

energy liberated in a thousand years could be released instantaneously, a single milligramme of radium would equal in its effect a ton of any known explosive."

It is clear from these quotations that, even at that early date, the ultimate results of their researches were apparent to this group of pioneers. For the next forty years a small number of research workers scattered throughout the world, but still mainly in Europe, pursued this fascinating trail of knowledge into new and uncharted country. It is important to notice that the rapid progress that they made was due very largely to the complete freedom with which they interchanged the results of their discoveries. Had military secrecy interfered with the free interchange of research knowledge in nuclear physics thirty or forty years ago it is reasonably certain that we would not yet be faced with the problems of how to get along in a world dominated by the existence of thermo-nuclear weapons; nor would we be able to contemplate the early advent of nuclear power for peaceful purposes--but that is a separate story in itself.

By about 1940 scientific knowledge throughout the world had accumulated to a point where the more enthusiastic exponents of nuclear energy felt that it would be possible to produce either a slow and controlled liberation of energy by nuclear fission for power production or an explosive liberation for military purposes. I will not attempt to go into the history of the wartime development of nuclear energy. Under the impetus of war tremendous resources were made available to the scientists, mainly in the United States, and the rate of progress exceeded anything that the world had ever seen before. The first atomic reactor, the primitive ancestor of the great power stations of the future, began to operate in Chicago in December 1942. The first atomic bomb, an equally primitive progenitor of the thermonuclear weapons of today was exploded near Albuquerque, New Mexico in July 1945.

It is interesting to recall that Canada continued to play an active part in this dramatic progress. A joint British, French and Canadian research unit was set up in Montreal in 1942 in laboratories operated by the National Research Council. The outstandingly successful atomic reactor at Chalk River was designed in these laboratories.

During this war-time period and for some years after the war the work directed toward controlled nuclear reactions for power production and that aimed at producing weapons of destruction was pursued under the same auspices and often in the same laboratories. In recent years the two streams of research and development activity have begun to emerge as distinct programmes leading in divergent directions. The main purpose of my talk today is to try to outline to you what is likely to lie along these two paths and the nature of the dilemma that their very existence presents to mankind.

Let us first consider the path that leads to the ultimate horror of total nuclear war. The world