OCTOBER, 1962.

4TH ISSUE



THE JOURNAL OF THE RUTHERFORD HIGH ENERGY LABORATORY

The Russian Visit

Dr. Pickavance fills in the background of the recent visit.

Seven physicists and engineers from the Soviet Union visited the A.E.R.E. on 28th September, and returned on 8th and 9th October when they visited the Rutherford Laboratory also. Their visit was concerned with nuclear and high energy physics, including accelerator technology, and was part of a programme established in 1961 in a formal agreement between the U.K.A.E.A. and the U.S.S.R. State Committee for the Utilisation of Atomic Energy. The agreement covers several topics of interest in the field of nuclear energy, and the N.I.R.N.S. became involved because of our special interest in nuclear and high energy physics. There have already been visits on other topics; for example, during the summer, Dr. Adams led an Authority team on a visit to centres of plasma research in the U.S.S.R. The general object is to exchange information in unclassified fields, and to have a visit by a small team about once a year for each topic. We expect, therefore, that a British team will visit nuclear and high energy physics laboratories in the U.S.S.R. next year.

Although the formal agreement is between the nuclear energy organisations of the two countries, the Authority and the Institute used their good offices to bring British Universities into the tour of the Russian visitors. Between their two visits to Harwell they visited Oxford, Birmingham, Liverpool, and Glasgow Universities. They even found time for a little sight-seeing, and were more fortunate than many Britishers in that they saw Loch Lomond in the sunshine. Having had two dry days out of eighteen on my recent Scottish holiday, I was very happy for them - especially as one of them, on the strength of a visit to Trafford Park in 1936, previously thought of Britain as a country perpetually covered by black fog.

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THE RUSSIAN VISIT - (Cont'd)

They were very tired when they left us, and a little confused after having seen so much in so many places, but they appeared to have enjoyed themselves. We certainly enjoyed having them with us, and considered our privilege holiday well lost in the interests of international collaboration.

The Visitors

Mr. Mullett adds some of his thoughts on the visit and the characters in the Russian team.

The recent visit of a USSR delegation on nuclear physics to AERE and the Rutherford Laboratory ran true to form. We expected that in our scientific and technological discussions they would extend us to the full in the breadth and depth of their questions. This they certainly did and without much need of help from interpreters. We also expected that we should enjoy their company, particularly since their sense of humour closely parallels our own. Here too we got along very well, with the members of the delegations doing the hard work themselves in English.

The members of the delegation were as follows - and I add some personal comments to the official descriptions.

M. V. Pasechnik, academician of the Ukrainian Academy of Sciences, Director of the Institute of Physics of the Ukrainian Academy of Sciences. Leader of the delegation.

I shall particularly remember him for his great breadth of interest in physics, his quiet smile and sense of humour and his trilby hat which was full of character. He could cope quite adequately in English.

Ye G. Komar, Doctor of Technical Sciences, Director of the "Yefremov" Scientific Research Institute of Electro-Physical Apparatus.

He can well be described as an old friend. He was in England before the war. He is an engineer who knows his physics and will make you anything from a plasma physics device to a 70 GeV proton synchrotron and beyond. He looks like a really tough "works manager", and is now quite elegantly dressed; a man of tremendous drive and competance. He has a great zest for life and a boisterous sense of humour which bursts through the language barrier. He copes quite well in English. At the Laboratory I particularly remember two incidents. He took one look at NIMROD and said "I am an old-fashioned man; I like it", and when we were being questioned on why we decided to build a constant gradient machine he took up our point of view with such conviction that a spirited argument ensued, in Russian,

between himself and other members of the delegation. Socially he is a great success.

A. A. Logunov, Doctor of physio-mathematical sciences, Joint Institute of Nuclear Research (Dubna).

A theoretician on the highest plane, and therefore I had no scientific dealing with him. His English was in the formative stage and he spent a most enjoyable evening with one of our Harwell colleagues whose Russian was in the same state swapping words, sometimes with the aid of a dictionary.

S. M. Polikanov, candidate of physical mathematical sciences, Dubna.

He didn't really register with me partly because he is, I believe, interested in low energy nuclear physics and partly because he could have been just a somewhat a shy visitor from anywhere else.

F. A. Vodopiyanov, electrical engineer, Radio-Technical Institute of the U.S.S.R. Academy of Sciences.

He too is very much an old friend. He is a radio-frequency expert, particularly in synchrotron affairs. He asked searching questions and gave much in return, struggling admirably with English throughout except when it was inadequate to deal with one of his own Here I particularly remember his reaction to hearing of our advanced methods of magnetic survey on NIMROD. One got the impression that Vodopiyanov would like to see Komar take up such methods and he lapsed into Russian to tell him so. Vodopiyanov crowned his performance with a lecture which was well attended and very well received. It was in English and made us feel even more ashamed of our incompetance in foreign languages. He is a more serious man than Komar but with a personal warmth which is immediately felt. In refering to the time scale for construction of their 7 GeV alternating gradient synchrotron he commented that it was a large fraction of their lives and when giving a completion date of 1965 for the 70 GeV machine he added "I hope".

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Work expands so as to fill the time available for its completion. General recognition of this fact is shown in the proverbial phrase 'It is the busiest man who has time to spare'.

Extract from "Parkinson's Law"
C. Northcote Parkinson

Social contacts with him were very homely and he was quite happy to talk about family matters with our wives. It was repeatedly pointed out to us by Komar that Vodopiyanov means "drunk on water"; we detected no insobriety.

V. I. Terent'Yev, engineer-physicist, Kurchatov/Institute of Atomic Energy.

This was the only member of the party who could be described as "typically Russian" although the term these days is almost mean-I should hasten to add that I refer to appearance and manner of dress only. had no conversation with him and got the impression that language was the barrier.

Ye C. Lazutkin, engineer-physicist, State Committee for the Utilisation of Atomic Energy.

This was the baby of the party. the name of his department he assured us that in Russia they too stretch their terms of

reference and that his role was a co-ordinating one in the field of particle accelerators. His English was adequate although not anywhere near as polished as others that we have met from this department. Although we know that the Russian style in clothing has changed in recent years his suit seemed to be more Italian than Russian. He had to check by looking at the label and then said it came from West Germany. He shared our amusement when we asked if it came through a tunnel under the wall and on looking again at the label announced that it came from East Germany.

The Scientific value of these exchanges is obvious but the personal contacts could be of great significance. The fact that we find our Russian equivalents to be so much like ourselves is in the main due to their increasing competance in English. Just a few words are sufficient to transmit the whole character of a person in a way which no interpreter can.

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They also serve Who only sit and scan work already underway at the Laboratory.

Mr. Snowden describes some high energy physics

Some of us have come back from journeys abroad this year laden with colour films with which to enliven our dark winter evenings. few members of the 'East End' of Building R.1, however, have returned with rather different nowever, nave returned with rather different photographic records, the enlivening effect of which may be seen between the hours of 8.30 a.m. and 9.30 p.m. on any working day. Those who visited this part of the Laboratory on Open Day will know that reference is being made to high energy physics experiments using nuclear emulsion and bubble chamber techniques. Perhaps it is relevant at this stage of NIPROD to give a little publicity to this work and show that the publicity to this work and show that the Rutherford Laboratory's preparations for the start up of NIMROD include high energy physics experiments.

Chronologically the emulsion work came first and arose out of the Laboratory's interest in shielding problems around NIMROD. At CERN anexperiment had already been started to measure the attenuation of multi GeV beams in concrete and other shielding materials using the photographic emulsion technique. We were very kindly given some of the emulsions to scan and since then, have been fully collaborating in further experiments. The other groups interested include DESY in Hamburg, and Stanford, while both Hannover and Oak Ridge are collaborating on the theoretical side.

We have been able to have measurements made at CERN at 9 GeV/c, this being the lowest momentum convenient for satisfactory operation of the CERN PS and is sufficiently near NIMROD's maximum momentum for the results to

Indications so far be directly applicable. show that the variation in attenuation from 9 GeV/c to 24 GeV/c is not large but the need for better defined beams has become apparent and a further experiment is planned for next month. In this, three members of the Laboratory will be helping during the run and a further three will be involved in scanning work.

Our bubble chamber measurements started just about 9 months ago when we were accepted as collaborators in experiment T.8 at CERN. Each experiment on the PS at CERN is given a code number and this one was planned to study the interactions of 1.5 GeV/c K mesons in the Ecole Polytechnique Heavy Liquid Bubble Chamber. The main groups concerned were Ecole Polytechnique, CERN, University College London, Bergen and ourselves and the 200,000 pictures taken during the fortnight of the experiment were shared among the groups. Five members of the Laboratory went out to help in the experimental run which included every duty from film processing to beam monitoring.

Since June, when the film arrived, we have scanned 25,000 pictures and fully measured some 120 cascade zero and cascade minus events. We have also been involved in the computation work for this experiment and it seems likely that the Rutherford Laboratory programme will be used by all the collaborating groups.

This experiment has been very good in giving us an insight into the problems we are going to have when NIMROD bubble chamber experiments start and we have been able to

(Cont'd on Page 4)

train our scanners and get our equipment operating to our satisfaction ready for this.

In the meantime we shall continue our collaboration with CERN and have a proposal in for a further experiment, T.11, which involves a higher momentum KT beam and the CERN 1 metre diameter Heavy Liquid Bubble Chamber.

So even with the excitement and hurry around NIMROD the Laboratory has been able to spare some effort to bring high energy physics into its everyday work. As this grows it should enable every member of the Laboratory to feel personally involved with its 'end product' and may help to quell some of the anxieties on this subject recently expressed in this publication.

Assisting the said Incumbent

Ken Smith joined Magnet Group as an A.E.O. in 1960 after completing his training for the Anglican Ministry at Ripon Hall, Oxford. In his spare time he assists the Rector of Sumningwell village near Oxford as a Lay Reader and lives in the Rectory. A graduate in Physics at Durham University he insists his hobbies include Hi-Fi, hot water heating systems, and hot air!

I was cornered on the second flight of stairs near the Editorial Office by an ORBIT man. He suggested that a "few words" might be contributed on the subject of outside activities. The immediate reaction was a horrified "No!" but smooth and persuasive talking (in which the ORBIT men seem to excel) eventually produced a rather weak "Yes". This, I gather, is intended as the first of a series of articles on outside activities - it probably will be the last!

As the Editor has indicated I had already completed a course of training for the Ordained Ministry in the Church of England before applying for a post at the Rutherford Laboratory. Most Ordinands, as we are called, go straight on to Ordination and a post of Assistant Curate in a Parish under some good Vicar - a kind of apprenticeship before they are given a Parish of their own. In my own case I have preferred (as some Ordinands are now doing) to take a spare-time appointment as a layman in a village Parish and a full-time post at a place such as the Rutherford Laboratory. Later on I hope to be ordained but rather more in the context of a Worker-priest. At least that is what I think now but these things have a habit of working out in a way one least expects.

Perhaps a word or two on the system of lay appointments might not be out of the way. As well as the usual Vicars, Rectors and other types one expects to see round Churches there exists a further species - without a dog-collar - called by the remote title of Lay Reader. He is "licenced", after training and examination, to take services, preach, and generally as his Licence says "to assist the said Incumbent in all that he may lawfully direct you to do". He carnot of course, take a service of Holy Communion though he may, with special permission administer the Chalice at the service. It depends on whether a Vicar is in charge of one or two Churches how useful a Lay Reader can be. If there are two Churches in one Parish then the said Vicar is usually very, very, nice to his Lay Reader. Without him he would be absolutely stuck to maintain the services since the chances of persuading the Bishop to send another clergyman to help are so remote as to be absolutely nil.

Very often Lay Readers get called upon to take services in other Parishes usually at very short notice and usually because the Vicar has suddenly been taken ill. When I was at theological college we often used to be called out to hold the fort in some remote country village. The Principal was quite used to receiving last minute requests for help in taking services. They usually came by 'phone: "could you possibly send someone out to Little Wittering... Rector has been rushed to Hospital... twelve miles if you go via Farringdor". Sunday morning would see a pair of us somewhere in the middle of Berkshire trying to make Little Wittering by la.m. having lost the way twice already and realising that the distance is more like twenty miles than twelve. We were usually met by the Vicar's wife, nearly always accompanied by the Churchwarden. Experience taught us two vital questions - was the Church High or Low and did the Churchwardens read the Lessons. Having made sure that we did not upset (a) the congregation (b) the Churchwardens we made friends with the Organist. This is vital. Consider. You are about to take a service in a strange Church miles from anywhere where custom has remained unchanged for the last couple of decades at least, and in front of a congregation who are wondering where their Vicar is anyway. Only the Organist, by a system of facial contortions, penetrating whispers, or cutting in with an extremely loud note on the organ can warn you that you are about to change the established custom of the last twenty-five years. Split second timing is essential. The service over Invariably you meet the congregation as they leave. this is the point where regardless of whether your sermon was good, indifferent, or just plain horrible, you will be told how much they have enjoyed it and would you like a cup of tea before departing. The said tea consumed we usually succeeded in arriving back just too late for a hot lunch which meant cold salads instead.

There is a great deal of fun to be had as a Lay Reader but I think that I should end by saying a little of why I returned to Science and to the National Institute. I worked at R.R.D.E. Gt. Malvern in Radar before taking my degree and then for a while at the BBC while I took my degree, so

(Cont'd on Page 5)

that the background of scientific research is not new to me. I think it was during my theological training that I realised for the first time the immense common ground between the scientific search for fact and the Christian

discovery of Truth. Both sides are learning about God in their different ways. Perhaps this is another answer to that question: Why build accelerators?

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EDITORIAL

The visit of the team of scientists and engineers from the USSR was a success scientifically and socially. It has brought to mind two features of accelerator laboratories for which we can be well and truly thankful — our position with regard to security and the nature of our inter-laboratory rivalries.

The thick mist which shrouded the Laboratory on the two days of the visit was certainly not conjured up to serve as a security screen, for the flow of information in both directions seems to have been quite free. We are very fortunate to be engaged in a field of scientific research in which this free exchange is possible. Science and technology are taking an increasingly bigger part in the life of all developing nations and unfortunately many of the curses of national politics have accompanied the blessings the increasing recognition has brought. A large number of scientists can never discuss their work with their counterparts in other countries and are compelled to live out their scientific lives clamped in a straight jacket of security. This phenomenon in the world of science is only as old as the atomic bomb on its present scale and we can count ourselves lucky to have escaped it.

Another factor influencing free exchange of scientific knowledge is the nature of the rivalries existing between the groups engaged in a particular field of research (and this itself can bring down the security screen). These rivalries can be a healthy stimulant to vigorous application without dislodging the motivation of research too far into being the 'firstest with the mostest'. They can also reach the ludicrous proportions of the 'space race' where much of the dignity of one of mans greatest enterprises has been lost in a squalid prestige battle.

Accelerator laboratories have their rivalries and on the whole the influence seems to be a healthy one. Certainly as regards in exchange of information no major inhibitions are apparent. Thus we were able to talk freely to pothe Russians and they to us and both sides gained from the exchange.

But, perhaps, in view of the present lethal division of the world into two violently opposed camps, this mutual direct benefit may be of less overall importance than the social coming together of people from each side. Mr. Mullett's reflection on the visit illustrates this social benefit very well. It does not matter whether the occasion is the Pugwash Conference, a visit of Russian scientists or even a Tiddywinks Championship one excellent purpose will be served. This is the realisation in both directions that the opposing group consists of people. Propaganda on each side is so relentless that this obvious fact can be lost in the lurid picture painted for political motives. Both camps do consist of people - people open to many of the same influences, capable of the same thoughts.

The particular political systems arose out of particular, differing environments and they can, and will, be modified by the people who hold them in being. And the people themselves can, and will, be 'modified' by the influences coming to bear on them. The more each side is in contact with those who hold opposing ideas, the greater the understanding of those ideas, how they arose and how they survive; the greater the chance of 'peaceful co-existence'.

One possible development in high energy physics where we have an excellent opportunity to press for closer co-operation, is the building of an accelerator to give energies in the 1000 GeV range. A machine of this size could be so expensive in both scientific manpower and in money as to strain the resources of even America or Russia, should they decide to 'go it alone'. But if nations were to pool resources and make such a machine a world venture, more than a purely scientific purpose would be served. From comments in our correspondence columns it is obvious that the scientific justification for such an expensive enterprise is at least debatable. Perhaps if the scientific motive were bolstered by the motive of international co-operation it would be well worth while.

Why not concentrate efforts, not on achieving an American, European or Russian Ultra High Energy Accelerator but on doing everything possible to bring into being a 'World Accelerator'?

Letters to the Editor

Letters may be addressed to 'The Editor, ORBIT, Building R.1.' Psuedonyms are accepted provided the authors name is known to the Editor.

Sir

The September issue has devoted some space to the philosophic outlooks of some of the staff of the Rutherford Lab. and it is certainly a thought provoking issue.

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LETTERS TO THE EDITOR - (Cont'd)

Mr. Mullett's letter troubles me; before coming to Harwell at least I understood the look on peoples faces on telling them that I designed armaments for a living. The same look appears when visitors ask me what is the end product of Nimrod and I reply "Knowledge". The problems of engineering design of armaments and Nimrod I have found of absorbing interest, I suppose because they both present the same challenge, "to be the firstest with the mostest".

One of the reasons why I came to Harwell was to escape from the sense of wrong in spending so much of my life in producing weapons to kill and maim. Working on Nimrod has only confirmed what I knew anyway, that there is little difference between the assassin and his hirer.

Sir John Cockcroft has drawn attention to our sense of values and Leo Hobbis also appears to be troubled about the division of money and effort between the many desirable and conflicting national demands. Where does one stop in the attempt to influence political decisions — are the Aldermaston Marchers right after all — how can we not violate Christian principles every day of our lives in our present society?

Perhaps we are just ostriches, if the sand of our daily lives is warm and dry enough we need not lift our heads too often to look at the frightening world outside, or in other words our work is mentally satisfying. Is it only in middle age that one feels a sense of urgency in the attempt to solve the problems of our time? The issues raised are those of our generation, and every generation since man has had time to think, and it is little consolation to know that we shall probably only learn the answers when we join the 97.5% of the others who have dwelt on this planet.

(Incidentally what are the age limits of "middle age"? Within the age limits of 20 to 60 years, it appears to be the age of the person concerned +10. Below 20 it is too far off to matter, above 60 it's past anyway).

Another item to catch my eye in your excellent journal was the Typing Equation. Unfortunately, you give no indication of the contributor. If, for a few moments we divide those who work for NIRNS into one of three groups, Scientists, Administrators or Engineers, it seems reasonable to assume the contributor was a Scientist or an Administrator.

Whilst I have heard that a Scientist is judged by the number of papers he produces and the Administrator's love of paperwork is a long standing music hall joke, I shudder at the thought of an infinite quantity of paper even from such eminent people. It is hard to believe that the mounting excitement as Nimrod approached completion would be quite so great if it was constructed of paper. No doubt your contributor has from time to time used that curse of our age—the motorcar. I wonder if he considers his passage from A to B would be so speedy and comfortable if seated on a pile of paper. Is it not just possible that the hewers of wood and drawers of water are as valuable to to Rutherford Laboratory as the most exalted pen pusher.

On another page of your journal another contributor draws attention to "one of the most challenging problems to the leaders of todays scientific organisations; how to engage the enthusiasm of the rank and file". Perhaps your contributor of the Typing Equation will one day agree that any surplus wit or wisdom available at the end of the days toil should be devoted to the "fusion" of my three groups rather than their fission.

E. G. HIGGINS.

Sir.

The truth of T. R. Walsh's observation concerning the communication of enthusiasm of the 'rank and file' is convincingly demonstrated by the 'Letters to the Editor' stimulated by M. Wroe. Letters on the topic from 'rank and file' are conspicuous by their absence unless 'rank' can be translated as 'band'.

A possible explanation is that the enthusiasm of the rank and file is directed exclusively to their careers. This state of affairs persists until material ambitious are realised. Only at this stage can one afford complete apathy to worldly wealth and a touching devotion to Physics.

SIN-CROW-TRON.

Sir,

It is pleasing that a start has been made on improving the Chivers-desolated ground that (Cont'd on Page7)

At the Extraordinary Meeting of the Fire Committee on the 6th June, it was recommended that the use of paper hand towels in Men's Toilets be discontinued, following a fire from this cause on 9th May in R.20. It is understood that this decision is not to be extended to toilet rolls.

surrounds most of our buildings. The main gate is now gilded with kerb-stones which only took approximately three months to lay. But perhaps the most useful amenity of all is the bus-stop opposite the main entrance to R.1. How nice it is to be sheltered immediately after alighting from the feeder buses.

GADERENE NUTZ.

Sir.

A letter in the August issue of ORBIT drew attention to the lack of any sign post on the main road (A34) directing visitors to the Rutherford Laboratory.

There is still no sign post. Is there any objection to erecting one?

CHRISTOPHER.

Sir.

A correspondent drew attention in your August issue to the absence of any sign post on the main road which would direct visitors tc our Laboratory. But neither are there any notices at our gates (though I did once see one sticking up out of an old oil drum), sign posts on our internal roads or adequate signs on our buildings.

Does no-one care?

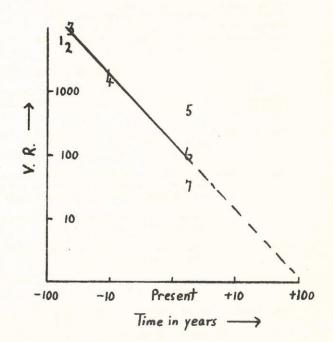
ELIJAH

A Modest Proposal

The recent publication of articles describing the discovery of the anticascade particle 1,2 focuses attention on what has surely become the most serious problem in the communication of scientific results. I do not refer to the proliferation of more and more specialized scientific journals, the increasing thickness of those that exist, or the inevitable creation of "Annual Reviews of X" or "Progress in Y", which help us to find the significant articles we should have read during the previous year. Rather, I wish to describe a phenomenon which has perhaps been hinted at, but not yet fully recognized as a clear and present danger.

A casual glance at almost any scientific journal of fifty years ago shows that most articles were written by one or perhaps two authors. An equally casual glance at a contemporary journal often reveals a list of authors longer than the title of the paper. Also, as Reif has pointed out, the pressure of scientific competition and the adage "publish or perish" competition and the adage "publish or perish" have helped to spawn a new type of journal (e.g. Physical Review Letters), in which only brief communications are published. These two factors may be combined into what I shall call the "Verbosity Ratio (VR)" defined as the ratio of words in an article to the number of authors. The temporal evolution of the VR over the past several decades is shown in the accompanying several decades is shown in the accompanying figure, and it is evident that the ratio is dropping rapidly. Intuitively and naively one would think this a desirable state of affairs, and indeed it would be if the total number of contributing authors were to remain constant. But surely the total number of scientists, and hence would-be contributors, is increasing

The following letter appeared in the June issue of 'Physics Today' and is republished here by kind permission of R. E. Weston and 'Physics Today'.



- 1. Proc. Phys. Soc 17 (1899-1901)
- 2. Phys. Rev. 1 3. Ann. Physik 64 (1913)
- (1921)
- 4. Phys. Rev. 77 (1950) 5. Phys. Rev. Letters 6 and 7 (1961) Overall Average.
- 6. Phys. Rev. Letters 6 and 7 (1961) High Energy
- Physics. 7. Reference 1/

(Cont'd on Page 8)

A MODEST PROPOSAL - (Cont'd)

rapidly with time. Therefore the slight extrapolation indicated in the figure indicates that in less than a century a VR "catastrophe" will take place. At that time, the ratio will have dropped to three words per author, and the space devoted to listing the authors' names will roughly equal that required for the contents of the article. It is also evident from the figure that articles devoted to high-energy particle physics have a lower verbosity ratio by a factor of almost two, by comparison with other current articles. This appears an inevitable consequence of a type of physical research which demands enormous machines and large teams of researchers to serve them. Goudsmit⁴ has commented eloquently on the impact of this phenomenon on the future of physics research.

Now my suggestion is simply this: Apply the concept of 'team' research logically, consistently and enthusiastically. Individual scientists in such groups must forego the pleasure of seeing their names emblazoned in 8-point Baskerville and accept authorship designated by a group name. I propose that a suitable international body begin at once to choose appropriate and easily remembered names for the various teams of physicists engaged in high-energy nuclear research. Some possible titles suggest themselves at once: the "Reds" of Dubna, the Harvard-MIT "Yankees", etc. Of course, the make-up of a given team will vary continuously, which will require the publication

at annual intervals of a statement of the number of articles attributed to each team and a list of the group personnel. Each member will be given a "writing average" e.g. 0.5 means he was a co-author of half the publications issuing from his team. It might prove desirable to form subgroups of teams, for example an American League of laboratories with accelerators operating at energies greater than 30 BeV and with beams travelling counter-clockwise, and Un-American League with accelerators of greater than 30 GeV and beams travelling clockwise, and AAA league with energies between 3 and 30 BeV, etc., etc. Further possible extensions of this system such as "trading" of team members, relegation of members to minor leagues, and so forth, are left to the imagination of the reader,

We remain, Sir, etc.
Ralph Emerson Weston, R. E. Weston,
R. Emerson Weston, Ralph E. Weston,
and several others.

Library Lane, Brookhaven, Long Island, New York.

- 1. Brown & 16 others. Phys.Rev.Letters 8,225(1962) 2. CERN, Ecole Polytechnique & Saclay. Phys.Rev.
- Letters 8, 227 (1962) 3. F. Reif. Science 134, 1957 (1961)

4. S.A. Goudsmit. Phys. Rev. Letters 8, 229 (1962)

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Any suggestions on names for Rutherford Laboratory teams?

EDITOR.

SOLUTION TO 'MONKEY PUZZLE' IN SEPTEMBER ISSUE

To reach the solution by an easy route the choice of starting point is vital. The best point is the last statement in the long sentence relating the mother's age to the monkey - from here things are quite straightforward.

Time (a) Let the age of the mother when she was 3 times as old as the monkey be 3n years.

The monkey was then n years old.

Thus the monkey was, is and always will be 2n years younger than the mother.

Time (b) When the monkey is 3 times as old as the mother was at time (a) it will be 9n years.

When the mother was half as old as the monkey was at time (b) she would be 4½n years and the monkey (2n years younger) would be 2½n years.

The mother is now twice as old as this age of the monkey - she is 5n years and the monkey is therefore 3n years.

We are told their combined ages equals 4 years, $5n \div 3n = 4$, $n = \frac{1}{2}$ year and the mothers age is $2\frac{1}{2}$ years.

The weight of the monkey and also that of the weight is as many pounds as its mother is years old - $2\frac{1}{2}$ pounds.

Now, Weight of weight + weight of rope = $1\frac{1}{2}$ x (weight of weight + weight of monkey - weight of weight)

= $1\frac{1}{2}$ x weight of monkey $2\frac{1}{2}$ pounds + weight of rope = $1\frac{1}{2}$ x $2\frac{1}{2}$ pounds Weight of rope = $1\frac{1}{4}$ pounds

The rope weighs a pound per foot. Therefore, Length of rope = 5 foot

Many solutions, correct and incorrect, were received - among them a most elegant logical flow diagram to the correct solution from C. G. Bonfield, Lab. 4, R.1. The first correct solution was received from Dr. Peter Smith, Magnet Group, R.1.

He duly received 5 ft. of best rope (in presentation box) which he acknowledged with thanks though expressing some regret that the prize was not in fact the monkey.

What Vs from CERN?

Dr. Galbraith has recently visited CERN where preparations are underway for neutrino experiments

One of the projects at present underway on the PS machine at CERN is the provision of a high intensity neutrino beam to be used in experiments which are planned for early next year. Following the successful neutrino work in the earlier half of this year by the Columbia University physicists working on the A.G.S. machine at the Brookhaven National Laboratory considerable theoretical importance is attached to the outcome of future experiments in this field. They are planned to see how these mass-less and charge-less particles behave in interactions. There is hope, for example, that a particle invoked by the theoreticians, the intermediate boson (W) to account for weak interactions, may be produced in some of these neutrino reactions. However, the probability of such an event occurring is so small that detectors consisting of many tons of matter have to be constructed. Optimistically, neutrino event rates of the order of one per ton

of detector per ten hours are being talked about, and depending upon several factors, the production rate of W's may be smaller than the neutrino event rate by an order of magnitude.

How does one go about obtaining a neutrino beam to do such experiments? This is where the technical know-how and resources of a laboratory like C.E.R.N. have to be co-ordinated, to ensure that preparations go on smoothly in such a way that the intensive research programme of the P.S. machine already in progress will be least affected by the considerable installations required.

First, the circulating proton beam in the machine itself has to be extracted and it is hoped that more than 90% of these protons will be focussed by a system of quadrupole lenses and steared in direction by bending magnets on to a small diameter metal rod target external

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Personnel News

ORBIT is for everyone at the Laboratory -

Do YOU get married, have babies, etc

When you do, tell 'The Editor, ORBIT, Building R1'

Congratulations to-

Valerie Pryor on her recent engagement.

Brian Belcher, who is with Nuclear Physics Group having successfully completed his third year at Northampton College of Advanced Technology, on his marriage to Miss Margaret

Mike Audus of Bubble Chamber Group and his wife, Hazel on the birth of a daughter, Heather Margaret, on October 9th.

Trevor Hyman of Injector Group and his wife Marianne, on the birth of a daughter, Anne Deborah, on September 29th.

Jeff Condliffe, attached to Cyclotron Group from A.E.R.E. and his wife Monica, on the birth of a son on October 18th.

Comings and Goings

J. D. Forbes joins Bubble Chamber Group; T. R. Mason joins Magnet Group;

P. I. Hill, J. Kay and A. $\dot{\text{V}}_{\bullet}$ Payne join us and will be at the Training School.

W. R. Morris joins Electrostatic Generator Group; I. C. G. Sewter joins Scientific Admin.

Miss M. J. Ashcroft joins Theoretical Physics; Miss M. A. Brooker joins the Atlas Laboratory.

L. H. C. Crowther, D. Wooton, E. E. T. Exon, R. D. Druce, G. Rutherford and M. W. Woods join Nimrod Engineering.

Mrs. Chapman and J. B. Mellor join Administration; E. J. D. Newbold joins Accounts.

P. A. Braham, C. G. Barker, P. D. Pearce, A. W. Caroll, R. P. Glover, W. J. Hughes, P. C. Jones, B. P. Keen, B. R. Maynard, R. A. Padgham and R. M. Rafiq join Central Engineering Services.

Sid Cross, who has been Vacuum Group Leader for several years, has left us to enter Industry. We may have a message from Sid in the next issue and will bid him farewell more fittingly.

 $\ensuremath{\mathrm{R}_{\bullet}}$ J. Griffiths has completed his fixed term appointment.

Miss Sturrock, A. F. Bentley and A. M. Popplestone have left us.

to the machine.

The problems associated with the extraction system here are somewhat comparable to those one will face in obtaining an extracted beam from Nimrod. The neutrinos arise from the decay of charged π and K mesons produced in nuclear reactions in the rod target, and since they are uncharged, the number of neutrinos crossing a unit area will depend very much upon the direction of the TT's and K's relative to this area. The

meson fluxes in a given direction can be increased by focussing the beam by a conventional quadrupole lens, but at C.E.R.N., an ingenious conical focussing "horn" has been devised, by which means it is hoped to increase the meson fluxes and consequently neutrino fluxes, by at least an order of magnitude over that attained by a quadrupole system.

The identification of events produced by neutrinos depends critically upon the effective shielding of the apparatus, since stray p-mesons, which are very penetrating particles and which are present in large numbers around machines like the P.S., might mislead one into supposing a neutrino event had been observed in which a $\mu\text{-meson}$ was produced. Consequently, the shielding required around the detectors is very considerable, and the presence of such shielding poses interesting problems to the structural engineers who see their building foundations sinking if overloaded.

Of the detectors themselves, bulk is again the important factor and two types will be used, one a propane bubble chamber of less than 1 ton weight absorber and the other, an array of spark chambers weighing 25 tons. The bubble chamber affords a means of detailed analysis of any detected event although the rate will be low; the spark chambers probably afford less detailed analysis than the bubble chamber, but the rate of events will be higher, and so one can become more quantitive about the cross-sections for interaction.

The scene then is set and given satisfactory operation of all the vast complex of equipment which goes to make up the P.S. machine, its extraction system, the focussing horn and the well-shielded detectors, we may hope soon to hear what >> s are to be found at C.E.R.N.

DON'T FORGET!

Friday night, December 7th is

Rutherford Laboratory Dance Night.

Magnet Room Saga

(ABRIDGED VERSION)

A mystery poet has struck in the Magnet Room. Who is Koo? The following characters, in order of appearance, would dearly like to know - Maurice Mackereth, John Hook, Harry Jarvis, Percy Brooks and Brian Mucklow.

North of the white cliffs of Dover And East of Ilfracombe Lies a steaming den of white slavery It's known as the Magnet Room.

The Geezers in charge of Construction Know every trick in the book With good dispositions as well as positions There's Mac and his side kick John Hook.

There's a fair sized mob Being paid a few bob With big slabs of steel to wrestle. A deft 'Flying Mare' Flips them up in the air And backheels them into a yessel.

They're a fabulous sight,
This mob dressed in white,
Their clobber washed weekly in Lux.
As a stranger went by
He uttered a cry,
'What a fine pack of Aylesbury Ducks!'

Harry Jarvis stands there, Quite smart, debonair, In his eyes a peculiar gleam As the boys pass by Pole pieces raised high To the strains of the Harry Lime Theme.

There's a howl and a wail From some unfortunate male And a crash of an upturned trestle T'was only a mate But sad to relate There's another big hole in the yessel.

With a cry of despair
Percy takes to the air
And flies round the ring like a bat
Till Brian Mucklow
With one mighty blow
Knocks him down with his deerstalker hat.

Peace reigns once again
In this torrid domain
With height targets set and aglow
Tech. Threes on their stands
Start clapping their hands
Chanting, 'High reading means that it's low'.

There's more I could tell But I must say farewell It's teabreak and my time is up. The teaboy's name's mud He's never had it so good It costs us a guinea a cup.

KOO

Ultra High Energy Accelerators

Mr. Walkinshaw who has been concerned in the Western discussions on accelerators up to 1000 GeV energy writes on the background and progress of these discussions.

During the past few years considerable attention has been given to methods of extending the energy range and intensity of high energy accelerators. One proposal, coming from Russia, was described in the September issue of ORBIT. The present article provides some of the background history to this work and to companion studies elsewhere.

The Early Developments

In November 1959, the McCons-Emelyanov agreement opened the door to collaboration between America and Russia in the "utilisation of atomic energy for peaceful purposes." In perticular it was specifically suggested that a large and novel accelerator outside the resources and Russia. No mention was made of other and Russia. No mention was made of other nations collaborating. An informal meeting between Russian and American physicists subsequently took place in August 1960 at the Rochester High Energy Physics Conference where it was agreed to set up study groups to investi-gate possible accelerators. It was hoped that this would prepare the way for more detailed technical discussions between America and Russia at the High Energy Accelerator Conference held in New York in September 1961. Unfortunately the Russians failed to turn up at this conference. Since then nothing has been published of further meetings. Nevertheless the American work was described at the 1961 Conference and it is apparent from recent publications that parallel work was carried out in Russia.

A "World Accelerator"

What accelerator then would come with the definition of a "world accelerator"? largest operating accelerators are the 25-30 GeV Alternating Gradient synchrotrons at CERN and at Brookhaven. In Russia a similar machine is under construction and this will reach 70 GeV. During the 1959 summer study session held by MURA (Midwestern Universities Research

Association, U.S.A.) Dr. M. Sands of the California Institute of Technology, presented proposals for a 500 GeV machine of small aperture. This work was followed by detailed investigation of its technical feasibility by the Cal. Tech. Group and has been published in a number of reports. At the Lawrence Radiation Laboratory, Berkeley, similar investigations were carried out by Dr. Lloyd Smith in 1960 for an alternating gradient synchrotron between 100 GeV and 300 GeV as a possible West Coast accelerator. A machine of this magnitude would certainly cost more than one hundred million dollars. With this level of expenditure contemplated for national accelerators - and it should be noted that the Stanford Electron Linac, now authorised will cost about 140 million dollars - an energy of 1,000 GeV was suggested for the "world" machine.

The Western Proposals

Study of the American proposals was entrusted to Brookhaven under Dr. J. Blewett. Interest was not confined to Brookhaven however and the summer of 1961 saw a spate of summer study sessions. To some extent these were complementary. The first meeting took place at CERN in June 1961. This group, with representatives from many laboratories, was concerned to a large extent with the desirability of still higher energies rather than the feasibility of accelerator design. For an excellent summary of the CERN discussions the reader is summary of the CERN discussions the reader is advised to read Dr. Van Hove's paper in the Proceedings of the High Energy Accelerator Conference, 1961, on the "Role of High Energy Accelerators in Particle Physics". The CERN group emphasised the need for greater intensity as well as high energy. They also strongly supported the building of storage rings for studying high energy nucleon-nucleon interactions.

The second study group met during July and August at Berkeley. Lectures covering a wide variety of topics were held each morning and (Cont'd on Page 12'

Chief angineer on Fire!

Our Chief Engineer, Mr. Percy Bowles, was driving along the M1 early this month, heading for Marston Excelsior to attend a meeting on vacuum vessels, when he caught fire.

Smelling burning, he naturally suspected the car, which was flat out, but was rather surprised to find smoke rising steadily from his jacket pocket. A hasty stop, some quick stamping out of flames and the damages were an unwearable jacket and a lost cigarette lighter.

There was some expression of disbelief at this story when he arrived late at the meeting in a golfing jacket which happened to be in the boot.

ULTRA HIGH ENERGY ACCELERATORS - (Cont'd)

smaller discussion groups met during the afternoon over a period of six weeks. It is impossible
to give an adequate summary of this meeting here.
Of particular note was the attention paid to
estimates of secondary particle intensity and the
need for new experimental techniques in this
ultra high energy range.

Finally, a pre-conference concentration of accelerator specialists met during August 1961 at Brookhaven. At this meeting one group, under Dr. L. Yuan investigated experimental techniques. The result of this is contained in two very large volumes prepared for the U.S. Atomic Energy Commission. For a summary of their findings the reader is referred to the paper presented at the 1961 High Energy Accelerator Conference by Dr. M. Sands entitled "Design Concepts for Ultra-High-Energy Synchrotrons".

The Present Situation

Perhaps the most impressive feature of all these discussions was the universal confidence that the technical problems in building a 1,000 GeV synchrotron could be solved. Since then studies have continued at a slower tempo in most laboratories including CERN and there is now little doubt that such a machine is feasible. It is also clear from reading the findings of the various study groups that nuclear physicists can make out a good case for having such a machine. Whether or not it will be built depends on distribution and availability of national scientific resources and this is a topic which will be hotly debated in the next year or two.

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"SUGGESTION AWARDS"

The Rutherford Laboratory Suggestion Awards Committee met for the first time on 2nd October to consider a number of suggestions recently submitted.

Congratulations to the following who won the following awards:-

Mr. C. Wallis 2 encouragement awards of £1 each.
Mr. E. B. Iberson
Mr. D. A. Hutchings
Mr. H. Webb 2 £3

The Suggestion Awards Committee is meeting again on 22nd October to consider a number of suggestions that it could not deal with at its previous meeting and will meet again at regular intervals in the future.

Will it have YOUR suggestion to deal with? Have YOU any bright ideas?

If so - don't keep them to yourself, let the Committee have them!

If not - look around you and start thinking!

can put your suggestion in any of the Suggestion Boxes, or post it to:-

Suggestions Secretary, Room 65, Building R.20.

Operation of the ZGS Linac

A cable arrived from the Argonne National Laboratory, $U_{\bullet}S_{\bullet}A_{\bullet}$ on 18th October announcing the successful performance of the ZGS Linac.

'On October 16th 1962 the first proton beam of approximately 2 milliamps was accelerated to 50 MeV by the ZGS Injector Linac. All systems are go'

Staff Meeting

The second meeting in the Cockcroft Hall on 17th October was attended by most of the people who were not present at the earlier one in July. The Director, Dr. Pickavance, explained the purpose of the meetings as communication between staff and management and proceeded to discuss the progress we have achieved at the Rutherford Laboratory and our future plans. A significant announcement of development elsewhere was the news that a site has been selected for the Electron Laboratory and now awaits approval.

Dr. Willis explained the situation with regard to our stores budget which has led to restriction on signing power for stores withdrawals. Now that the bulk of capital expenditure on Nimrod is behind us an increasing proportion of our money is going on 'consummable' items used in research experiments. We have heavily overspent our stores budget in the first half of this financial year and need to cut down our expenditure drastically for the remaining half.

Mr. Bowles discussed the changing nature of the engineering requirements on Nimrod and its effect on the engineering staff. The total of thirteen engineers who presided over the birth of Nimrod has now risen to four

hundred occupied with the closing stages of the construction and, increasingly, with the nuclear physics apparatus Nimrod will feed.

Mr. Mullett spoke with enthusiasm on the recent progress on Nimrod due largely to the growing team spirit among all the contributing groups of people. Achieving a 10 milliamp beam from the Injector recently probably establishes it as the finest linear accelerator of its kind in the world. If the work generally continues at its present pace we may be able to start commissioning the machine earlier than we expected.

Dr. Stafford described the role of the PLA in nuclear physics experiments — the field of investigation is so great that many types of machine are needed to cover the different areas. For many experiments a machine of the PLA type is more suitable than one providing higher energies. Already much remarkable scientific work has been done using the PLA and much is envisaged for the future. A development in linear machines which we have been studying under the title of 'The Planet' Project' is the application of the principle of superconductivity. One major advantage would be the possibility of continuous operation instead of pulsed operation as we use at present. Nothing we have done so far indicates that this project is impossible.

JOHN WILKINS

It is with the greatest sorrow in our hearts that we have to record the untimely death of John Wilkins in a car accident in Zurich. He and Bob Sheldon were being taken to the airport by three members of the staff of Oerlikon Engineering Company when the car skidded into collision with a lorry. Mercifully Bob Sheldon was not seriously injured but our thoughts have been with him and his wife in this very trying time. One of the Oerlikon people was also killed, another is dangerously ill and the third is injured but not in danger. The Oerlikon people are heartbroken at what has happened and we can only return to them our sympathy for their own loss.

In John Wilkins we have lost a wonderful colleague. He was a superb physicist and any success that we have with NIMROD is a vast tribute to his work and his memory. It is however our personal loss which is so hard to bear. Mrs. Wilkins knows how much we share her grief and we will not forget when she needs our help.

L. B. MULLETT