

OPENING ADDRESS BY DR. W. MARSHALL, DIRECTOR,
A.E.R.E., HARWELL.

Mr. Chairman, Ladies and Gentlemen,

It gives me great pleasure to welcome this distinguished gathering to the Fifth International Cyclotron Conference and to say, on behalf of all the staff at Harwell and the Rutherford Laboratory, how pleased we are that the conference is being held in the U.K. I am especially pleased to be representing Harwell on this occasion because our first Director, and the man who created Harwell, was Sir John Cockcroft. Sir John's experiments, with Dr. Walton, in Lord Rutherford's Cavendish Laboratory marked the beginning of modern machine physics and paved the way for the immense developments that have taken place in the last four decades. A most important development was, of course, the invention and proving of the first cyclotrons at Berkeley by Ernest Lawrence and his collaborators. We have here today some distinguished scientists who were involved in these developments and who played a major and pioneer role in them. On behalf of all delegates I would like to give a special welcome to them. We also have with us distinguished scientists from many other countries including, I was particularly pleased to see, nearly all the active cyclotron projects in Europe, Canada, Japan, and the United States.

This conference comes just 10 years after the first in the series which was held in Sea Island in 1959. In the foreword to those Proceedings Dr. Snell pointed out that the Sea Island conference marked the beginning of a third wave of Cyclotron development. The first wave was the early pioneer work to which I have already referred. This inspired a surge of cyclotron construction throughout the world, all of it deriving, more or less directly, from the initial Berkeley concept. The second wave, starting after the end of World War II, took cyclotron development and construction into the relativistic range of energies made accessible by frequency modulation. At the time of the Sea Island conference people were just beginning to embark on the third wave, the development of machines using unmodulated frequencies and sector focusing, with isochronism at all energies.

I was pleased to see that the Organising Committee have concentrated on performance, the improvement of performance and the principles that govern improvements, rather than on descriptions of machines and hardware. Sessions 3-8 should demonstrate how cyclotron designers and operators throughout the world are endeavouring to meet the demands of users for higher beam currents, better beam quality, and wider ranges of ions for acceleration. Indeed one of the themes of the conference is to be how best to meet these increasing demands from users who now come from many different disciplines each with their own special needs. One interesting development to be covered is the development of compact cyclotrons on a commercial basis. The two papers on computer control of cyclotrons I find especially interesting as perhaps a significant pointer to large future development in this area.

Our conference is timely in that we are now able to assess the results of a

decade of development, design, construction, and operation of sector focused machines. In particular, part of the Conference will be concerned with the versatile cyclotrons, of which the Berkeley 88 machine, the Oak Ridge Isochronous Cyclotron, and the V.E.C. are examples, that have so many potential applications in fields entirely distinct from nuclear physics. The last 10 years has shown that the cyclotron has wide applications in other sciences and we have reached the stage at which cyclotrons are designed and built solely for these other applications. Our own V.E.C. at Harwell is indeed an example of this. The variety of ions and the relatively high currents that can now be achieved make the cyclotron one of the most versatile of research tools exceeding the Van de Graaff electrostatic accelerator in energy, and beginning to compare well with it in resolution at lower energies. Users now include radiochemists, biologists, medical workers, metallurgists, radiation chemists and analytical chemists. The scope is so wide that we decided to arrange the first International Conference on the Use of Cyclotrons in Chemistry, Metallurgy, and Biology, immediately following this one. I am told that 40 delegates here today also expect to attend the Users' Conference.

Like the earlier conferences this meeting aims to bring together designers and operators of widely separated machines to exchange the ideas on which improvements depend. We thought that you would welcome the opportunity to do so in a College like this where the conditions and the atmosphere encourage the maximum of informal discussion and consultation which may often be more valuable than the formal sessions. We chose St. Catherine's College, the newest foundation in this ancient University and on your behalf I would like to thank the Master and the Fellows for permitting us to hold the Conference here. I am sure that the Conference will be a successful one at which the scientific exchanges will be most fruitful and that it will lead to the cementing of many bonds of personal friendship across the world. It therefore gives me pleasure, Mr. Chairman, to open this Conference.