harmed through exposure to radiation, and how these injured cells recover in certain conditions. The studies have been going on for many years and were particularly stimulated as a result of the discovery that most of the radiation effects on living material are due to short-lived toxic products in irradiated water. This has been demonstrated by the fact, for example, that bacteria irradiated in salt solution are slightly more sensitive to X-rays than bacteria in broth, where these radiation products are neutralized. From this basis research has expanded and progressed.

Scientists from thirteen Member States of the Agency, together with representatives and observers from EURATOM and a number of national research institutes were present for the meeting. Among them were such leading pioneer workers in radiation biology and protection as Z.M. Bacq (Belgium), A. Kusin (USSR), P. Alexander (UK) and A. Hollaender (USA).

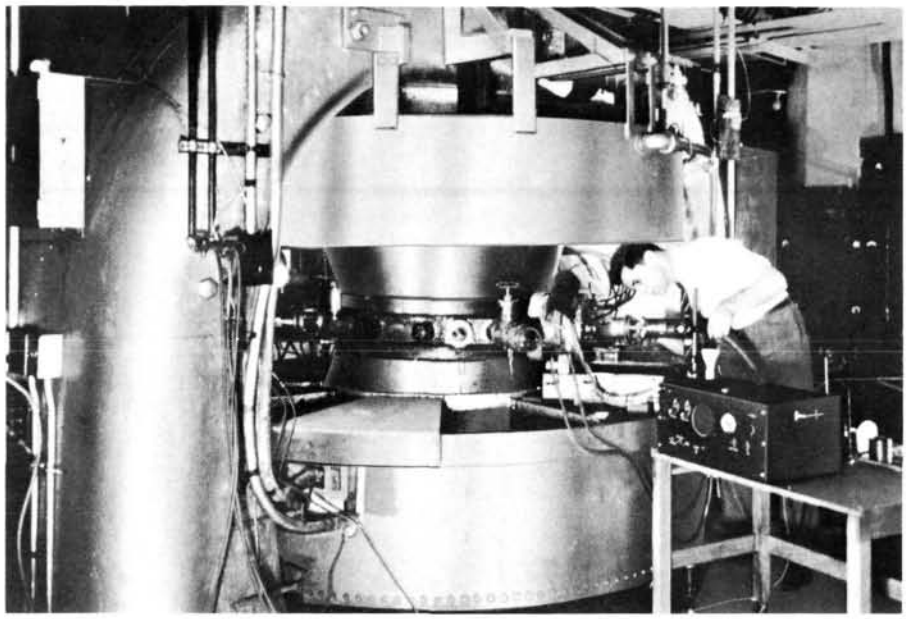
At the end of the meeting, the panel adopted a report indicating the most promising areas of further research and making recommendation to the Agency on future activities in radiation biology and its practical applications.

WHEN THE CHAIN REACTION STARTED

It was 2 December 1942. Just as the band of distinguished scientists were waiting for the world's first chain reaction to start in the first atomic pile Enrico Fermi looked at his watch and said "Gentlemen, time for lunch". This incident was part of the first-hand story related to members of the Agency staff on 3 September this year by Professor Herbert L. Anderson of Chicago University, one of the team engaged in the project.

Professor Anderson's connection with the historic event began with an encounter in January 1939 with Niels Bohr, who was excited about news given him by Lise Meitner and Otto Frisch. This initiated a long collaboration with Fermi, which led to the setting up of an experiment proving that fission took place, and eventually the construction in a squash rackets court of the first atomic pile in which a self-sustaining chain reaction was proved to be possible.

Enrico Fermi lecturing on nuclear forces, Chicago 1952.



Professor Anderson performing a cyclotron experiment during early research on uranium atoms.

The story of the three years before the actual event was one of exciting developments resulting from work in a number of different centres, meetings with Government and army authorities, and steady progress towards the moment when it was proved that the energy within the nucleus of an atom could be both released and controlled.

Professor Anderson recalled that at that time engineers of the Manhattan District Project were responsible for construction of the pile, and Fermi had received permission for it to be built in the West Stand of the University of Chicago campus. Layers of graphite were steadily built up containing at intervals layers of uranium metal and uranium oxide. Progress was carefully recorded until 1 December 1942 Fermi, who throughout the whole project was completely confident of success, decided that on the following day criticality could be achieved. So exact had been his calculations that well before this he was able to predict almost exactly the point at which the reaction would become self-sustaining. On the night of 1 December he left Anderson in charge with instructions not to take any action during the night.

"I have to confess" said Professor Anderson "that the temptation that night to see whether the chain reaction could be set in motion for the first time was enormous". The following day representatives of a large American firm happened to be in Chicago. Major-General L.R. Groves, who was in

command of the Government's atomic programme at the time, wanted to involve American firms in the construction of reactors, and Fermi himself, who seemed completely unworried, wanted to make the most of the occasion. He assigned a member of the group to handle the cadmium rods used for control purposes and others to watch the instruments, while the rest of the party sat where they could see the counters which measured neutron activity. The control rod was withdrawn and at each stage Fermi explained what was happening. The point came when the neutron counters were clicking faster and the graph line climbing; at this moment the automatic safety rod, deliberately set at a low point, came into operation. It was then that Fermi, who always kept to a timetable, decided it was time for food.

After lunch, during which Fermi and his colleagues talked about anything but the experiment in progress, the operation began again. Eventually Fermi said "Pull out the rod another foot and this time the chain reaction will be in progress".

Now the clicking of the counters became more and more rapid until the sound became almost a roar, and it was impossible to distinguish single clicks any more. Some people began to wonder how Fermi knew he could stop the reaction, but Fermi was calmly continuing his calculations. All eyes were on the safety controls and on the man operating them. At last Fermi calmly said "Well, zip in". The rods went in, the noise died down, everyone sighed with relief, and the realization came that a great event had taken place.

One of the questions afterwards was why no photographs had been taken of the occasion and Professor Anderson pointed out that at the time everything was completely secret and strict rules were applied. His own scientific paper on the event had to be held back until secrecy could be relaxed. The only official pictures taken were while some of the layers were being installed. To another question as to whether safety measurements were taken of radiation, he said they were all well aware of the situation. The activity was so low that Fermi considered the heat generated was only enough to boil an egg and at no time was any large amount of activity built up.