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SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 2, 1950

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Henry P. Kramer

March 17, 1950

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Summary of the Research Progress Meeting of March 2, 1950

Henry P. Kramer

Radiation Laboratory, Department of Physics
University of California, Berkeley, California

March 17, 1950

Nuclear Cross Section as a Function of Neutron Energy. J. DeJuren.

An investigation of the total neutron cross section as a function of energy has been undertaken. The neutron count was recorded by means of a bismuth fission chamber possessing a plateau of about 30 volts in width. The pulses that were produced by the fission recoils in the 1/2 atmosphere argon filling of the chamber were amplified by a factor of 10^5. The resolving power of the instrument was 100-120 counts/sec. In order to utilize the bismuth fission chamber, the fission cross section of bismuth had to be measured in the energy range of interest, 90-270 Mev (Fig. 1).

The chief difficulty in the work has been the lack of certainty regarding the energy of the neutron beam produced by protons on a 1/2 in. Be target in the cyclotron. By comparing the yield of neutrons from the (n,2n) cross section on carbon from the neutron beam produced by stripping deuterons with that from neutrons from protons on Be, and relying on stripping theory, it was decided that a proton energy of 165 Mev corresponds to a neutron energy of 90 Mev. Fox et al. have measured the neutron energy from 180 Mev protons to be 100-110 Mev. The energy of neutrons from the 350 Mev proton beam has a bell shaped distribution about 50 Mev in half-width with a maximum at 270 Mev. It was generally observed that the energy of neutrons was about 70 Mev lower than that of the protons that produced them. None of the neutron energies are, however, known within closer bounds than $\pm$ 15 Mev.

The relative position of target, collimator and detector are shown in Fig. 2.

To reduce the initially high background to 4 percent, a brass sleeve was inserted in the shielding.

The results of the measurements on Pb, Al, and Cu indicate that in the neighborhood of 270 Mev the cross section is practically constant. This is displayed for copper in the graph of Fig. 3.

Monitoring High Energy Proton Bombardments. P. Stevenson.

In conjunction with an investigation of the fission of U^{238} with high energy protons a monitor was needed that would enable the experimenter to compare proton flux at different energies. Since the cross section of the reaction $Al^{27}(p,3pn)Na^{24}$ was thought to be fairly constant in the region of high energies it was decided to examine its suitability.

After the previous values of the cross section for the reaction $C^{12}(p,pn)C^{11}$ had been revised by five percent, this reaction was used as a standard of comparison for measuring the cross section of the $(p,3pn)Al^{27}$ reaction. The results are indicated in the graph of Fig. 4 and demonstrate that the cross section for the (p,3pn) is actually a constant of energy above 100 Mev. The errors of the measurements are no greater than about 100 millibarns.

A target holder was devised for uranium and Al foil which can be caused by remote control to feed and cut strips of target and monitor of equal dimensions.

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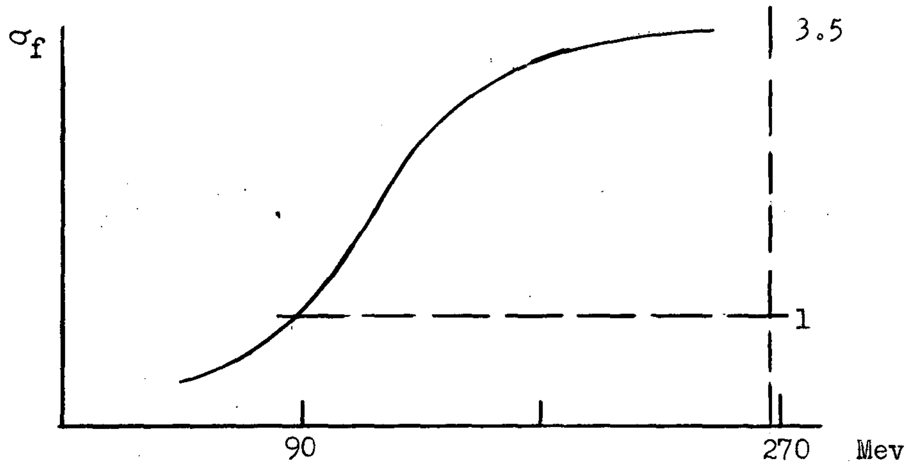
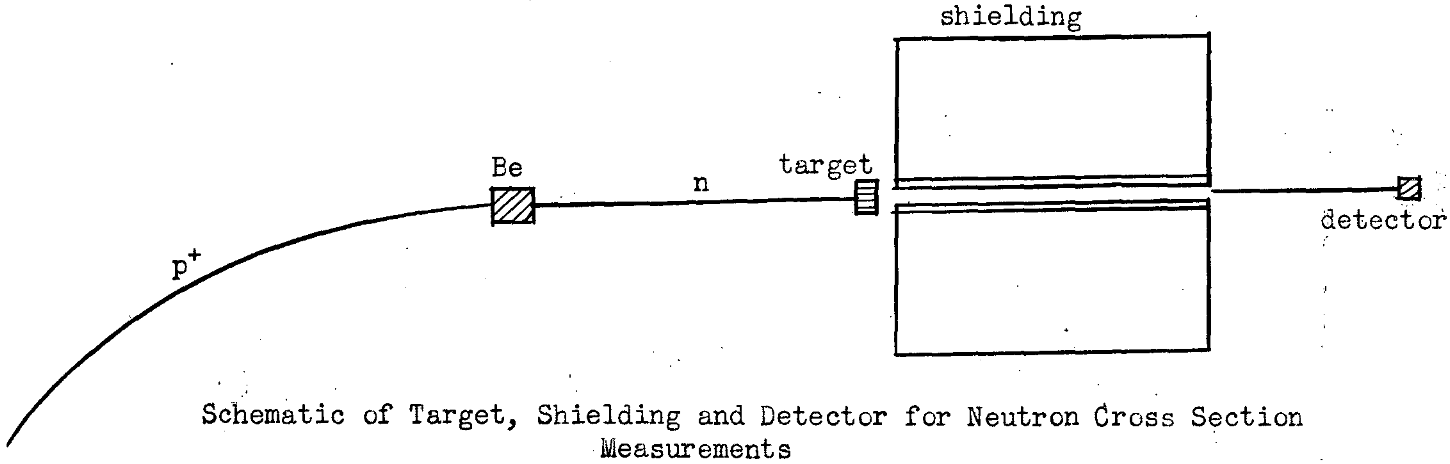
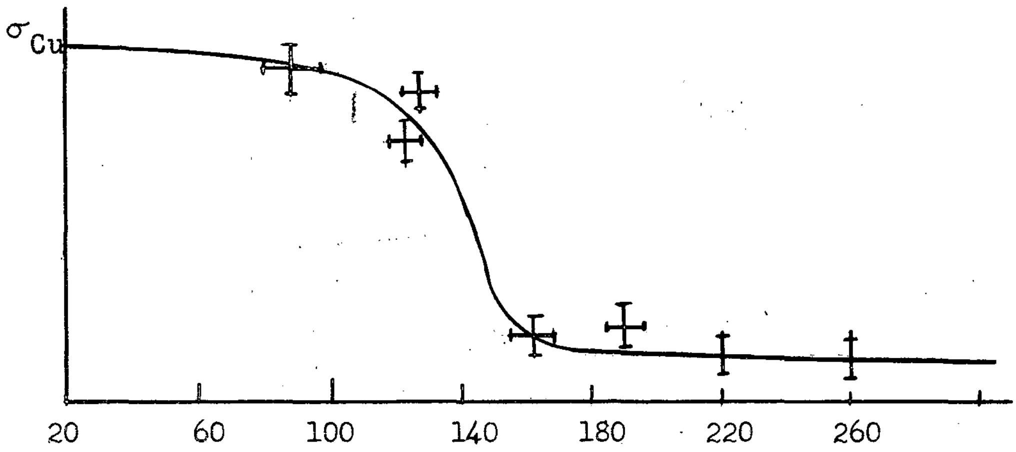


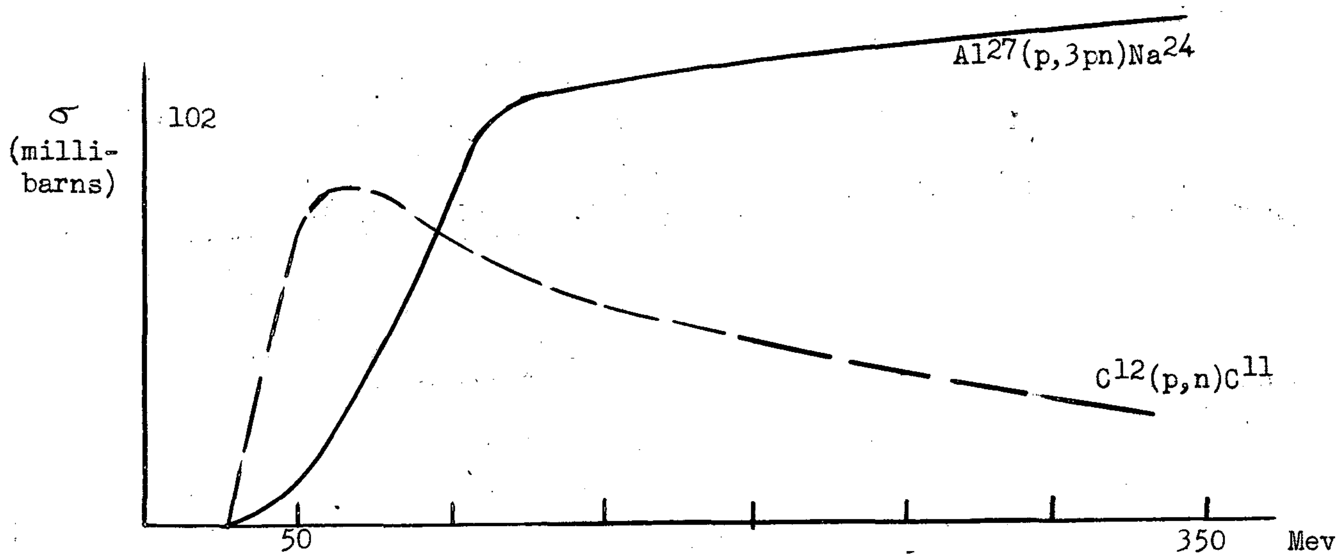
Fission Cross Section of Bismuth
Fig. 1



Schematic of Target, Shielding and Detector for Neutron Cross Section Measurements
Fig. 2



Total Neutron Cross Section of Cu as a Function
of Energy
Fig. 3



Excitation Curves for $Al^{27}(p,3pn)Na^{24}$ and $C^{12}(p,pn)C^{11}$
Fig. 4