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UNIVERSITY OF LONDON KING'S COLLEGE  
DEPARTMENT OF PHYSICS

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Dr. R.R. Roy entered King's College in October 1945 and obtained his Ph.D. degree in October 1946. He has been engaged in working mainly with the expansion chamber and he has published a number of papers in conjunction with myself, and he has one or two further papers in the press under his name alone.

When he arrived at King's College Roy had had practically no experience of nuclear physics technique and his standard of general knowledge in physics was definitely below the average of one of our own graduates. This handicap was very marked during the first year of work and at one stage I must confess I seriously considered advising him to discontinue his research work. Since that time, by extreme diligence and very long working hours, he has made exception progress both in his command of the subject and in his specialised knowledge and technique in nuclear physics.

He began working on a low pressure expansion chamber which he had to abandon after some nine months work due to our difficulty in obtaining rubber of an adequate quality because of the war conditions. Actually, he adapted this chamber to work at ordinary pressures and with it he obtained the results on the angular distribution of protons ejected from nitrogen under  $\alpha$ -particle bombardment which were published jointly with me in the Proceedings of the Royal Society. The dimensions of this chamber which had been designed for low pressure work were too small for a further prosecution of this type of disintegration problem, and Dr. Roy transferred to a larger chamber which I had myself constructed and which I was then using to examine the large angle scattering of  $\beta$ -particles of 1 million volts energy by nitrogen nuclei. These results are in process of publication by the Physical Society, and we are reading them before a meeting of the Society on November 5th 1948. As used in this manner, the chamber was of a sort of counter-controlled type and consequently Roy has had experience of the operation of Geiger counters as well as of expansion chambers.

The next problem was to continue the proton angular distribution work and Roy used this expansion chamber to examine the disintegration of fluorine and neon, the results of which were published in the July number of the Physical Review of this year. Dr. Roy has further extended the work to solid targets and now has information on the disintegration of aluminium and magnesium and is at present seeing what can be obtained with deuterium in the form of heavy paraffin wax. Owing to the large number of proton groups in aluminium and magnesium these results are taking somewhat longer to interpret than in the previous experiments with gaseous targets, but definite results are being obtained and will be published in due course.

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Mr. R. Ramanna entered King's College in October 1945 and before coming here he had indicated that he wished to study one of a few stated branches of physics, among which cosmic rays was selected as the most suitable one for study in the physics Department here at that time. Just at the time that Mr. Ramanna arrived Dr. A.N. May returned from Canada and was the acting Head of the Department here. Consequently, although Mr. Ramanna's original correspondence was with me he worked under the direction of Dr. May towards the end of 1945.

Apart from my own cloud chamber and counter techniques there was very little apparatus and equipment available at King's College for the study of nuclear physics at that time and consequently May suggested that Ramanna should first develop the ionisation chamber technique as a further detection method before applying it to some specific problem. Ramanna was therefore assigned the task of developing a new form of ionisation chamber which would record not only the total ionisation produced by the passage of an ionisation particle ~~through~~ the chamber, but which would also give the actual position and direction of the ionising track. After Dr. May had left in March 1946 Mr. Ramanna came under my direction and I felt that he should continue with this work which he has done successfully enough and obtained sufficient material for a Ph.D. degree thesis. He is now in process of writing his thesis which will be submitted in due course. I am sure you will appreciate that I cannot guarantee that he will be awarded his Ph.D. degree at this stage. Our system is to have two examiners, one of whom is the student's supervisor and in my view Mr. Ramanna is likely to be successful, but I cannot in advance vouch for the opinion of the other examiner. In the event of a disagreement a third external examiner is called in to arbitrate.

In any case, the physical problem which Mr. Ramanna has examined with the aid of his new ionisation chamber is not of very great importance and it is usually highly desirable, and in accordance with his wishes, that he should be able to continue for a further year with the apparatus which he has constructed to apply it to a more interesting problem. Ramanna met with the usual experimental difficulties about which he showed considerable ingenuity in obtaining a solution, but he was unable to reduce his background sufficiently to give him detailed information about particles of less ionising power than fission fragments. His problem, therefore, was confined to an examination of the ~~total~~ *angular* distribution of the fission fragments resulting from the fission of uranium by neutron bombardment. The background difficulties

were almost certainly due to contamination, but as we were concerned with investigating the possibility of getting such a chamber to work at all we found it preferable to neglect this background and work with heavily ionising particles rather than to spend time constructing another chamber with a lower background. This is the problem upon which Mr. Ramanna is now engaged and on which he should obtain interesting and important information during the coming year.

There is no doubt that Mr. Ramanna possessed a higher standard of knowledge and a more mature mind than Dr. Roy when he arrived at this College and I am inclined to believe that his critical faculty is definitely of a higher order than in the case of Dr. Roy. His judgements are usually very well balanced, possible alternative interpretations are carefully considered before an opinion is passed, but nevertheless that opinion is not long in forthcoming. Whether he has the degree of patience and perseverance in adversity as shown by Dr. Roy I have not yet had a suitable opportunity of judging, though no doubt I could pass a more valuable opinion on this in about a year's time as I am confident that the reduction of contaminating background which is going to be necessary in his next piece of work would try the patience of any experimenter to the utmost. I think that he is fully capable inherently of initiating and directing research with perhaps greater vision than Dr. Roy, but of course his range of experimental technique and experience at King's College is definitely less than Dr. Roy's.

*Mr. Ramanna*  
My conclusion, therefore, is that Dr. Roy has had the greater experience and has produced more definite results than ~~Dr. Roy~~, but that as far as one can judge Mr. Ramanna strikes me as being potentially the better man in the long run.

21.9.48