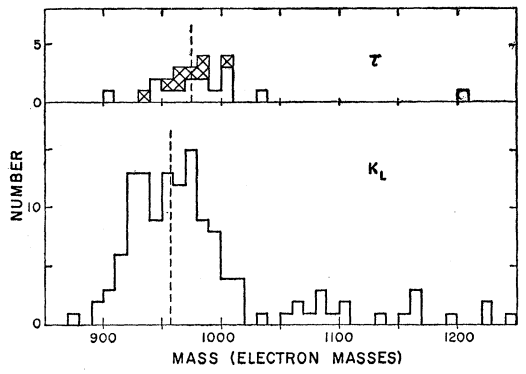

FIG. 2. Mass distributions: Upper histogram represents τ mesons. Crossed squares refer to τ's found nonsystematically. Lower histogram is made up of particles decaying into a single lightly ionizing secondary.

comparison of the measured τ meson mass of (974 ± 6) m_e with the accepted value[3] of $966\,m_e$ indicates a possible systematic error.

This work was done with the encouragement and guidance of Professor Chaim Richman. Most of the scanning was performed by Mrs. Beverly Baldridge, Miss Irene d'Arche, Mrs. Marilynn Harbert, Mrs. Edith Goodwin, and Miss Kathryn Palmer.

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† National Science Foundation Predoctoral Fellow.
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14-Mev (n,α) Cross Sections in Zirconium. I*

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IN a survey of neutron-induced reactions, Paul and Clarke[1] quote a value of 194 ± 107 mb as a lower limit for the 14.5-Mev (n,α) cross section in Zr^{90}, and 63 ± 25 mb for this process in Rh^{103}. Brolley and Dickinson[2] conducted a direct search for the alpha particles from these elements using neutrons of about 14.3 Mev in an attempt to observe any variation in barrier height with angle. In this work the valuable help of the nuclear plate and Cockcroft-Walton groups is gratefully recognized. Their study indicated considerably smaller cross sections than reported by Paul and Clarke. The problem has been re-examined using several different methods by A. Armstrong and J. E. Brolley, Jr., F. L. Ribe and R. W. Davis, and the present authors. In the following Letters the results and the compatibility of the several experiments are discussed by A. Armstrong and J. E. Brolley, Jr., and F. L. Ribe and R. W. Davis.

We have bombarded various samples of normal zirconium metal with neutrons of average energy 14.1 and 14.9 Mev produced by the Cockcroft-Walton machine. Strontium was chemically separated from the zirconium and counted with a Na(Tl)I crystal whose sensitivity was known for the γ radiations from Sr^{87m} and Sr^{91}. Table I presents the results.

The standard deviations indicated are essentially those of counting. The Zr^{90} cross sections apply to the production of the isomer only. The diminution of these

TABLE I. (n,a) cross section in mb. Neutron energy, E_n, in Mev.

E_n	14.1	14.9
Zr^{90}	3.1 ± 0.2	3.0 ± 0.2
Zr^{94}	4.9 ± 0.6	3.9 ± 0.5

cross sections with increasing neutron energy may possibly be associated with competition from the $(n,2n)$ process. These cross-section values fall markedly below the trend of $\sigma_{obs}/\sigma_{calc}$ cited by Paul and Clarke. Though all nuclei in these processes have magic numbers or near magic numbers of neutrons (50), the (n,α) cross sections of neighboring nuclei are not sufficiently well established to discern a correlation with neutron number. We are indebted to R. W. Davis for invaluable help in the irradiations.

* Research performed under the auspices of the U. S. Atomic Energy Commission.
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14-Mev (n,α) and (n,p) Cross Sections in Zirconium. II*

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FURTHER confirmation of a low value for the (n,α) cross section for zirconium bombarded by 14.1-Mev neutrons has been obtained in still another experiment, in which nuclear plates were used as detectors of the reaction products.