from several European countries were discussing the possibility of constructing an incoherent scatter station in the auroral zone. This would be a powerful, up-to-date radar capable of obtaining data over a considerable height and latitude range and sufficiently flexible to allow many different phenomena to be investigated. Depending on how the aerials are pointed, the radar would be able to observe: the "polar cap", ultimately linked by magnetic field lines to interplanetary space; the "auroral oval" where high-energy magnetospheric particles enter the atmosphere and cause the aurora; lower latitude parts of the magnetosphere. The project, named EISCAT (European Incoherent Scatter) now involves Finland, Sweden, Norway, Germany, France and the UK.

The sites chosen for the principal items of equipment are:

Tromsø (Norway), L = 6.1 (see note at end). Transmitter and receiver for VHF radar; transmitter and receiver for UHF radar; master clock and computer for controlling the transmitters.

Kiruna (Sweden). Steerable aerial system with receivers for the UHF radar; computers for data processing.

Sodankyla (Finland). Aerial system and receivers similar to those at Kiruna, for the UHF system.

It is proposed that the UHF radar will cover the approximate height range 100-700 km. The VHF radar will be able to cover the whole range from about 85 to 2000 km, being particularly useful at the lower and upper end of this range where for technical reasons the UHF radar will not be effective. Both transmitters will have available a wide range of pulse lengths, repetition rates and pulse codes, all of which will be controlled by the computer, in order to maximise the possible kinds of experiment. Data processing will be performed on-line at these three stations to provide the basic temperature, electron density and drift values. Autocorrelators are being developed in Norway by the University of Trondheim, to be used in conjunction with commercially available computers.

Besides the main EISCAT installations, there will be many complementary experiments located near Tromsø, including ionosondes, riometers, auroral scatter radar, magnetometers, auroral all-sky cameras, ionospheric partial reflection and possibly others. The Germans intend to install a powerful transmitter near Tromsø for heating the ionosphere; used in conjunction with EISCAT, this will be a powerful tool for conducting plasma physics experiments in the ionosphere. Of the two transmitters, planning of the UHF system is the furthest advanced, tenders having been received during the autumn, and it is hoped that this radar will become operational in 1979, while the VHF transmitter should begin useful work in 1980. The lifetime of EISCAT should be at least 10 years. Basic specifications for the two transmitters are:

UHF: 933.5 MHz, 2 mW peak power, 250 kW mean.

VHF: 224 MHz, 5 mW peak power, 250 kW mean.

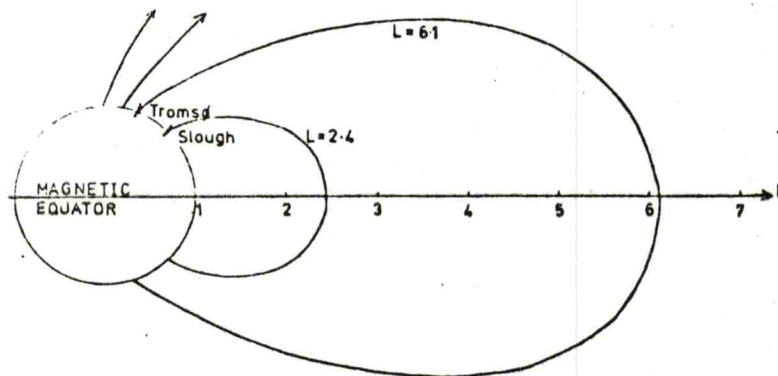
As originally planned, the UHF receiving aerials would be conventional 25 m dishes with some steerability, enabling them to scan up and down the transmitter beam. The UHF transmitting aerial would be a 50 m long-focus, asymmetric paraboloid with offset Cassegrain feed to reduce shadowing. However, it seems possible that a different approach will be adopted, using standard fully steerable dishes, about 30 m in diameter, at all three sites.

The VHF system will have only one transmit/receive aerial. Its design has been the subject of long debate and the final form still remains uncertain. The original proposal, on which Finnish scientists have done some work, was for a novel "chain" aerial, in which chains of radiating elements are mounted above a reflecting plate. Each plate would measure approximately 15 m x 15 m and the total aerial size for the specified sensitivity would be 100 m x 100 m. Any method of steering an aerial of this size will be expensive and several other types of aerial are now being considered. One possibility is an array of small dish aerials and another is a single 100 m diameter dish steerable only in the north-south direction.

After months of international negotiations, patiently and expertly conducted by SRC London Office, the text of the EISCAT agreement was finally settled. The SRC signed the agreement on 30 December 1975, making the UK a full member of the organisation. The governing body of EISCAT is its Council, on which the UK representatives are Dr Atkinson, Prof. Beynon and Dr Horner. On the EISCAT Scientific Advisory Committee are Ross Meadows and Henry Rishbeth (respectively UK Project Manager and Project Scientist for EISCAT). Nick Taylor of RRE (at one time seconded to RSRs in connection with our own MISCAT experiment) acts as consultant. Peter McPherson has also taken part in international meetings on EISCAT, besides being secretary of the "UK Steering Committee for EISCAT", on which are represented ten research institutions and university departments that are interested in doing research with EISCAT.

Peter McPherson

Note: The EISCAT emblem shows three receiving aerials (representing the sites at Tromsø, Kiruna and Sodankyla) looking at an aurora.



The L-value of a place (see figure) is a measure of how far its magnetic field line goes into the magnetosphere. For instance, the magnetic field line passing through Slough ($L = 2.4$) reaches a maximum distance of about 2.4 earth radii from the earth's centre - i.e. a height of 1.4 earth radii above the earth's surface - before returning to sea level at Slough's "conjugate point" off the southern tip of Africa. The field line through Tromsø ($L = 6.1$), where the EISCAT transmitters will be located, goes far out into the magnetosphere into the regions where at least some of the auroral particles have their origin. At very large L values (greater than about 10) the simple definition does not hold, and field lines may go out to much greater distances than their L values would indicate. By pointing the EISCAT VHF aerial northward, it should be possible to make observations in the upper ionosphere and lower magnetosphere up to L values of 20 or even 50 (well within the polar cap). By pointing the aerial southward, observations should be possible at L values down to about 3.5.

Staff News

Congratulations to :

J R MacDougall now HSO

Mrs M Thrift now Specialist Typist

Mrs P G Willmott " " "

Resignations :

Mrs B G Buck SMO

Dr C Jordan PSO

Other Changes :

C R Carter SSO returned to duty after LWOP

J M Woodroffe HSO " " AL " detachment

G M Courtier SSO transferred to IUE Project Management 'A'

B C Stewart SSO " " " " " "

C M Sethna PTO I " " Group III Div. III

First Aid Members

The following members of staff have passed the St John Ambulance First Aid Exam held here following the course held during October and November 1975 :

Stuart Beatson (Chilbolton)

Lawrence Harris

Antony Lucas

Shelagh Mackinnon

Mary Parissien

Janet Ryder

Robert Smith

Antony Thomas

Elaine Wright

The following passed a re-examination at the same time :

Timothy Bevan

Martyn Clowes (Chilbolton)

Lynette Kennedy

Rodney Knight

Norman Lewis (Chilbolton)

Frank Bennett.

Letter to the Editor

Inflammable, Outflammable?

Sir

The remarks by C. Eng. on the subject of "flammable" recall the story of the US Senator who was approached by a correspondent:

"Senator, are you in favour of deflation?"

"No, sir"

"Then are you in favour of inflation?"

"No, sir"

"Then what policy do you favour, Senator?"

"Flation!"

With regard to the odious kiLOMeter, why is it we are not also plagued with centIMetres, meGASycles and piCOFarads? Possibly Yanks do say "naNOMeter"; I've never heard one on the subject. Another Yankism, now regrettably masquerading as with-it officialese in Britain, is "transportation". In due course it will probably spawn a new verb, "to transportationize". The only legitimate use of "transportation" in this country is now defunct, i.e. "forcible removal" to those ex-colonies from which this word, among others, has returned to pester us. How about arranging a colloquium or "bleating meeting" on the misuse of English?

Yours etc.

Non-Eng.-ity

(also overworked)

Chess Solution

Efforts to discover the origin of the game published in the last Newsletter have failed. This solution, therefore, may be incorrect, and I welcome comments from readers.

French Defence, Tarrasch Variation

- | | | | |
|-----------|--------|---------------|-------|
| 1. P-K4 | P-K3 | 18. Q-K5ch | P-B3 |
| 2. P-Q4 | P-Q4 | 19. Q-K7ch | K-N3 |
| 3. N-Q2 | P-QB4 | 20. R-Q2 | B-K6 |
| 4. KN-B3 | N-QB3 | 21. R-B1 | BXRch |
| 5. PXQP | PXQP | 22. NXB | Q-Q5 |
| 6. B-N5 | B-Q3 | 23. RXB | KXR |
| 7. PXP | Q-K2ch | 24. B-Q3ch | K-B5 |
| 8. Q-K2 | BXBP | 25. Q-Q6ch | Q-K4 |
| 9. N-N3 | B-N3 | 26. Q-N4ch | P-Q5 |
| 10. N-K5 | K-B1 | 27. N-K4 | K-B4 |
| 11. B-KB4 | Q-B3 | 28. QXNP | K-N5 |
| 12. B-N3 | P-KR4 | 29. B-K2ch | KXP |
| 13. P-KR4 | KN-K2 | 30. P-N3ch | K-R6 |
| 14. O-O-O | NXN | 31. N-B2ch | K-R7 |
| 15. BXN | QXBP | 32. Q-R1ch | KXP |
| 16. BXPch | KXB | 33. N-K4ch | K-B5 |
| 17. QXN | B-KB4 | 34. Q-B3 mate | |

Stop Press

I have been told that this game was won by Karpov (then a comparatively unknown 19 or 20 year old) against Korchnoi in 1971. It was by defeating Korchnoi, in a match played in 1975, that Karpov qualified to challenge Fischer for the world championship. Fischer refused to play, and Karpov became the youngest-ever champion.

D H Long

LABORATORY NEWS

The Director, as International Chairman of Study Group V, will be present during the interim meetings of C.C.I.R. Study Groups shortly to be held in Geneva. Laboratory Staff also taking part are the Deputy Director, Dr. Lane, Mr. Bradley, Mr. M. Hall, Dr. Bramley and Dr. Davies.

R.A.S. GOLD MEDAL

We offer congratulations to Mr. Ratcliffe, our former Director, on his being awarded a Gold Medal of the Royal Astronomical Society.

LETTER TO THE EDITOR

Dear Mr. Editor,

CHRISTMAS (re) PAST

One of the many hats I put on (and take off as the occasion demands) is marked "Deputy Chairman - Catering Advisory Committee", consequently I hear all sorts of things, some of which are not repeatable, some are, and I cannot let this edition of your News Letter go by without telling you about some of the pleasant ones I have heard since 19th December last. They concern the 1975 Christmas Dinner of course and all expressed admiration for the work of Mrs. Jeremiah and her helpers in decorating and setting out the restaurant, for Mrs. Loudensack and her staff for cooking the food, for Dr. Burrows' musical accompaniment for the carols and for Mr. Mason who looks like becoming a serious rival to Larry Adler.

It seems appropriate then to say, on behalf of all who partook, "Thank You" in your columns to those who helped in any way to make the event the success it was.

Yours sincerely,

R. TUCKER

FURTHER STAFF NEWS

Congratulations to:-

Yvonne Dias and Nick Hillsdon on their engagement.

Marilyn (Ex. A.L.) and David Harrison on the birth of their son Brian John on Wednesday, 21st January.

Marion and Lawrence Harris on the birth of their son Timothy Lawrence on Sunday, 15th February.

SAFETY COMMITTEE NEWS

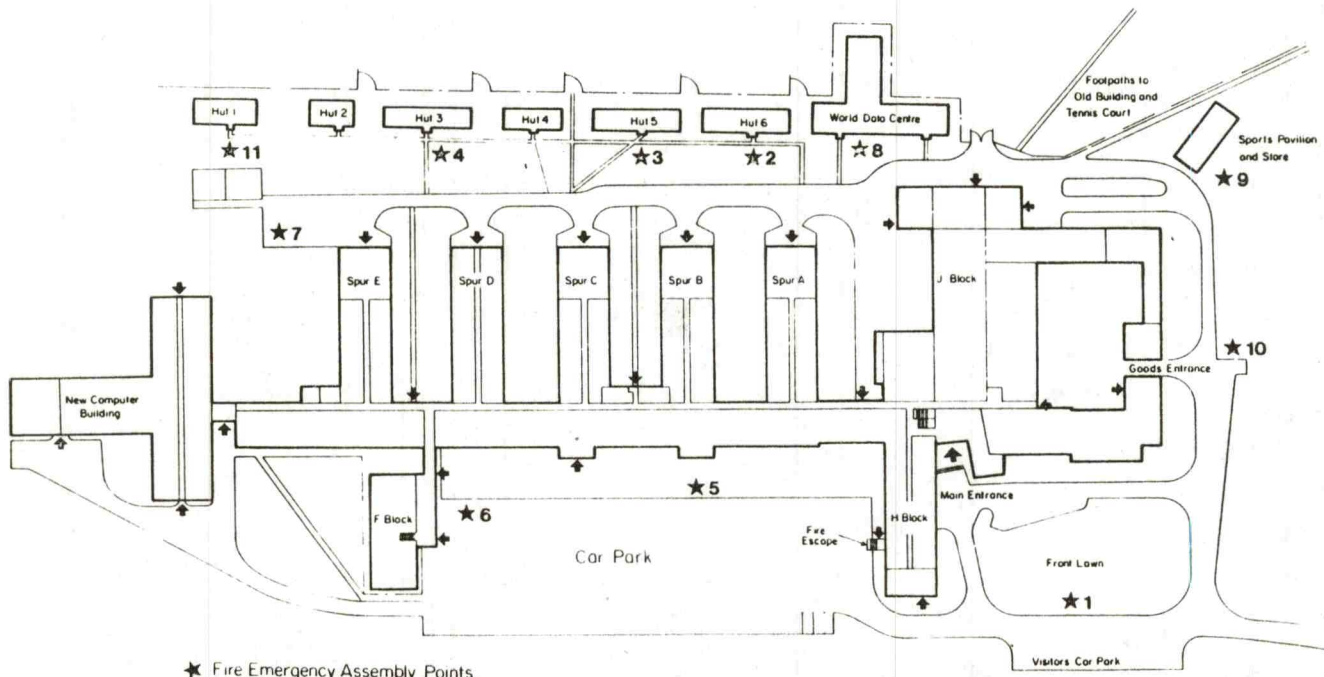


FIRE EMERGENCIES

Staff are requested to note the following revised list of assembly point officers to whom they should report in the event of a fire resulting in building evacuation:

| AREA | AREA OFFICER | | ASSEMBLY POINT |
|---|-----------------|----|---|
| H Block and Library | C. Clarke | 1 | Lawn by Visitors' Car Park |
| Spurs A and B | Mrs N. Faulkner | 2 | In front of Hut 6 |
| Spur C, Toilets G9 and G11 | F. Muzlish | 3 | In front of Hut 5 |
| Spurs D and E | T. Bevan | 4 | In front of Hut 3 |
| Rooms G3 to G8, G10 and G11 and G17 | G. Harris | 5 | Main Car Park opposite G7 |
| F Block and G18 | P. Hicks | 6 | Main Car Park opposite door to Photographic Section |
| Rooms G19 - G26 | M. Tracey | 7 | In road by Substation No. 2 |
| Workshop, Balloon Payload Lab. and Boiler House | H. Lovesey | 8 | In front of World Data Centre |
| Stores, Carpenter's Shop and Garage | R. James | 9 | Alongside Cricket Pavilion |
| Kitchen | L. Mitchell | 10 | Playing field by Goods Yard entrance |
| Huts 1 to 7 | G.W. Gardiner | 11 | In front of Hut 1 |
| Old Building Complex | K. Freeman | 12 | Alongside the Tennis Court |

A Plan showing the actual location of the assembly points is shown below. Practice fire drills are likely to occur at regular intervals and it is essential that staff know where to go when they leave the buildings.

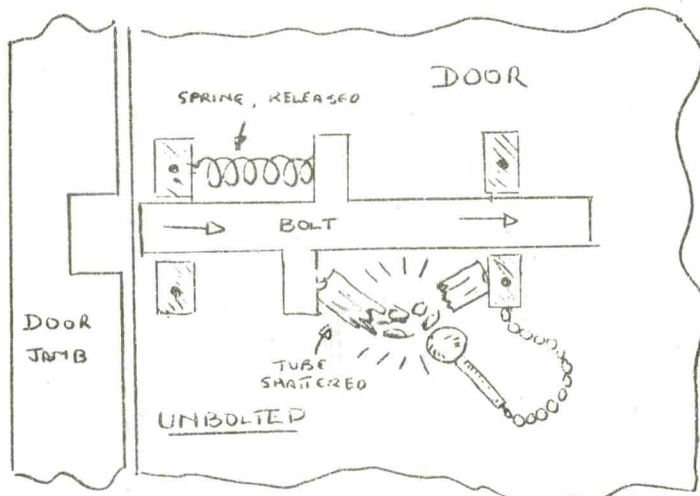
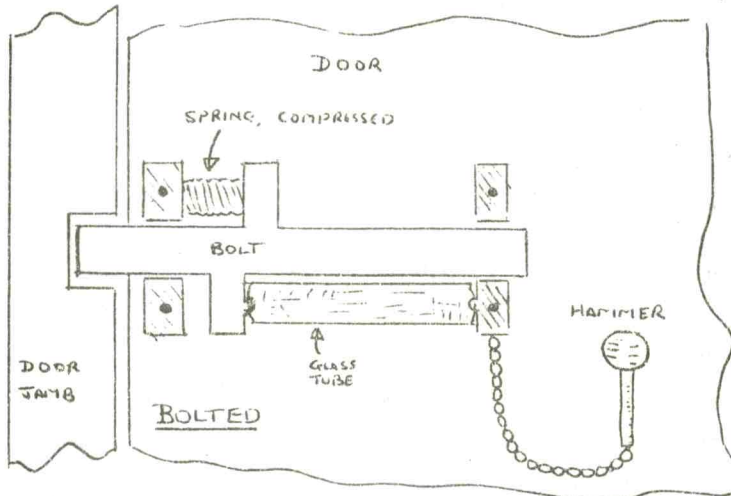


EMERGENCY DOOR BOLTS

Some normally locked doors used as exits during emergencies have been fitted with special bolts.

It has been suggested by the Safety Committee that it might be useful for staff to have a basic knowledge of how these bolts operate to enable them to escape from such areas as quickly as possible.

The diagrams below, which are simplified and not to scale, are more or less self-explanatory. The bolt which is spring loaded is held in the locked position by a glass tube. In an emergency this glass tube is shattered using the hammer provided and the bolt automatically unlocks - all that remains to be done is to open the door to escape.



LETTER TO THE OUTSTATIONS

Dear Colleagues,

It's well known that your correspondent is a modest creature possessed of a charming incompetence in matters of worldly gain. All the same he usually takes good care not, knowingly, to repeat himself in these lines before a decent lapse of time. This time it's different. Scarcely had I disposed of my commentary on the new fire escape than that edifice suffered a sea-change.

The house of glass remains but upon its walls, portrayed most excellent-well, a monster appeared. No ravaging apocalyptic beast this, rather might it relate to those amiable sea creatures of legend who spent most of their time rescuing sailors or transporting holy men from place to place. What is it? Need you ask. Admittedly the creature doesn't look particularly Scottish, why should it, its family lived there countless ages before that enterprising race. The only clues we have to its habits lies in the name-plate (making due allowance for slight changes in spelling over the years) 'Necessarium' it says and we at once have hope of tripartite enlightenment.

Firstly of course it cannot fail to suggest to all that the animal adheres to that most common subject for discussion, the doctrine of the Necessarians, wherein volition is a necessary effect of antecedent cause.

At the same time it proclaims its dwelling a 'Necessarium' or 'necessary house' preferring the classical euphemism to such continental imports as 'Loo'.

Finally and, seemingly, nominally, it is the Place of Nesse - or is it - for if this be so is not Rubidium Ruby's Place? Potassium a Pot house and - but I dare not persist in the Periodic Table

The mystery remains. The creature's philosophy we know; its animal limitations we surmise, yet we cannot name it for sure. Better perhaps thus. Could it not remain, ornamenting our building, exciting interest and forming, as does Kapitza's Cavendish Lab. Crocodile, a subject for even such inexpert photographers as

Yours sincerely,

The Editor.

Reprints January 1976

A. 1163 T Edwards Electric fields and energetic particles
 D A Bryant precipitation in an Auroral arc.
 M J Smith
 V Fahleson
 C G Fälthammar
 A Pedersen

Internal Memorandum

I.M. 370 J R Norbury Rainfall records at the Appleton Laboratory,
 W J K White Slough for the years 1972 and 1973.
 B N Harden