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APPLETON LABORATORY
NEWSLETTER

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A.L. AND FIREWHEEL

Space launch promises fireworks

West German engineers are preparing to launch a bizarre new satellite that will perform like a space firecracker. After it is put into orbit, at the end of next year, it will eject clouds of coloured gas high above the American continent. The venture's purpose is profoundly serious however - it is to help evaluate ways of confining plasma for thermonuclear fusion reactors of the future.

The satellite is being built at the Max Planck Institute for Extraterrestrial Physics at Garching, near Munich. Picturesquely called Feuerrad-Satellit (Firewheel satellite), it will carry four sub-satellites made in Britain, Germany, the US and possibly the Soviet Union.*

After the launch from Kourou in French Guinea, the sub-satellites will eject clouds of ionised barium and lithium in such a way that they become clouds of plasma. Instruments in the satellites, on the ground, and in aeroplanes will monitor how this plasma is affected by the Earth's magnetic field, thus creating the circumstances that exist in fusion experiments where plasma is confined in a torus by a man-made magnetic field.

Conditions in space compared with the laboratory are better for experiments in one important respect. Plasma in space will remain stable for an appreciable time, perhaps up to half an hour, whereas in the laboratory it will break up in a fraction of a second. Thus the disruptive forces can be studied at length with the idea that the results will be important in ground-based fusion research projects such as at the UK Atomic Energy Authority's Culham laboratories.

Feuerrad will get a free ride on the second test launch of Europe's new big booster, the 200-ton Ariane rocket, now under construction within the framework of the European Space Agency. Dr Gerhard Haerendel, the satellite project leader at Garching, stresses that his satellite is relatively cheap - he says it should cost one-twentieth the price of a satellite constructed by the aerospace industry.

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*Britain's role will be undertaken by U.C.L. and A.L. and Canada rather than the U.S.S.R. will be involved in the experiment.

This is not only because of the free ride but because his diagnostic instruments have only to function for a few hours: after that time the plasma cloud will have vanished. This means there is no complicated and expensive energy supply with solar cells - plain batteries will do the job. In addition, Haerendel will use "spare" satellite equipment left over from earlier missions of other satellites (GEOS, ISEE and other ESA and NASA satellites). The equipment was sitting on the shelves in different laboratories and institutes in Britain, Germany and the United States. Haerendel asked the scientists involved whether they would like to cooperate in a new venture and hardly anyone declined.

Apart from helping in fusion research, the experiment could be important in astrophysics - for instance understanding what happens in comets.✓

(New Scientist Article)

The Laboratory will have joint responsibility with U.C.L. (M.S.S.L.) for the assembly, integration and testing of one of the four sub-satellites. In the UK this will particularly involve Dr. Bryant's group, he being Project Scientist, Mr. R. W. Mason Project Manager and Mr. T. Edwards Payload Engineer. Support will also come from A.L. Procurement (Mr. J. Reed) and A.L. Telemetry groups (Mr. A. Hall).

Responsibility for one of the experiments (energetic charged particles) rests with us (Mr. M. J. Smith) as does the overall electrical design and integration of the sub-satellite. Mechanical and thermal design will be completed at M.S.S.L., then the spacecraft will be integrated at A.L. It will be essential to solve any problems of thermal balance and effects caused by radiation, for this is a satellite in its own right and may well have to orbit for some weeks before being brought into operation.

That our Laboratory has been chosen to undertake these tasks is surely a mark of the high regard which our expertise commands in some important circles.

✓It is also a natural extension of, and complement to, work now being carried out by A.L. and M.S.S.L. in rockets launched at high latitudes.

Staff News

Congratulations to:

David and Hilary Matheson on the birth of their son Nicholas John.

Chris and Carol Gibbins on the birth of their daughter Emma Jane.

George and Pauline Walters on the birth of their daughter Elizabeth Rose.

Tony Thomas and Heather Welch on their engagement.

Steve Martin	now Ph.D.
Phil. Richards	now Ph.D.

Heather Welch	now C.O.

Welcome to:

E. J. Lisher	H.S.O.
P. Murrell	C.O.
D. M. Simpson	P.T.O. II (Culham)
Mrs. C. Brooks	C.O. P/T
D. L. Drummond	S.O.
M. R. Russell	S.C.S.
A. M. Swallow	S.C.S.
Mrs. B. Pearce	C.A. P/T
Mrs. J. A. Murray	Typist
Mrs. S. Y. Ewart	Dup. Op. P/T
Miss B. Pooni	C.O.
G. H. R. Liddiard	C.A.

Resignations, Retirements etc.

T. F. Smith	C.O.
G. Bennett	S.S.O.
Mrs. I. Frost	C.A.
D. Watts	C.O.
D. Boys	P.T.O. III
Mrs. B. M. Hall	C.O.
R. B. Young	S.O.
D. W. Wellby	S.O.
V. A. W. Harrison	S.S.O.
J. A. Williams	P.T.O. II
C. R. Carter	S.S.O.
R. A. Leach	S.C.S.
Mrs. S. Akrivos	Pers. Sec.
T. A. Austin	S.C.S.
Miss V. P. O'Keefe	C.O.
J. S. Moore	P.T.O. III

Other Changes

M. J. D. Courthold	S.O. Now Div. VI Gp.I.
F. J. Swales	P.S.O. to Central Office, Swindon.
G. P. Harris	H.S.O. Now Div. VI Gp. I.

Former Colleagues

Congratulations to John and Helen Dudeney on the birth of their daughter Elizabeth Amy.

SRC INDOOR SPORTS DAY

Most of you will be aware by now that SRC Indoor Sports Day this year is on Friday 20 April 1979 at Norton Recreation Centre (near Daresbury Laboratory) from 12 noon onwards. For those of you who need reminding - it is at the same place as last year. The formal part of the day will be followed

by a Hot Pot Supper and Disco - cost £1.00 per head - at Daresbury Laboratory from 8 pm. It is hoped that this year Appleton will put up a more sizeable force, as this may perhaps be our last year to enter a strong team from this location.

This year the following events are to be organised in the manner stated. I would urge you all to enter one event only. The names of the local organisers are given below. Please enter your names on the space provided on the notice-board near the Library.

(1) Badminton — Roger Burdett, Charles Whitlock

American Tournament
Mens or mixed pairs

(2) Bridge — Hari Shah

Pairs event

(3) Chess — Will probably be organised by Dudley Long

Individual event

(4) Darts — Tony Thomas

301. Teams of 5
Only two teams per establishment

(5) Dominoes — Piers Eggert

9 Spot Dominoes
Pairs event

(6) Squash — Dick Holdaway

Team event
Team of 5 - 2 females, 3 males

(7) Table Tennis — John Delury

American Tournament
Teams of 3

(8) Volleyball — Jim Foster

Mixed Teams of six
Minimum of 2 females per team

Spectators are also welcome, within the regulations laid down by SRC regarding leave and allowances.

Please put your names down as soon as possible so that practice play can start, if already not under way.

For further information please ask your event organiser or your local representative whose name is

Hari Shah

THE FIRST YEAR OF IUE OPERATIONS

The first year of IUE has seen 5000 astronomical spectra obtained including a few of "empty" space when the satellite missed the target! 620 of these were obtained by SRC supported astronomers who have been carrying out 37 different programmes. 61 visits by observers from the 8 universities and 3 SRC establishments involved have been made to the ground station, VILSPA, near Madrid. They use accommodation and a car organised by our admin division. As well as scheduling observations and training observers, Appleton staff have been involved in a number of collaborative programmes with universities. The highlight for Prab Gondhalekar has been the observation of distant QSOs with red shifts $Z > 3$ and the measurement of their previously unknown spectra down to 300 Å red shifted into the IUE range 1200 - 3200 Å. Dave Stickland, our man in Madrid, has discovered a heavenly body which is a hot companion to the cool supergiant HR8752, one of the most luminous stars in our galaxy. He has also obtained a very complete series of observations on the Nova Cygni and this being the first such series obtained in the UV their analysis should considerably advance our understanding of Novae. Mike Sandford has observed X-ray emitting binary systems and the effects of X-rays from the compact star (neutron star, black hole etc.) on the photosphere of the primary star.

At ARD the highlight for Bill Burton has been the absence of emission lines in BL Lac objects indicating they have no gas around their nuclei, and for Gordon Bromage the high resolution spectrum of a Seyfert galaxy is enabling him to identify the clouds of absorbing gas with different velocities around the nucleus.

Those who were involved in the camera development programme will be pleased to know that the two cameras in use have shown no degradation. Unless we suffer radiation damage to the electronics, IUE has a good chance of lasting until the output of the solar cells and batteries drops too low in about seven years time!

It really was worth all that effort after all.

M. C. W. Sandford

IUE 1ST ANNIVERSARY - JOINT AL/UCL CELEBRATION

On Friday 26 January 1979 the IUE Project - UCL and AL - met to celebrate IUE's first anniversary. The Director gave special dispensation for the use of the Board Room for a party and an organizing committee consisting of Brian Anderson, Mike Courthold, Geoff Douglas and Mike Trower, chaired by Kim Ward, did a magnificent job in making it all happen.

Although the bad weather of the preceding days caused many distant colleagues to cry off, around 60 people were able to attend. The former SRC Director of Science and Astronomy, Space and Radio, Mr. M. O. Robins, presented the IUE Project teams at AL and UCL with replicas of the NASA Group Achievement Award, the original of which resides at GSFC, and Professor Sir Harrie Massey proposed the toast. Both these distinguished guests made exceedingly complimentary remarks about our 'remarkable achievement' and our 'skill and staying power'. For those who felt we had taken more than our fair share of stick when things had not gone well, it was good to know that our efforts were appreciated. It was also pleasant to find that Sir Harrie's toast - not to the continued success of IUE since the wish did not need to be voiced - was 'to the people who made it possible'.

It was most enjoyable to meet past and present IUE team members and their ladies who, between them, had provided a regal buffet supper. The festivities continued until the small hours, observed by Kim Ward's UV-illuminated model of IUE which went continually round and round in small circles. Some of us who were on the IUE Project in the 'dark days' remembered when we had felt that we were doing something rather similar.

Thanks, for a very successful evening, are due to the many willing helpers, particularly those who returned on Saturday morning to restore the sanctity of the Board Room. We look forward to a further year of IUE operations - and perhaps even a second anniversary celebration.

P. J. Barker

Retirements

Mr. B. N. HARDEN

Bill Harden, who retired in December, was one of the now small group of colleagues who spent the first few years of their career in the huts of the "old building" at Ditton Park. Born in Auckland, New Zealand, he attended the University College there from 1937-1940, returning there to take an MSc in Physics after the Second World War. The intervening war years were spent in the Royal New Zealand Air Force and the R.A.F.V.R.; as a reluctant guest of the Luftwaffe in P.O.W. camps. However, the hardships of the life there served as an appropriate training for the rigours of field work at the Radio Research Station (as it then was), which he joined as an S.O. in 1950, after a period at Imperial College.

His early work was on tropospheric propagation in a group led by Dr. Saxton, and the results obtained made an important contribution to the planning of V.H.F. and U.H.F. broadcasting. He later moved to studies of transistors and then t measurements of atmospheric noise during the International Geophysical Year (IGY). With the arrival of the "space" era he contributed to the design of several experiments for rockets and satellites. In 1969, however, he returned to tropospheric propagation as group leader of a team engaged on studies of the effect of precipitation on microwave terrestrial links, a major project carried out in collaboration with the Post Office. The successful completion of this work, and especially the development of a generalized prediction procedure based on the data, are largely the result of Bill's contribution.

Always a loyal New Zealander, despite his long period of exile, Bill could always be relied upon to defend whatever mayhem his compatriot All Blacks were perpetrating on the rugger field. We all hope he will have many opportunities, in a long and happy retirement, of following their fortunes at close hand - both here and perhaps "down under". We shall certainly miss him here at A.L.

Mr. V. A. W. HARRISON

After 34 years of public service together with an intermediate 4 years in the RAF, Vic Harrison decided at the end of last year to hang up the well-worn pen with which he assiduously made out his notorious claims and to take early retirement. On 19 December he was duly presented, by the Director, with an

Anglepoise lamp, a calculator and the best wishes of his many friends

Early in his career, Vic transferred from the Ministry of Supply to NPL and thence to RRS. He did a tour of duty in the Falklands and another in Singapore and for the last 17 years has been the energetic participant in numerous space research projects, including some of the UK Ariel satellites and collaborative programmes with ESRO.

Most recently Vic was amongst those of us who were sentenced to several years hard labour on IUE where he made major technical and management contributions towards its resounding success. He not only left his mark on the project but, metaphorically speaking, on some of the people working on it. His thoroughness and incredible persistence soon became known on both sides of the Atlantic and occasioned the agonized cry from a weary contractor 'whatever you do don't point Vic Harrison at us'. Whilst carrying out the crucial task of rectifying a UK camera fault - a potential 'show-stopper' - at the launch site and under the full glare of a NASA spotlight, Vic found time for critical examination of some of the NASA on-board hardware, and characteristically identified a number of highly desirable improvements. With long experience as the benevolent bringer of unbelievably bad tidings he then charmed NASA into their own bit of frantic activity. After launch he was summed up; "That Vic Harrison is a lovely guy - such a gentleman".

It is interesting to discover that some 30 years earlier an NPL probation board, in more restrained British fashion, had pronounced him to be 'an excellent type'.

We agree with both sentiments and wish him and his wife Pam a happy and well-earned retirement in their new home near St. Austell. Knowing Vic, he will be anything but idle, so watch out Cornwall.

Mr. D. MORTIMER

"Don can't be old enough to retire" was the general reaction to the news that he was taking premature retirement. Don's appearance, scarcely a grey hair to be seen, was the envy of colleagues many years his junior.

Yet he had joined the Radio Division of the NPL at Teddington back in 1947. His move to Ditton Park in 1956 was but the prelude to his wanderings as he had two tours of duty in the Falkland Islands and one in Singapore in the course of his work with ionosondes and satellite ground stations. Transfer to SRMU in 1972 confined his travels to the United Kingdom and limited them to days rather than years.

Over the years the acquisition of a wife and four children reduced Don's cycling activities from regular rides to work and for relaxation to mere maintenance of the family machines and helping with cycling proficiency classes in Egham. Journeys to work were transferred to a car large enough not only for the family but also to tow the caravan regularly used for holidays, despite comments on vans cluttering up the roads at Bank Holidays.

As a colleague Don was the most pleasant and helpful of men showing no sign of the stern Victorian father image which he implied he showed at home.

We wish Don every success in his plans to find a "useful" job within cycling distance of his home, and a long and happy retirement when he and Joyce decide the time has come for him to give up work altogether, (domestic duties excepted of course).

Letter to the Outstations

Dear Colleagues

Thus far it's been a twitchy sort of winter. Not only are there what might be termed pre-nuptial nerves on our part, when faced by the Council's Act of Union, even the very elements themselves conspire to grind us down - or to build up our characters. One and all are subjected to a thermal cycle about zero; winds blow first this way then that. Nature mirrors the emotions.

We freeze, melt, refreeze and come the more to appreciate the efforts of those who have worked above and beyond the call of duty to prevent Ditton Park from vanishing beneath the ice sheet.

Meanwhile within, preceded by skirmishers armed with rulers, the decorators have come amongst us once again. Room colours, carefully chosen with a view to suit current occupants or spite their successors, are being put on thick and fast. Paint fumes grip one by the throat; features long familiar in the form of dirty marks and flaking plaster vanish beneath clinically clean surfaces.

All very nice .... but ..... there's something ..... 'clinical' is a clue. This measuring up and cosmetics seem, in the present circumstances, to have undertones of 'The Loved One'. Maybe not though. Our old Lab., suitably tarted up, might fetch a fair price. If she must sell herself, let's at least ensure that she can afford to set up in business, on the shady side of Jermyn Street, with the blessing of us all, including,

Yours sincerely,

THE EDITOR

JANUARY/FEBRUARY 1979 REPRINT LIST

A1271 D. J. McEWEN, D. A. BRYANT
'Optical-Particle Characteristics of Pulsating Aurora'
JATP, Vol. 40, pp 871-876.

A1314 W. M. BURTON
'Echelle Spectrographs for Astronomy'
Trieste Astronomical Observatory, pp 73-92.

A1274 D. LLEWELLYN-JONES, R. J. KNIGHT, H. A. GEBBIE
'Absorption by water vapour at 7.1 cm^{-1} and its temperature dependence'
Nature, Vol. 274, pp 876-878.

A1168 W. M. BURTON, R. G. EVANS
'Spectroscopic Observations of the Be Stars η Cen, γ Gas and φ Per'
Be & Shell Stars, 1976, pp 199-207.

A1289 B. C. FAWCETT, A. RIDGELEY, G. E. BROMAGE
'The Spectrum Ar IX and Extended Spectral Classification in Ar V to Ar VIII and Ar X'
Physica Scripta, Vol. 18, 1978, No. 5.

A1302 B. C. FAWCETT, G. E. BROMAGE, R. W. HAYES
'Observed spectra due to n = 3 to 4 transitions in Fe XVII and isoelectronic spectra'
Mon. Not. R. Astro. Soc., Vol. 186, 1979, pp 113-116.

A1279 E. N. BRAMLEY, R. BROWNING
'Mid-latitude ionospheric scintillation of geostationary satellite signals at 137 MHz'
JATP, Vol. 40, pp 1247-55.

Internal Memorandum

NIL