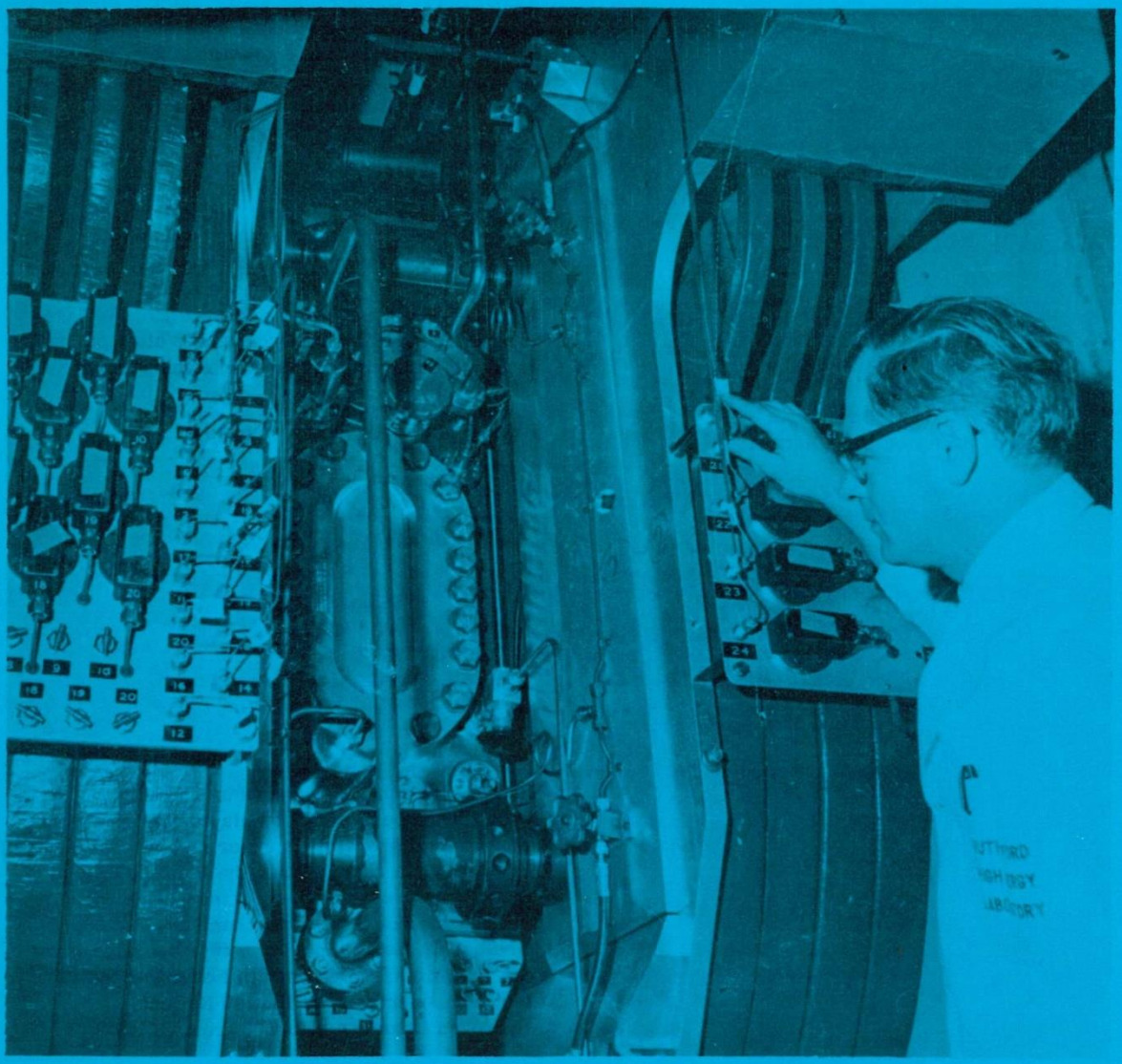
orbit

No 41 November 1965

Journal of the Rutherford High Energy Laboratory



Cover Photograph : Beam end of the Heavy Liquid Bubble Chamber.

First this month we pay tribute to Brian Southworth, Orbit's first editor, who has left the Laboratory to become editor of the CERN Courier.

In May, 1962 a paper went to the Laboratory's steering committee proposing the appointment of "part-time editor with drive and enthusiasm" to edit a journal whose aim was to help create a popular and lively image of the Laboratory. By chance Brian Southworth was available for the job at that time. With drive and enthusiasm which never flagged he piloted Orbit through 40 issues, giving it a characteristic "Rutherford Laboratory" flavour, but also making it his own. Readers will judge for themselves the quality of his work. Orbit has sometimes been compared unfavourably with the CERN Courier: by appointing him editor of its own journal CERN has paid its own unmistakable tribute.

From the point of view of the editorial board Brian Southworth always showed himself devoted to the Laboratory, enthusiastic about physics, tolerant of the opinions of others, calm in a crisis and industrious to a fault. We wish him every success in his new job. We are determined to continue Orbit and to attempt, at least, to maintain the standards which he set.

Brian Southworth writes on page 8.

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Three events have reminded us recently that bubble chambers will soon play a dominant part in the Laboratory's experimental programme. On 20th October the British Oxygen Co. held a press day here to inaugerate the refrigerator of the helium chamber. On 29th October the heavy liquid chamber operated for the first time. Then on 12th November the last components of the British National Hydrogen Chamber returned from CERN

To help build up a bcakground to this new era of physics we publish this month articles by C. Henderson and H. Tomlinson on the Heavy Liquid Bubble Chamber

The Heavy Liquid Bubble Chamber

CYRIL HENDERSON

Originating from a design study at University College London, the chamber was constructed and installed by a joint U.C.L. - Rutherford team led by Mr. M.S. Tomlinson.

Towards the end of October the large heavy liquid bubble chamber, which is to be found in its annexe at the southern end of the Nimrod experimental hall, produced its first picture of the track of a particle. This was an eventful moment for the physicists who initiated the project and who can now make firm plans for experiments using the chamber. It was designed at University College London and the project became identified with its leader Mr. H.S. Tomlinson who above all others, whether at University College of the Rutherford Laboratory, deserves the credit fo its successful completion.

If you take a look into the annexe all that is immediately obvious is a large and rather elegant magnet forming a cubical mass of copper coils and iron return path. However, safely embedded in this, is the 420 litres of operating liquid of the chamber. It is contained in a massive stainless steel box, bounded on one long face by the expansion diaphragm and on the other by a single 9" thick observation window of optical glass.

The magnet, when energised by 4 MW provides a field of 22Kgauss throughout the bubble chamber. The chamber and its magnet can be readily moved over the smooth floor of the annexe upon a set of three air flotation pads. Special attention has been given to the design of equipment to speed running repairs. In particular the main fast expansion and recompression valves can be extracted and replaced in a very short time.

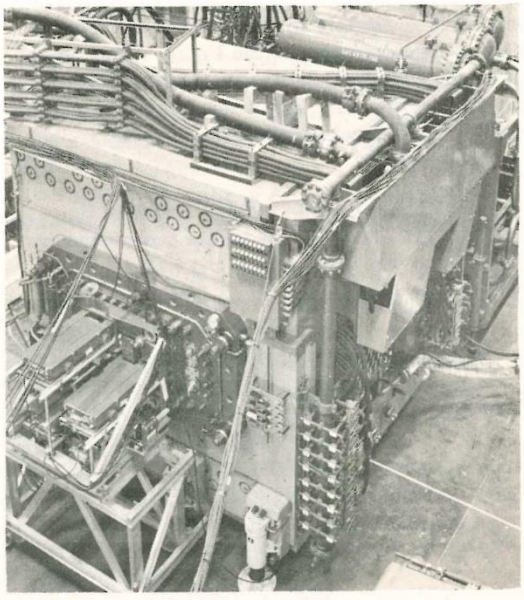
The chamber can now take its place in the ranks of the detection devices that are necessary around large accelerators like Nimrod in order to study as fully as possible the complexities of particle physics. Large heavy liquid chambers are in use at CERN, Argonne, Saclay and Dubna. Their unique property is the ability to detect gamma rays with a high efficiency independent of energy and direction. This is combined with typical bubble-chamber clarity of the production origin. Our chamber full of the liquid CF_3Br, as it is now, will convert about 80% of all gamma rays produced within it into electron-positron pairs whose visible tracks will enable the momentum of the gamma rays to be estimated.

Since a neutral pion decays extremely quickly into two gamma rays we can fully detect $0.8 \times 0.8 = 0.64$. of these otherwise elusive particles.

Many liquids and mixtures of liquids may be used in the chamber and the filling is tailored to suit the particular experiment. On one extreme we have the hydrogen rich propane C_3H_8, which contains as many free protons per unit volume as does liquid hydrogen, and in which momenta can be measured from curvature to about 4%. Towards the other extreme we have liquids such as CF_3Br whose chief virtue is the high conversion efficiency of gamma rays.

There is an infinity of possible experiments but we hope to start off with a particularly interesting study of the decay modes of the eta meson. It is pleasant to know that we will be joined in this work by physicists from the Rutherford Laboratory. The beam of positive pi mesons necessary to produce the etas in the chamber is ready for use and with any luck a trial run will be made before shut down, with the experiment proper beginning in January next year.

A large and rather elegant magnet....



The Heavy Liquid Bubble Chamber 2

H.S.TOMLINSON

A heavy liquid bubble chamber first operated at University College London, during the early months of 1955. It was a tiny piece of apparatus, with a chamber blown from thick wall glass tube filled with about $\frac{1}{4}$ cu. inch of pentane. From this humble beginning, subsequent research led the U.C.L. Physicists in 1959, to propose the construction of a rectangular shaped heavy liquid bubble chamber of 100 gallons capacity, for the Rutherford Laboratory.

In construction, the austenitic stainless steel bubble chamber, inside dimensions 55" x 26" x 18" deep, is sandwiched between 2 sub-assemblies which include the poles of the magnet. A hydraulic test pressure which produces an end opening force of about 700 tons has been applied. All the components are doubly sealed with the pump-outs connected to pressure switches.

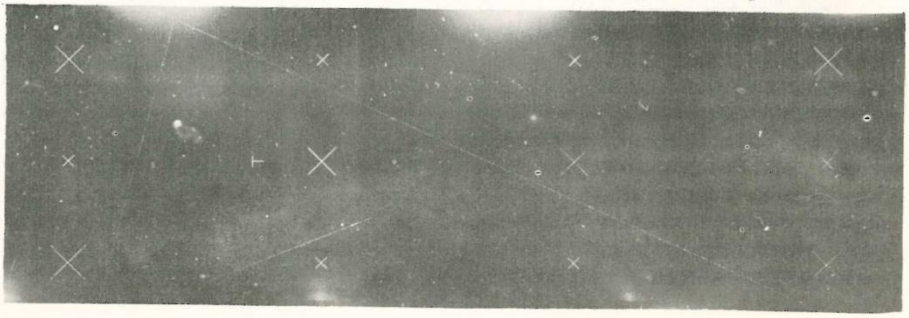
Looking from the cameras through the assembly we have, the camera plate, a pole of the magnet hollowed for viewing the chamber, a 9" thick optically marked glass observation window, the bubble chamber, a $\frac{1}{4}$" thick polyeurethane diaphragm which transmits the gas pressure cycle to the chamber, a hole plate for its support, and finally the rear pole of the magnet containing the pressure cycling valves.

The camera plate houses 4 windows, 3 of them for stereoscopic photography of the tracks. The hollow pole, serves a dual role, since it is pressurised slightly in excess of the compression pressure applied to the liquid. This is a safety measure which directs the net force on the window inwards, and keeps it small, except during the momentary expansions of the chamber liquid.

Nimrod's beam travels the 55" length of the chamber via either of the double beam windows covering the openings in the end walls. The bubbles are illuminated by 12 500 joule linear Xenon filled flash tubes inside the liquid, but shielded from it by Pyrex envelopes mounted close to the top and bottom walls. Ten 3" bore pilot operated valves cycle the chamber. The valves fit in holes bored longitudinally through the rear pole, and are stalk mounted to minimise the volume, behind the diaphragm. When in position, the valves open non-return valves set at the ends of the holes. This feature allows valve replacement during operation. At present the chamber is being expanded by 6 valves which pass 20 cu.ft. of Standard Air in 25 millisecs with a 5 atmosphere mean pressure difference. The photographic system is designed to reproduce the position of a point in the chamber to an accuracy of better than $\frac{1}{250}$ of an inch. Three separate cameras look at the chamber from a distance of about 6 feet. Each camera holds 1000 feet of film which in normal Nimrod operation, during an experiment, would be exposed in about 2 hours. An average size experiment would demand about 250,000 pulses of the chamber resulting in a film record some 50 miles long to be examined subsequently frame by frame.

The pneumatic system is comprehensive. A 300 H.P. compressor delivers gas via buffer vessels at 600 p.s.i. max. at a rate of 1200 cu. ft. of Stand Air per minute into a loop formed by the bubble chamber, and a by-pass which is back pressure controlled and rated to pass any output not taken by the bubble chamber. Gas leakage in the system is automatically restored. For safety, the system gas will be Nitrogen when the chamber is operating with a hydrocarbon. At the chamber end are pressure controlled vessels which define the pilot and chamber compression and expansion pressures.

The magnet yoke, weighing 140 tons is made up from 12 24" thick mild steel members. A 400 G.P.M. flow of cooling water is passed



Cosmic Ray tracks in the Chamber

through the exciting windings at 4 MW. The windings weigh 25 tons and are vacuum impregnated with polyester resin. Field uniformity values over the chamber volume are: 21.4 KG, 5.5%; 16.3 KG, 5.5% for 4 MW. and 2 MW. respectively.
There are a number of devices associated with the detection and control of faults. Those appearing in the compressor system or in the chamber, lead to the isolation of the compressor and closure of the chamber cycling valves. If an increased pressure develops in the chamber through the mixing of gas with the vapour of the chamber liquid, the pilot pressure closing the chamber cycling valves is increased above the sum of the partial pressures. Leakage of the chamber liquid to the atmosphere, whilst very unlikely, in view of the test pressures and double sealing that has been applied, will require the removal of the contents.

With the dumping system installed, the chamber liquid is emptied in $3\frac{1}{2}$ minutes into a tank outside the building. A mixture of gas and liquid in the chamber, can also be routed into a P.T.F.E. bag, which is of sufficient capacity to bring the pressure down to atmospheric pressure.

The Rutherford Laboratory has helped this project enormously. It made an excellent choice in Ralph Walker and his colleagues, to join us in the design of the equipment. Alan Davis, also deserves much credit for the great amount of work he has very successfully undertaken.

Why Go On?

From "Physics with Storage Rings" by Professor Cocconi.

'I cannot finish without asking the general question that involves us all. Why do we want to know these things, and urgently? Could it not be that we are a cast of maniacs, who try to solve the problems created only by our machines, problems not at all important for the equilibrium of nature, the nature we live in?

If that were the case, if our pure science were so pure as to be of no foreseable utility, then I fear that in the long run Society would stop us from progressing so fast. We begin to be a burden to Society when we go on asking for larger and costlier accelerators.

My answer to these disturbing questions is that, practical applications apart, we are not so queer and that our problems are not Byzantine. My faith comes from the fact that there are places in the universe where matter consists uniquely of particles having an energy of 10^{12} - 10^{13} eV each, and these places are light years in dimensions and contain a number of particles equivalent to millions of suns. I have in mind, of course, the centre of the radio galaxies.

Mesonic matter is thus not only produced in the odd situations present in our accelerators (or in the even more odd one that will be created by colliding beams), but it is also the basic matter at the centre of not-so-rare galaxies. Possibly even the apparent rarity of these objects is due to the fact that galaxies remain in those conditions only for a small fraction of their evolution. Perhaps all galaxies, all of us, went or will go through that stage. Thus the GeV, the TeV world (1000 GeV = 1 TeV, tera-electronvolt) cannot be an abstraction, since it is deeply connected with the nature that surrounds us. It is even imaginable that in time we will be able to exploit it to our advantage.

The parallel with stellar evolution is too banal for us to dare to think that, mutatis mutandis, it will be applicable in this case. But I cannot help recalling that what, forty years ago, looked like the impossible probelm of understanding how the centre of the sun kept on burning is nowadays reduced to the still difficult but not so impossible problem of making nuclear energy economically competitive with coal burning.

Can we afford to be ignorant about these problems: can we avoid asking what is the equation of state of matter at these excitations, what are the properties of a mass collapsing towards the relativistic limit? Can we afford to wait? According to the rules of the human game, we must go ahead, and as fast as we can.'

"Physics with Storage Rings", CERN Courier, July. Professor Cocconi.

PLA ANNUAL SHUT DOWN

It has become traditional in PLA Annual Shut Downs to have one major objective surrounded by a mass of minor but none the less important tasks. In former years there have been the installation of the polarized proton source, the commissioning of the second experimental area, the assembly of the ($n=\frac{1}{2}$) spectrometer magnet etc. This year it was improvements to the beam line and the experimental facilities for the spectrometer magnet. The ancillary tasks included improvements to the R.F. monitoring, RF measurements on Tank 1, and general maintenance.

The spectrometer magnet has an energy resolution of 1 part in 1000, a gathering power of 2×10^{-3} steradian and an energy bite of about 10%. The P.L.A. beam has an energy spread of about 200 keV. The beam line uses quadrupole focussing, a bending magnet and two slit collimators to achieve an energy bite of 100 keV at 50 MeV and 60 MeV at 30 MeV. A transmission of up to 4% has now been obtained.

The recent modification of the beam line involved the installation of improved collimating slits and diagnostic equipment inside two steel and concrete igloos. The radiation from the intercepted beam is almost totally attenuated by the igloos even at the maximum beam intensity of the P.L.A. which is at present 3 A (mean).

The experimental facilities of the spectrometer magnet have been greatly improved by the installation of a 25 ft. diameter platform (at 8 ft. 10 ins. from the experimental area floor) which rotates with the magnet. The platform has a load bearing capability of 80 lbs per square foot and a total load capacity of 40, 000 lbs. It is flat to $\pm \frac{1}{4}$ ins. and follows the magnet to better than $\pm \frac{3}{4}$ ins at the outside radius.

The spectrometer magnet has now become one of the most popular of the PLA's facilities; it is used by the nuclear physics teams for about 27% of the total scheduled time.

THE 1965 NOBEL PRIZE FOR PHYSICS

R.G. Moorhouse describes the background to the award:

In 1947 W.E. Lamb and R.C. Retherford announced a splitting (the "Lamb shift") between the $2s_{\frac{1}{2}}$ and $2p_{\frac{1}{2}}$ levels of the hydrogen atom in contradiction with the Dirac relativistic theory in which these levels are degenerate. Now it was an old observation that a calculation of the electron self-mass (due to virtual emission and re-absorption of photons) gives an infinite result and that this was true either for a free electron, or an electron bound in the hydrogen atom. But it was this time realised that the most infinite part of the self-mass was certainly exactly the same both for a bound and a free electron and that the difference in self-mass between a bound and a free electron should be regarded as the true, observable, quantity. H.A. Bethe made an instant approximate calculation of the contribution of this residual self-mass to the "Lamb shift" and found that his answer accounted for most of the effect. However the calculation of Bethe was non relativistic and for that and other reasons still contained an albeit less severe, infinity, which had to be brutally disposed of. The problem at this stage in 1947 was how to dispose of the infinities that had made higher order, more accurate, calculations in quantum electrodynamics impossible and to obtain a finite, relativistic theory.

Already in 1946 and earlier S. Tomonaga had formulated quantum electrodynamics in a new way intermediate between the Schrodinger picture (in which the state vectors but not the operators moved) and the Heisenberg picture (in which the operators but not the state vectors moved). This new formulation made evident the relativistic way to absorb the infinities in the electrodynamics calculations into redefinitions, of mass and charge - the famous "renormalisation theory". Tomonaga and his collaborators worked on this renormalisation theory. Meanwhile, working independently though using the same methods as Tomonaga and inspired by the discovery of the "Lamb shift", J. Schwinger was the first to achieve a satisfactory renormalisation theory.

The third attack on the problem was made by R.P. Feynman and involved a more fundamental recasting of quantum mechanics. Feynman reformulated quantum electrodynamics by developing the quantum mechanical analogue of the classical idea of action at a distance. In 1949 F.J. Dyson published the first of two classic papers in which the equivalence of the Tomonaga-Schwinger and Feynman theories was proved. This paper was entitled "The Radiation Theories of Tomonaga, Schwinger and Feynman" and its title foreshadowed the award of the Nobel Prize 16 years later.

Letters to the Editor

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

Sir,

THE DIVISIBILITY OF SPACE.

In a recent letter, E.G.Higgins queried Professor Frisch's remark about a possible limit to the divisibility of space. This is a much discussed problem which lies at the root of any attempt to evolve a unified physical theory, and I would like to try to summarise very briefly the present theoretical position.

It may be useful first to illustrate the meaning of the question by remembering that the same question was once asked about "solid" matter. Paradoxically, although one could imagine continually subdividing, say, a piece of iron, one was compelled to believe in a limit to this process to account for the material's characteristic properties, and for this reason the idea of atoms was invented over 2000 years ago. We now know that this idea proved correct, and there is indeed a limit of about 10^{-8} cm to the divisibility of material substances. This does not, of course, mean that smaller distances are meaningless, but that the original concept of matter loses its meaning below this distance and we enter a new level of physics.

We have the same problem with the "vacuum". We can imagine it infinitely subdivisible, but postulating a finite structure would help us to account for the finite values of physical constants. There are, in particular two pieces of theory which suggest a numerical value:

(1) Quantum electrodynamics correctly describes the behaviour of electrons and photons only by artificially removing infinite integrals which arise in the theory. These infinite quantities are due primarily to the assumption that radiation of arbitrarily small wave-length is possible. To obtain the correct finite value for e.g., the rest energy of the electron, it is necessary to assume a "cut-off" distance something like $(h/mc)e^{-137}$, which is 10^{-70} cm.

(2) A second estimate is obtained by combining general relativity and quantum theory. General relativity say that the velocity of light becomes zero at a distance $2Gm/c^2$ from a mass m. Quantum theory says that below 10^{-11} cm the automatic formation of electron-positron pairs results in the mass of a localised system being inversely propotional to its size.

Combining these two, the smallest possible system would have a radius of about $(Gh/c^3)^{\frac{1}{2}}$ or 10^{-33} cm (and would contain about 10^{20} electron-positron pairs about 10^{-40} cm apart).

The present evidence, therefore, is that there must exist in the vacuum a fundamental length in the region 10^{-33} to 10^{-70} cm, below which we would enter a completely new level of physics. As mentioned above, this whole question can be discussed in relation to different levels of physics, and it is probable that Professor Frisch was referring only to the strongly interacting particles, which appear to behave as composites of one another on a scale 10^{-14} to 10^{-13} cm. From the viewpoint of electromagnetic and gravitational interactions, however, current theory suggests a limiting length vastly smaller than the size of the proton.

P.F.Smith.

Three Years in Orbit

BRIAN SOUTHWORTH

"After over three years of conceiving and bringing forth ORBIT my current change of life is such a considerable one that I don't know how to comment on it adequately.

I enjoyed working on ORBIT very much. I hope that it has made some contribution to the life of the Laboratory and that my eventual successor will be able to sustain and improve it. It should be a good thing for a fresh mind to take over - there is still a lot that could be done given time and enthusiasm. I look forward to watching its transformation ... from a distance.

ORBIT is in possibly a unique position. It has the support of management but is not an "arm of management". Its mandate has never been to carry management messages or to do a public relations job, and this, I think, has saved it from the sycophancy of almost every "house journal" I see. For this freedom I, as Editor, have been grateful. By far the greater part has always gone to straight reporting of projects or news from high energy physics, but the ability to include critical comment and to take things not quite so seriously at times, kept ORBIT alive. I never worried much when people were irritated by anything in the journal - that's much better than being bored.

It requires some sense of responsibility to strike the right balance, but my conviction has always been that any platform that sings "All things bright and beautiful" all the time, is asking to be ignored even when it is singing the truth. Interpretation of this doctrine has led to mistakes but I would like to indulge in one concluding bit of revolutionary philosophy - I wish people would make more mistakes.

The pathological fear of laying oneself "open to criticism" can cause endless frustration. The insistence on formalities, search for precedents, reference to other "authorities", cross checking etc., etc., is, I suspect, often the outward sign of inward apathy about the real work of the Laboratory. A mistake, en route to a vigorous day's output, is worth making.

Is it too heretical to look forward to the day when the Civil Servant goes home to his wife (an hour or two late because he was so absorbed in what he was doing) and says proudly, "Darling, I made a wonderful mistake at the office today" meaning, "I got through a hell of a lot of work, kept a dozen other people moving when I could have stalled them, but in the maelstrom I forgot to tell 'X' something he should have known"?

I am now busy establishing myself at CERN. I am going through the administrative mill that inevitably confronts arrivals to a new organisation, and a new country, and have signed so many forms that I may well be enrolled in the Swiss Army for all I know. Life in Geneva looks potentially excellent; life at CERN could be really absorbing. It is a large (over 2,000 people) organisation and, with the imminent start of the storage ring project, it will grow still more. Scientifically it seems very alive and there should be more than enough to keep me busy.

I begin editing the CERN Courier for the January 1966 issue. It is a very different journal from ORBIT (for example, whereas ORBIT was always directed to a Laboratory audience, the Courier has by far the greater part of its circulation outside CERN) and it will need a modified approach. But if it brings me the satisfaction I got from my work at the Rutherford Laboratory I will be content. My new work should yield at least occasional contacts with the Laboratory and I hope I will be able to pay a visit sometime in the future.

I owe a lot to the many people who helped me in my work and I can look back with great pleasure on the many excellent friendships developed during my stay. Finally I must thank all those who sent me on my way with such generous good wishes. And, from my family and myself, I thank all those who contributed to the set of vast suitcases which were presented to me. As we packed to leave Abingdon, my wife, for the first time ever, failed to overflow all available suitcases!"

Orbiting Around

Editor: H F Norris
Building R20, Ext. 484.

Budapest to Oxford

A chance remark that Frank Borsay was leaving, uncovered not just another brief paragraph for Orbiting Around, but an interesting and uncommon story. Frank however is not leaving but is taking three years unpaid leave so that he can study in the Engineering Science Department at Oxford for his D. Phil. Incidentally he is the first to do this from the Rutherford Laboratory. His subject is, "to investigate transport properties of liquids and gases near the critical point".

But the story began nine years ago, in Hungary. Frank had been studying for Ph.D in physics at the Central Research Institute for Physics, near Budapest. With the 1956 revolution he left Hungary and came, as did many others, to England. The unmarried refugees, Frank amongst them, were placed in a camp. He was the only one with a knowledge of English, which as he says, meant that he could speak a few words. This was sufficient for him to be appointed as English teacher, and to be paid, much to his surprise.

In March, 1957 he was offered a post with Timkens at £8 a week. The incremental rate was quite staggering as on arrival the figure was £9, and in his pay packet at the end of the first week, it had increased to £10. Imagination boggles at what would have happened had he stayed there, but after two weeks he had accepted a post with A.E.I. at Aldermaston. By 1961 he felt that Canada offered a promising future but, with arrangements almost completed for his departure, an offer of employment with the P.L.A. Engineering Group at the RHEL proved tempting and Canada lost a new immigrant. During his time at the PLA Frank has been engaged in such jobs as project engineer for the ($n=\frac{1}{2}$) spectrometer magnet, long range machine development and various projects connected with experiments.

Frank is now a member of Magdalen College, Oxford and has the correct tie. He is married to an English girl (his wife works for the Scanning Lab.) is naturalised and, has a mortgage, so he now feels he is a true Britisher. Many thanks Frank, for an interesting story and good wishes for your effort in the New Year.

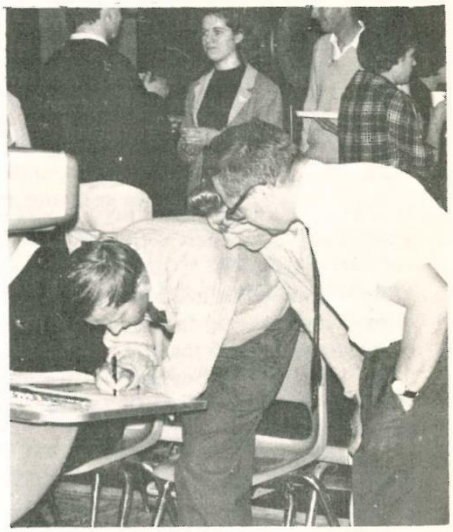
Cartoonist's Award

Dave Baker, R.9 Workshops, who has given a lot of enjoyment over the last two years with his cartoons in Orbit, has had another success. He is taking the Mechanical Engineers and Technicians Course of the City and Guilds Institute and having obtained a first class pass in part one, has been given an M.G. Award. This award is split into two parts and is for the best pass in a technical subject. The course Dave is taking means six years hard work, the final result giving an equivalent status to the Higher National Certificate. This award, coming as it does after the first two years, has given Dave a lot of encouragement and we wish him every success in the next four years.

Elastic Scattering Experiments at Swindon

On 8th October experiments were carried out on the 24 channel ball machine at Swindon. As usual, scientists were opposing engineers. On this occasion the latter proved superior by 1800 points to 1796, or 4 games to 3, thus retaining the P.L.A. Division ten pin bowling trophy.

The presentation took place during the main business of the evening at THE BELL, when final analysis had confirmed the overall superiority of the engineers, in spite of various computational tricks by the opposition. The event was held to mark the impending departure of two notable members of the P.L.A. Division: Ray Wilson of the Engineering Group and Ken Batchelor of Accelerator Physics are leaving for the U.S.A.



There have now been three events in this series, in January, 1963, January 1964, and October, 1965. Comments from reliable sources within the Division indicate willingness now to accept challenges from other quarters of the Laboratory.

Rutherford Laboratory Table Tennis Club

As reported in the August issue, the hope that the Laboratory Table Tennis Club would be able to enter two teams in the Didcot and District League has been fulfilled and to date they have played 14 matches. The 'A' team has already climbed to fourth place in the League, due mainly to excellent play by John Crawford. He, in fact, has only dropped three sets this season. The standard of all players in these matches has improved steadily, which is sufficient reason for joining the club, apart from the enjoyment of good social evenings and the opportunity of meeting members of other clubs.

With the aid of a good scrub, a coat of paint and a lot of effort the new club room has been transformed. A new table has been constructed and the Recreational Society has kindly provided some chairs and a tea urn. But more members are required to play in league matches. Come along ladies, your membership will be more than welcomed! There are plenty of lady players in the league so you won't be on your own. More men players are also required, so if you are interested, contact Keith Sinclair, Bldg R.9 Ext 558 or come along to the regular Friday club nights.

The Gold Rush

Sometime ago we reported on the Duke of Edinburgh's Award and presentation of the Gold Medal to Graham Waters. So it is with much pleasure that we hear that a second Gold has been earned by Frank Smith of Accounts Branch. He was awarded the Bronze and Silver Medals while he was attending the Blackstone Secondary Modern School at Wallingford and is now to receive the Gold Medal from the Duke in the Spring. As mentioned before, the Award is made for success in various fields such as endurance, public service, physical skills and pursuits. A 60 mile trek round Dartmoor in October, 1964 meant four days marching and three nights camping in very severe conditions. Fog, snow, hail, ice, wind and rain made this trek a severe test of endurance. As a pursuit Frank with others undertook "a survey into the Employment Possibilities for School leavers in the Wallingford area", which meant visiting AERE Harwell, the Hyraulics Research Station, Agricultural Engineers, Insurance Brokers etc., where interviews were recorded by tape and notes. In the public service section Frank has been helping to build a Pentecostal Church at Wallingford. (Ernie Newbold who is responsible for this Church will be telling his story in next month's "Outside Hours"). Amongst his many activities Frank is Treasurer and Youth Secretary of this Church, a member of the local Angling Club and the Portculles Tennis Club. And so to Buckingham Palace in the Spring. Well done Frank.

Suggestion Awards

At the thirty first meeting of the Suggestion Awards Committee on Wednesday 27 October, the following awards were made.

£4 to T. Morgan whose proposed modifications to the Fork Lift trucks would greatly reduce the time taken for servicing.
£2 to H. Taylor whose suggestion had drawn attention to a shortcoming in the R. 2 Crane.
£1. 10s to R. Hall whose suggestion, though not original, could be implemented on the redesign of a target mechanism.
£1. 10s to C. Wallis whose proposal would be adopted, thus keeping the "wages car" in continuous contact with the Patrolman's office during pay runs.
Encouragements Awards of £1 were made to R. Hall and B. W. Fail.

B. Briscoe Secretary.

Many attempts are being made to bring our liturgy up to date. But I doubt if anyone has yet thought of making the alteration to the Prayer for the Church which appears in a well known communicant's manual: "And we most humbly beseech thee of thy goodness, O Lord, to comfort and succour all them, who in this transistory life are in trouble....."

Deanery of Abingdon "Church News," Nov.

Comings and Goings

P R Pitts, M J Blackman and Miss J L Barrage join HEP Bubble Chamber Research Group: Dr. K F Chackett joins PLA Nuclear and Radiochemistry Group: Dr. L E Williams joins PLA Nuclear Physics Group: D L Hill joins PLA Engineering. G Shadaksharappa, M J Baylis, J C Baldwin and Mrs. V M Burke join Atlas Programming Group: Miss J R May joins Atlas Operations Group: T W O'Donnel joins Safety Group: M Davies, A R Thompson and W L Harding join Nimrod Machine Engineering Group: E Collie , J A Herkes, D Hudson and D E Targett join Central Engineering Group: C A Bolton, C R Hadwin and R W Roberts join General Administration.

Dr. P G Murphy, Dr. A S Caroll, C F R Bradshaw, L A Loweth, J D Adams, F A Capocci, W A Mathews, J S Phillips, N A Cumming, W H Longley, A V Payne, D Blowers, J Martin and B Maynard have left us.

Congratulations to:

Ken Yeo, Nimrod Machine Engineering Group, and his wife Kathleen on the birth of twin boys, Martyn and Bryan on 24 August.
Alan Davis, Rutherford Laboratory Bubble Chamber Group, and his wife Isabel, on the birth of their sixth daughter, Jacqueline on 2 October.
Rosemary Borbone Rutherford Laboratory Library on her engagement to Malcolm Arnold on 23 October.
Keith Bellinger, Nimrod Machine Engineering, and his wife Jean, on the birth of a son, Peter Stephen, on 5 November.
Bob Hall, Nimrod Machine Engineering, and his wife Margery, on the birth of a daughter, Jacqueline on 8 November.
Ron Chitty, R. 9 Workshops and his wife Dorothy, on the birth of a son, Neal Peter, on 8 November.
Alen Mayhook, Theoretical Studies Group, and his wife Eileen, on the birth of a son, Andrew, on 12 November.

Record Programmes

Programmes will be held on Tuesdays at 12.30 p.m. in the Lecture Theatre.

7 December	Ravel: Suite "Daphnis and Chloe"
14 December	Folk Songs and Music from Northumbria and Ireland, and items sung by Nina and Frederick.
21 December	Christmas Music, including Carols and Haydn's "Toy Symphony".
28 December	(No concert).

Printed by XPDO Ltd., Didcot in association with The Kilburn Press Ltd., Wallingford.