

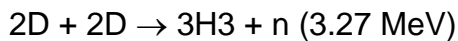
# Physics and World War II

Monday, Jan 10, 2005 1:30 - 3:00 PM

(i) A. P. (Tony) French

Tony French (author of a widely-used undergraduate text on relativity) worked on the Manhattan Project during World War II. His field of research was actually nuclear fusion, looking past the atomic bomb to the hydrogen bomb. What follows are notes made by me during his talk. Any errors mine.

Tony attended Cambridge University from 1939 - 1942. On graduation, he was assigned to work with Egon Bretscher on particle accelerators at the Cavendish Labs. One task was to measure the cross-section for fission using fast neutrons. Sources of fast neutrons included the reactions



An apparatus similar to that developed by Otto Frisch was used.

In 1943 research was moved from the UK to Los Alamos, NM, and Chalk River, ON. Tony stayed in the UK until 1944, when he was moved to Los Alamos. Here he worked with Teller and Bretscher on the development of the hydrogen bomb.

The tritium used in their experiments was made at Oak Ridge Labs by inserting  $6Li$  into a reactor using the reaction  $6Li + n \rightarrow 4He + 2T$ . At the time, tritium cost 80 times as much as plutonium. The entire world supply of tritium amounted to  $1 \text{ cm}^3$ .



(ii) Robert Pound: development of RADAR at MIT

Development of RADAR in the USA lagged that in the UK because they had no way of producing 10 cm microwaves. The magnetron had been invented by Boot and Randall in the UK, but had been kept secret. It was brought to the USA by the Tizard mission to spur the development of RADAR to the point that a RADAR set could be mounted in an aircraft. The magnetron produced 15 kW of RF power.



(iii) Charles Townes: Masers and Lasers

"We need a crisis to get public support for science". In general, politicians will not fund pure research, only research aimed at a definite end. The development of the maser and laser came out of microwave studies of large biological molecules as an unexpected result.

After World War II, public support for science waned, and many research projects involving microwaves were shelved. The next crisis that rekindled interest and support for science was Sputnik. President Eisenhower formed the President's Science Advisory Committee, which was very effective at promoting funding for research. This committee was killed by President Nixon.



It is important to continue doing science even when there is no crisis. Government and business leaders tend to think short term, whereas science results are often long-term and unpredictable.