



orbit



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Journal of the Rutherford High Energy Laboratory



Cover: Occupants of Radiation Protection's Landrover - a vehicle in daily use.

Editorial

We are sorry to announce that this is the last issue of Orbit, at least in its present form. Orbit, as we know it, is a very rare animal for the public service. It has never been an official arm of Management but rather pursued an independent editorial line. Nevertheless it has been supported from public funds. In retrospect it seems that this happy state of affairs was too good to last forever and the support has now come to an end.

There is another reason why the axe has fallen now rather than later. The initial success of Orbit, which generated the momentum to keep it going, depended largely on the availability of Brian Southworth the first editor. It has proved impossible to replace him, and a journal without an editor cannot last indefinitely.

All is not lost, however. It is hoped to establish a new Laboratory journal, perhaps in the new year, which will appear quarterly. It will be concerned with the communication of information on scientific achievements of the Laboratory and similar places and on general scientific matters. The style and experience of Orbit should help to make it a lively house journal.

It remains for us to thank the Laboratory for its support in the past, and for making Orbit what it was. We would also like to acknowledge letters from the following people who have appealed in various ways against the decision.

Acting Editor: T.R. Walsh.
Assistant Editor: H. F. Norris.

| | |
|----------------------|-----------------|
| A. P. Banford | P. Mackay |
| M. R. Bird | J. Macken |
| J. W. Bittner | V. Marren |
| G. W. Brewer | J. McPherson |
| M. Carrington | E. M. Mott |
| R. C. Carter | D. Ness Wilson |
| W. J. Clark | S. Norcliffe |
| W. Corderoy | A. G. D. Payne |
| B. Faldrowicz | P. G. Reeve |
| K. Freeston | D. A. Sharples |
| G. Gallagher-Daggitt | R. G. Smith |
| W. Glasgow | M. Stylianides |
| L. F. Goodall | F. J. Swales |
| H. Hawthorne | N. Swan Taylor |
| M. Hodges | E. W. G. Wallis |
| T. A. Hodges | C. R. Walters |
| F. R. A. Hopgood | J. C. Webb |
| D. Jones | |



Letters to the Editor

(Pseudonyms are accepted provided the author's name is known to the Editor.)

Sir,

I would like to make an unoriginal suggestion. It is about a way in which our Laboratory can contribute to the nation's well-being!

We in Britain suffer from the chronic immobility of our skilled manpower. We make a virtue out of stagnation in a job - and call it security, or even stability. We imprison people in their environment - and call them reliable, or even loyal.

We can link mobility with an aspect of our Laboratory's work. A high energy physics laboratory, where the frontiers of physical knowledge are explored and technologies pushed to the limit, should be a very invigorating place. The Laboratory has the potential of being a world first-rate institution in certain areas of applied sciences which are crucial to high energy physics machines and to experimental techniques. We obviously can not, and must not, proceed on too wide a front in applied sciences, but should select a few areas to study in depth. In these areas, as already in high energy physics, we should encourage a continuous flow of scientists and technologists from universities and industry. If we, as a matter of well publicized policy, carried a much higher proportion of fixed-term staff, the universities and industry would be more willing to let their staff come here for a specified period.

The major impediments to mobility are pensions, housing and education. These problems can be alleviated by offering cash incentives, for instance somewhat higher contract salaries, payment of employer's superannuation contributions into recognised life insurance schemes, and gratuities at the end of contract. I am sure many able young scientists/technologists would prefer the above alternative to a permanent post. It is heart-breaking to see the scandal of able young scientists spending their productive career in a single job for the distant promise of a pension in their sixties. After a few years a job often does not require the initial intensity of intellectual effort. As the challenge ebbs so does the enthusiasm. These one-job scientists constitute a far worse and more irrevocable brain-drain. Slipping quietly down the hole, they are completely lost, not just to the nation, but to the wider technological community.

A laboratory with a smaller permanent staff offers organisational advantages as well. There are fewer axes to grind, and in-fighting, should such an unmentionable thing happen, is contained in a smaller circle. The organisation becomes more flexible and precedents do not assume undue importance.

There are difficulties, a few real, many imagined, in implementing such a scheme. But, given the will, I have confidence in the collective wisdom of educated scientists and technologists to solve them. Will we take up the challenge and demonstrate that we are aware of, and act upon, our responsibilities for the health and vigour of this - our - technological society?

K. D. Srivastava.

Sir,

I should like to thank Mr. Walters for dignifying me with the title "Senior Scientist" - I must be looking as old as I feel some mornings!

More seriously, Mr. Walters criticisms and comments refer to two distinct and separate features in April's Orbit.

In the new article on the American 200 GeV accelerator he objects to my choice of the verb "play" when applied to politicians. No one who has read the "Hearings before the sub-committee on Research, Development and Radiation" ¹ can doubt that the professional politicians involved at the highest level - as Mr. Walters says - "take their work seriously" There is, however, in American politics a phenomenon known as the "pork barrel" - and the small minority of people involved in playing pork barrel politics are certainly not deserving of "mutual respect" - I refer Mr. Walters to the comments of Representative Hosmer in the Congressional Record ² on this subject.

My letter to the editor dealt with the status of Science in the U.K. and was in no way connected with the 200 GeV article. It is therefore extremely hard for me to understand how I insulted the potential British "customers" for Science - Industry, Commerce, Finance etc., by my comments on the American science in a completely independent article.

Ralph Thomas.

1. "Hearings Before the Subcommittee on Research, Development and Radiation of the Joint Committee on Atomic Energy"

March 2, 3, 4 and 5 1965 U.S. Govt. Printing Office, Washington D.C.

2. Op.cit. Remarks of Rep. Hosmer. P.67.

The Organization Monk

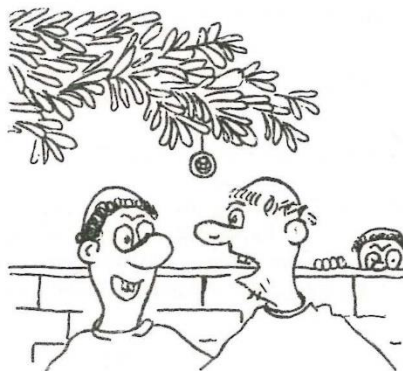
"Ah, there you are Roland - I've been looking all over the Priory for you. Father Bruno would like to talk to you."

"Well I'm not at all sure that I want to talk to our dear Prior. I've been sitting here in the garden trying to collect myself - that's why I didn't come to the meeting, I couldn't trust myself not to say things I might regret."

"You've heard the news then?"

"Yes and it makes me furious! At times like this, Sebastian, I sometimes think of leaving the Order altogether."

"Don't talk like that, Roland!. It's just this latest Council decision that has upset you. There's still valuable work to be done within the Order - if people like you were to leave, the future would indeed be black."



"But doesn't this latest piece of folly anger you, Bas. A new administrative building for the Priory! It's fantastic! - after all our efforts - and I was sure we had convinced most people that the other schemes should have priority!" "I know how you feel, but we mustn't give up. We must press hard for your new Cloisters next year."

"I mean it's crystal clear to me that our teaching activities are one of the most important things that we do. The present Cloisters are completely inadequate!"

"How right you are! But I can't understand why we aren't getting the extension to scriptorium - that was a very modest proposal."

"Isn't it obvious why? Haven't you seen the plans? Look at the size of those cells! And those windows! It will cost a fortune in glass. Why, this new building will overshadow the Chapel; it's monstrous!"

"I must say I'm very unhappy about it all. At the meeting today, Father Bruno put forward quite cogent arguments in favour of the scheme - the main one was that the efficient administration of the Priory would leave us free to devote all our time to these other activities which we think are so important. It's hard to gainsay that argument on principle."

"In principle it may be sound, but in practice it simply doesn't work like that! We have more time but fewer facilities and how do we know that the administrators will not interfere with our work? Before long there will be another extension to their buildings and then we shall be enlarging the grounds and building more walls."

"There seems to be a force at work which I don't understand, Roland - it frightens me sometimes. I wonder if the Abbeys are becoming too powerful, really."

"It's the work of the devil! Some people are beginning to suggest that the Devil may not exist, I'm told. I should have thought this was pretty clear evidence that he does. Why are our relations with the Abbey less cordial than they should be, when we all belong to the same Order? Look at the development of the Order itself, as a whole. First a small group of dedicated people, who did real work, then the Abbey, which grew larger and larger, then the small, subsidiary establishments like our own Priory and now they are growing bigger! Where will it all end? Have you visited the Abbey recently? - no? - well you should. Old Father James, since he became Abbot, why, he's running a small town! He has his farm, his smithy, horses, spinning and weaving - but what has all this to do with the Spirit?"

"What was the story I heard about fish breeding?"

"Ha, ha - that's the latest thing. We must all eat more fish to obtain a balanced diet. Of course you can catch fish from the river but the modern way is to breed them under controlled conditions in a pond. You should see the quantity of stone he's putting into that pond! Why in the twentieth century the Abbey and ourselves will have crumbled into dust, but the fish pond will still be there!"

"This isn't a good place to talk, Roland, I think we had better move. The acoustic properties of the Priory are very strange - you can often hear people whispering a hundred yards away." "You've noticed that? I think it may not be entirely accidental."

"What do you mean?"

"Hadn't you realised that the Priory is identical to that one in France which has the same curious property and has been visited by only one member of our Order. It isn't built in the traditional style as many people have noticed."

"But Father Bruno is the only person who has been to France -- Roland --- you're not suggesting that he deliberately had the Priory built in this way so as to eavesdrop on our conversations? That would be a very dangerous idea!"

"We live in dangerous times. All I'll say is that our Prior is always extraordinarily well informed. Anyway isn't it logical? If the organisers are to operate efficiently they have to know what we're thinking."



TILEHURST TO OXFORD

27 MILES FOR OXFAM by W.S. EARLE

Mr. Earle describes how he became one of 115 walkers, each backed by sponsors contributing 1d or more per mile to Oxfam.

Two weeks before Easter Monday when the walk was to take place, I found myself in the awkward position of being "committed". Not only had I been persistently challenged by my children to join them in the walk, but I had made the fatal mistake of mentioning it in the office which provoked additional encouragement from my colleagues who are noted for their sadistic tendencies. Things developed rapidly to the point where I could not extricate myself without losing face and yet I had a horrible suspicion that in attempting to walk 27 miles, I might easily collapse and make a greater fool of myself than if I simply backed out hoping eventually to live it down.

Having deliberated on my dilemma and repeatedly cursed myself for opening my big mouth, I decided that I must prove to myself conclusively whether or not there was any chance of making the distance before going on public exhibition. My plan for this was simply to try to walk home from work - 20 miles, first taking the precaution of arranging for a rescue vehicle to set out in search of me at about 9.00 p.m. I also selected a route on which the pubs were very evenly spaced so that in the event of distress, I should not have far to go before being able to collapse in comfort. One friend agreed that this was a good idea and forecast that with the aid of a running start and a favourable wind, I might possibly make the Horse and Jockey. Realising that I had Hobson's choice, the next Friday evening while you were queuing in your cars and buses to get out, I set off from R. 25

making my way to the A 34 via the prefabs at what I thought was a good pace. On the way to East Ilsley, I felt that I was walking well, but after three cars had risked serious pile-ups in their efforts to stop and offer me assistance, I could only conclude that perhaps I seemed to be in need of it. By the time I took the Compton Road, I was really in my stride and having got clear of the heavy traffic found the walk becoming pleasant as well as stimulating. To my surprise 10 miles was completed comfortably in 2½ hours and at this point, I decided to pause for rest and refreshment. All was well except for a blister which I was able to render painless with a plaster. After ½ hour I found that I wanted to be walking again as I felt chilly and noted that I should have worn extra warm clothing. However, I continued in high spirits but found that it took rather a long time to warm up again.

At 15½ miles now dark but still in good fettle, I encountered the rescue vehicle and airily waved it on to wait at the 17 mile point. This proved to be an instructive mistake because fatigue set in rapidly during the next 1½ miles. By the time I reached the vehicle, I had difficulty in climbing in. However, I felt confident that by slowing down the pace, wearing plenty of warm clothes, taking frequent hot drinks and rests, I could manage the 27 miles. You may be interested to note that fatigue though very painful, did not prevent sound comfortable sleep and after two nights of this tonic, I felt very fit and tremendously refreshed.

Most adults have plenty to say about today's teenagers - not always without good cause or real concern. Those of us who have the added responsibility of being parents of teenagers probably criticise them even more. We criticise their untidyness, their clumsiness, their noise and their knack of taking everything for granted as if all good things are their's by right and nothing is a privilege any more. When we hear of an enterprise of this nature where the youngsters are prepared to tackle a tough walk to raise money for the world's hungry, we realise that they do care - that they are concerned.

For many, the walk would demand determination and courage - courage to keep going when they wanted to give up - courage enough to struggle for something they know to be right and good.

And we adults say "splendid - let's help them on a bit". Well, we did, and the youngsters are truly grateful. On their behalf may I say "Thank you" to the 70 sponsors from Rutherford Lab and AERE who contributed a total of £12. You will be pleased to know that at the time of going to press, the total for the walk stands at £285, with still some to come in. The parents are grateful too.

I was surprised to see how much effort the parents put in, many of them acting as Marshalls patrolling the route, encouraging the youngsters every inch of the way - sometimes almost cheering them on. I was rather slow on the uptake but later after all was over, the penny finally dropped, for in every home in Tilehurst peace and quiet reigned. No longer did the doors slam, the windows rattle, the lights flicker and the ceilings crack every time the youngsters came in and hurried their way upstairs. They were too tired; and how we revelled in the respite. How delightful to see the boisterous bounce toned down to the gentle limp.

This reign of bliss was not to last for long, things are back to normal again now, but though it was short lived and it was well worth the price of two tired feet and one blister.



Solution to 'Which?' (April Issue)

George's instructions to Petal before she went round the ten compost shops were: 'at the first three shops just note down the prices; after that buy the compost at the first shop which is selling it cheaper than all the previous shops'. It was of course understood that if Petal got as far as the last shop, she would buy the compost there anyway.

The argument that led George to this strategy went as follows. Imagine Petal arriving at, say, the sixth shop. Whatever plan she was working to there are really only two courses of action open to her at this shop:

N to note the price but not to buy.

B to note the price and buy if it is less than that charged at the previous shops.

How was she to choose which course to take? Since they knew nothing about the relative merits of the shops, George decided that he could do nothing better than give his wife a list stating which course to adopt at the first shop, which at the second, and so on.

Next George argued that if the list was to contain so many N's and so many B's, then the most sensible order to take them in would be with all the N's first then all the B's, since this meant putting the information from the N-shops to the best possible use.

The question then remained: what was the right number of N's and B's? Suppose tactic N is adopted at the first N shops. Then if the cheapest buy is at any of these Petal has no chance of getting it. If it is at the (n+1)th she is bound to buy it, i.e. the probability is 1. If it is at the (n+2)th she will buy it only if she gets as far as this shop. This she will do if and only if the cheapest of the previous shops is one of the first n; the probability of this is n/(n+1). Similarly if the cheapest buy is n/(n+2), and so on. Since the cheapest compost is equally likely to be at any of the shops, Petal's chance of getting it is

$$\frac{1}{10} \left(1 + \frac{n}{n+1} + \frac{n}{n+2} + \dots + \frac{n}{9} \right).$$

After much doing of sums George decided that this probability rose as n went from 0 to 1 to 2 to 3, and thereafter fell. Thus the best chance was with n=3. So Petal's list was:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| N | N | N | B | B | B | B | B | B | B |

This gives her a probability of very nearly 0.4 of getting the best buy. In fact George (who is a mathematician) told me that however many shops there were, he could always find a strategy that would give his wife a probability better than 0.3678 (=1/e).

Herman.

A MORE REALISTIC SOLUTION:

Dear Herman,

George and Petal are friends of mine and George is in for a shock. If he thinks Petal is going to tire herself out trudging round compost shops he is very much mistaken.

Petal intends to sit quietly at home and enquire the ten different prices of compost by 'phone. She will then ask the cheapest shop to deliver the compost, C.O.D., the following Saturday. George will be at home to take delivery while Petal is out buying herself a madly expensive hat.

George will obviously settle the telephone bill.

Lulu.

Orbiting Around

In his introduction to this section in February 1965 Brian Southworth stated, "Surveys conducted by the British Association of Industrial Editors have indicated quite clearly that the most widely read section is that dealing with the 'Personal News' type of material". It has been my privilege to edit this section for the past sixteen months and during this time I have had ample opportunity to realise the truth of that statement.

Orbiting Around has included a total of 55 pages with 46 interviews, nearly 40 photos, news on darts, cricket, table tennis, rugby, ten pin bowling, dancing etc. I have congratulated 14 couples on their engagement, 22 couples on their marriage and 100 parents on the birth of 52 children during this period. I would like to thank the many people who have helped with news, copy and ideas and particularly those who have been kind enough to allow me to interview them including those who contributed to the Outside Hours feature.

Inevitably the question arises, "has it been worthwhile?" and one has to admit that there have been occasions when the lost weekend or the evening out that did not happen have raised momentary doubts. The response to each new issue has however quickly dispelled any such feelings and I can do no better than to quote from Brian's farewell article: "I enjoyed working on Orbit and I hope that it has made some contribution to the life of the Laboratory".

Harry Norris.

RHEL Annual Darts Tournament

The evening of 10 June was rather warm so there was some keen competition between the darts board and the bar. Even with 13 teams toeing the line and raring to go, the bar was used some time before the boards, yet the accuracy of the players did not seem to be affected in anyway.

Bill Oliver of R. 25 won the singles final and the R. 9 fitters won the team prize, both for the second year running. Administration held on to a final this year by winning the pairs award. The two ladies teams entered played a 1001 knockout. The winners, Sheila Alcock (Capt.), Shirley Moore, Christine Pepperell and Marion Little each received a brooch.

I must thank all the people who worked so hard getting the coffee lounge ready, the management, for allowing us to use it, and the teams and supporters for making the evening go so well. It was the most successful social evening to date, and if you have any ideas for future social evenings, please don't hesitate in putting your ideas forward. Somebody must want to challenge somebody else to something.

LORD MAKES TRACKS



"After some 10 years at the Rutherford Laboratory I felt in need of a change". These few words explain the absence of a familiar figure around the site. David Lord left in May to join CERN at which establishment he is no stranger. During the last five years he has been concerned with track analysis and during this period he spent four months at CERN working on the Hough-Powell Device "on-line" set up, "to see if it would work".

Anyone who was present at David's lecture in the Applied Physics Series will realise the difficulties involved. Sufficient to say that the HPD is "on-line" at the Laboratory. At CERN he will be working on the same kind of problems. Our best wishes go with David for continued success in his new post.



Challenge Trophy Success

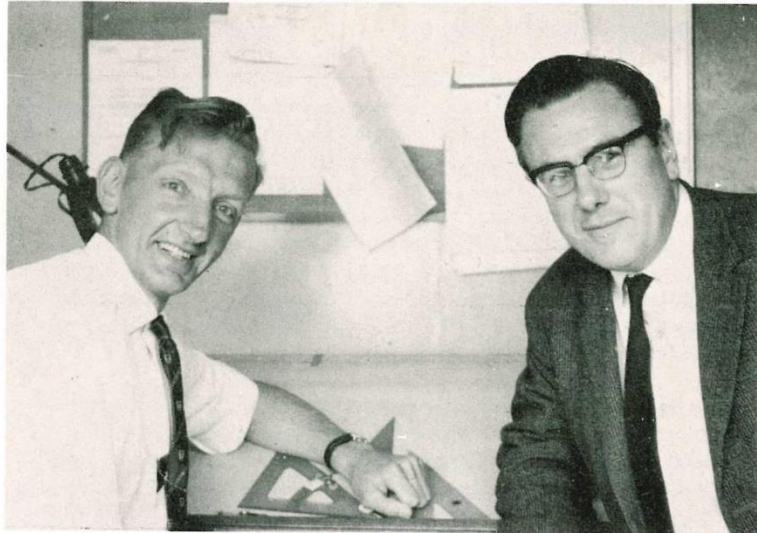
A. E. R. E. Recreational Association Darts Team Challenge Trophy for 1966 was won by a team from the Rutherford Laboratory in a keenly fought contest on 6 May. The winning team which went under the title of "Dads Lads SRC" consisted of Mike Bishop, Mike Rose, Les Patton, Frank Wright, Bill Ballard and Bernard Keen (Capt.). This win has broken the run of successes by the Bepo team. The cup is on view in the Coffee Lounge of R. 22. Congratulations are extended to all "Dads Lads" on their success.

Banford on Beams

July 28th will see the culmination of two years spare time work by Tony Banford of the PLA Division, for on that day his book on Beam Transport* is due to be published. When the task was started there was no book in existence entirely devoted to this important sub-discipline of accelerator physics, and Tony set out to write the sort of book that he would have liked to have found available when he entered the Beam Transport field seven years ago. After starting with a discussion of the physical properties of charged particle beams, the book goes on to a treatment of standard components such as bending magnets, quadrupole lenses and particle separators. Less common beam line components such as solenoids are also considered and the final chapters deal with design methods and commissioning procedures. Tony tells us that had he appreciated the true magnitude of the undertaking at the outset, it would probably never have got started - over 700 papers and reports were unearthed that were worth mentioning. His wife Jean contributed many hours to the drawing of diagrams, and also to the chores of proof reading and index compilation. Now the hard labour is over, and it remains to be seen how "Banford on Beams" is received by its intended readership and the reviewers. Their verdict will determine whether the toasts will be drunk in champagne or hemlock.

* "The Transport of Charged Particle Beams" by A. P. Banford, published by E. & F. N. Spon Ltd., at 65/-

Two-Fold Event



It has been the custom to give individual 'write ups' on members of the Laboratory who leave. However, as a change and for reasons that will become obvious, this will be a double event. Tony Broad left in the middle of June and Ken McAinsh leaves at the end of June. They have both been members of the PLA Division for the past 5 years and have been closely associated in the work of the Division.

Tony came here from the Cavendish Laboratory at Cambridge where he had worked for twelve years being concerned, amongst other things, with the design and construction of large X-ray tubes and apparatus for investigating the structure of protein molecules. During his stay at the PLA he has been largely responsible in conjunction with his colleagues in carrying into effect proposals which have improved the performance of the Polarized Proton Source more than 20 fold in the past five years. One of his colleagues in this combined exercise by the Accelerator Physics and Engineering Groups of the PLA Division was Ken McAinsh.

Ken, as a member of the Engineering Group has been concerned with general engineering in the PLA and Experimental Areas. After spending 3 years in the Army he went to Edinburgh University where he obtained a degree in Mechanical Engineering. A graduate apprenticeship followed at Napier's, where he stayed for 4 years, working on aero engine control system design. Ken moved on to the Sperry Gyroscope Co., to work on Blue Streak for the next four years.

Tony and Ken will be continuing their association of the last few years but in a new field. Some two and a half years ago a small instrument company was formed locally. Tony and his wife were associated with others in this venture. Tony is now joining the company as Technical Director and Ken as General Manager.

Probably the first instrument to carry the name of the Company will be for the measuring of magnetic fields. This and all other technical development will be Tony's responsibility, whereas Ken will be responsible to the Board for all the day to day running of the company. This new venture is quite a challenge to both Ken and Tony and we wish them every success in the hard world of commerce.

Three-Fold Event

Breaking with custom to a greater extent we record the departure of three people from R.9 workshops on Friday 17 June. Derek Hudson who has been a valued member of the Orbit Editorial Board left to take up a new job at Swindon. Derek, a skilled craftsman, came to the Laboratory three and a half years ago from Manchester. Tony Grice, a skilled craftsman at the Laboratory for the past eighteen months, moves to Newbury to take up drawing office work. Mike Somerville also a skilled craftsman, has been here for over four years. He was previously apprenticed to Vickers at Swindon. He will be joining a firm at Newbury as an inspector. To all three we extend our best wishes for their future.

Comings and Goings

Dr. G R Stevenson joins Radiological Protection Group; W Bowman, M R McLaren and R P De Kerbrech join Nimrod HEPE Group; Miss S D James, G H Adamson and M Marsh join Theoretical Studies Group; Miss J A Brind joins HEP Counter Group A; C Power joins Nimrod Machine Physics Group.

P T J Goodyer, D J Collingwood, J Dalton, D P G Daw, P G Moxon, C Richardson, P M Titterton, A J Brookes, C R Brown and S Colclough join Nimrod Machine Engineering Group; D Liddington, D J Pickford, R J Webber, S A C Ballard, R W Blunt and R T W Grimsdale join Central Engineering Group.

Miss K M Fisher, A Mackrill, D A Stock, Mrs D J Irvine, E Jamison and Miss C R Gallagher join General Administration; Mrs A F Marsh joins Atlas Operations; M C Morrissey joins Bubble Chamber Group; R S Wigley joins as Student Apprentice; P K Dey joins as Graduate Apprentice.

D C Howell, Mrs A A Jefferies, J G Sarll, P G Simonds, Miss R Wickens, J M Woodgate, R L Chitty, R O Mills, T B Stewart, B W Warner, T G Barr, J Dalton, W J Glenn, Mrs J S Nicholl, D H Lord, R A Hunt, B J Taylor, N J Wintle, J A Turner, Miss P L Brown, Mrs P A Solway, R H Niven, P S Hill, J R Humphries and R F Pegler have left us.

Congratulations to:

Brian Cooper Atlas Laboratory and his wife Jill on the birth of a son Michael John, on Thursday, 3 May.
Irene Foster, General Admin., and Del Devins, PLA Division, on their marriage on Saturday, 11 June.
Ted Sedman, A. Ph. Div., on his engagement to Stella Cruttenden on 14 June. Fred Williams, Admin Div., and his wife Hilary on the birth of a daughter, Juliet, on Wednesday, 15 June. Harry Atkinson and his wife Anne on the birth of a son on 25 June.

Suggestion Awards

At the thirty-seventh meeting of the Suggestion Awards Committee held on Wednesday 4th May 1966 the following awards were made:

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|--------------|--|
| £2. 0s. 0d. | to M. E. Byland for his design of a hemispherical honing attachment. |
| £2. 0s. 0d. | to E. Angell for his suggestion to modify the Fellows Stinger Crane in R. 2. |
| £1. 10s. 0d. | to E. G. Starr for his suggestion concerning the inflector box ion gauge. |

An encouragement of £1 was made to C. D. Moreton.