No explanation can be advanced at present as to why some of these analogous alpha transitions are relatively highly favored compared with others. The data do seem to correlate with atomic number and with neutron number for a given element.

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Angular Distribution of Gamma Rays in Coulomb Excitation*

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PREVIOUSLY reported calculations[1,2] of the angular correlation coefficient a_2 for Coulomb excitation of the 330-kev level in Pt^{194} have been expanded to include a_4, and similar calculations have been carried out for the 550-kev level of Cd^{114}. The formulas used were those in the literature[3] with signs corrected according to Breit, Ebel, and Russell.[4]

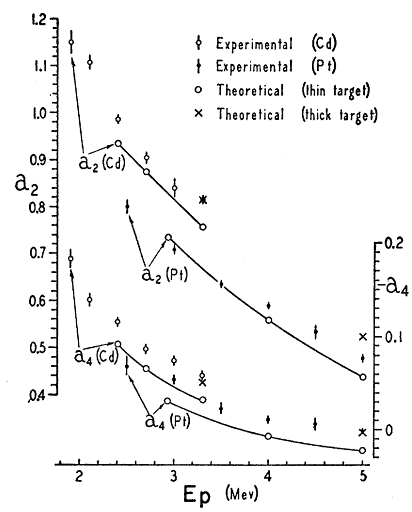

FIG. 1. Angular correlation coefficients a_2 and a_4 plotted against proton energy E_p. Circled points give thin target theoretical values for Pt^{194} and Cd^{114}. Experimental points are given by dots (Pt) or circles (Cd) with vertical spreads. The crosses give theoretical values corrected for thickness of target and admixture of Pt^{196}. The scale for a_2 is at the left, that for a_4 at the right.

The semiclassical approximation for radial matrix elements was used[5] and checked against direct calculation in typical cases. The error in a_2 is estimated to be about one percent, that in a_4 may be larger due to stronger cancellation. It proved sufficient to limit the calculation to values of angular momentum $L \leq 40$. The coefficients given here for Cd^{114} agree with those of Goldstein *et al.*[6]

Thick-target corrections have been roughly estimated for the highest proton energy in each case following McGowan and Stelson.[7] Use was made of their values of the energy loss weighting factor φ and the multiple scattering attenuation coefficients. For Pt a rough allowance for the presence of Pt^{196} with a 358-kev level has been included with the thick target corrections. In Fig. 1, the theoretical results are plotted together with the experimental values for Pt[7] and Cd.[8] The thin-target coefficients have the correct dependence on energy and on nuclear charge. The thick-target correction brings about agreement with experiment in some cases but not in all.

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Anomalous Neutral *V*-Particles*

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IN view of the current interest in the problem of whether there exist neutral curious particles which undergo three-body decay, and if so what is the nature of these particles, a search has been made for the so-called anomalous neutral decays among photographs of *V*-particles obtained from the Princeton dual cloud chamber at Echo Lake, Colorado.[1] Much of the previous work in this field has been summarized by Astbury.[2]

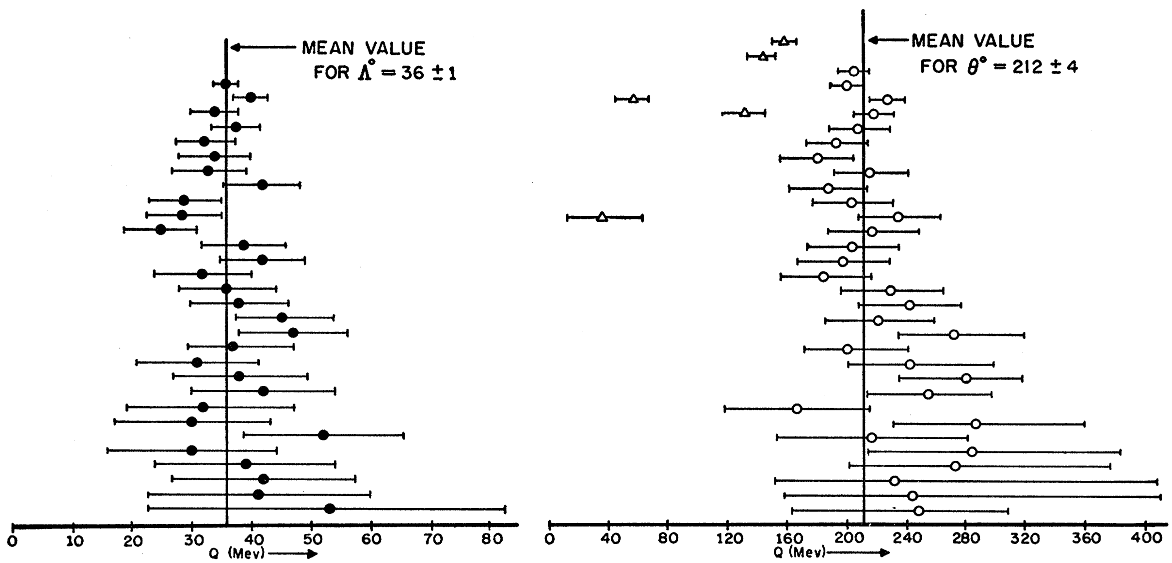

FIG. 1. Histogram of Q-values for Λ^0's, θ^0's, and anomalous cases. The points are plotted in order of decreasing absolute error.

An analysis of 82 neutral V-particles, whose Q-values could be calculated, has yielded the following: 30 Λ^0's, 31 θ^0's, and 21 for which Λ's and θ's were not distinguishable on a Q-basis. In addition there were 5 events which are considered anomalous. The analysis procedure and method of estimating errors is essentially that described previously,[1,3] except that in most cases track curvatures were measured with a cylindrical lens projector.[4] In order to distinguish anomalous cases from the more common Λ^0 and θ^0, a plot was made of the distribution of known cases; any case whose Q-value calculated on the basis of either decay scheme, $\Lambda^0 \rightarrow p+\pi^- + 37$ Mev,[5] or $\theta^0 \rightarrow \pi^+ + \pi^- + 214$ Mev,[6] differed from these values by more than three standard deviations was considered anomalous. The distribution of the Q-values for all unambiguous events is shown in Fig. 1. The mean Λ^0 Q-value is 36.1 Mev. This is a weighted mean in which the individual Q-values are weighted inversely as the squares of their standard deviations. The error as calculated "internally," i.e., from the errors of the individual Q-values, is ± 1.1 Mev. The "external" standard deviation was ± 0.9 Mev, calculated from the

TABLE I. Data on five anomalous neutral V-particles.[a]

Event	P_+ Mev/c	P_- Mev/c	θ_T degrees	$Q(\pi^+,\pi^-)$	$Q(p,\pi^-)$	Possible origin visible (?)	Angle of non-coplanarity	P_T unbalance Mev/c
147–405	± 50 1215+165 −135	± 75 1455+265 −195	13.0±0.7	132±15	246±40	Yes	0.4°	133±40
157–981	±50 660 ±55	±310 1750+470 −310	2.4±0.5	+30 36 −25	676±150	No	···	···
171–365	±40 563 ±80	±20 314 ±22	23.3±0.7	57±12	Possible track not proton from mom. and ionization	No	···	···
199–608	±33 973 ±95	±35 992 ±95	19.8±0.3	159± 7	243±55	Yes	2.5°	67±25
199–697	±50 971 ±90	±80 1635+270 −200	14.1±0.3	+ 8 144 −10	393±90	No	···	···

[a] The upper uncertainty with each momentum is the combined measurement and multiple gas-scattering error, independent for each track of a V-particle. The lower uncertainty represents that due to random gas distortion, carried separately because this is not independent for the two V-secondaries. The errors in Q due to the former were combined along with the error in θ_T as the square root of the sum of the squares; the errors in Q due to the latter were combined algebraically.

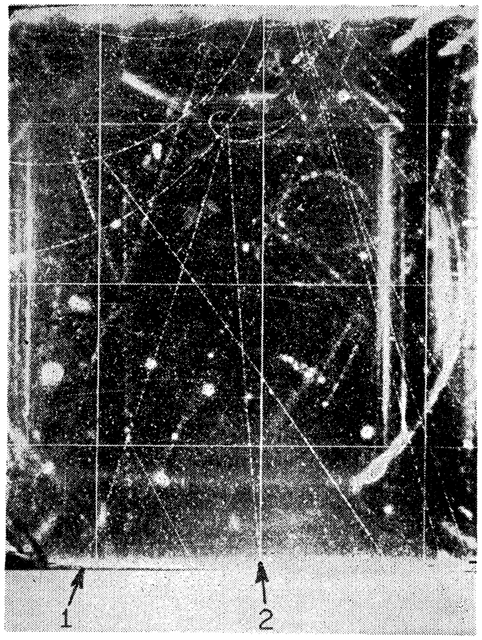

FIG. 2. Photograph of Event 199–608. Tracks 1 and 2 are the positive and negative secondaries, respectively, of a neutral V-particle.

spread of the individual Q-values about the mean.[7] The close correspondence of these figures is the basis for the statement that the errors assigned to individual Q-values are approximately standard deviations.

The weighted mean Q-value for the normal θ^0 particles is 212 Mev. The "internal" error is ± 4 Mev, the external standard deviation is ± 3 Mev. This is in good agreement with Thompson's value of 214 ± 4 Mev but is lower than the value of 227 ± 4 as reported by Fretter.[8]

The five anomalous cases were each analyzed several times and the curvatures remeasured with a comparator. The data for these events are given in Table I and one of these is shown in Fig. 2.

We wish to thank Mr. C. A. McGrew and Mr. M. T. Grisaru for their aid in many of the measurements and calculations and for their contribution in developing an efficient graphical method of analysis.

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† Now with the Westinghouse Electric Company, Pittsburgh, Pennsylvania.

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Capture of K^--Meson with Emission of High-Energy Electron as the Only Visible Prong*

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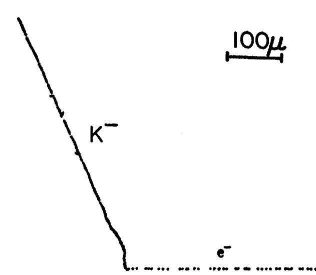
AN emulsion stack consisting of 136 2-in.×4-in. 600μ thick Ilford G–5 pellicles was exposed to the K^--beam of the Berkeley Bevatron. The magnetically analyzed beam admitted particles with a momentum of the order of 306 Mev/c to the stack.

Among 68 events, a K^--capture was found which is reproduced in Fig. 1. The K^- was traced to its entrance point at the edge of the stack. Its length in the emulsion is 3.9 cm, and it entered parallel to the beam. Grain counting gave a value of 5.0 (± 0.3) times minimum for the K^- at a distance of 5 mm from the capture star, corresponding to a particle of mass 1000 m_e.

At the point where the K^- stops, a single track is ejected. No other visible tracks or recoil are observed. The emitted track travels 1.23 cm in one pellicle before leaving the emulsion stack. The point of capture and more than 1 cm of the ejected track are situated in the middle of the emulsion. Grain counting of the secondary track gives a value of 1.06 ± 0.03 times the value given by ten pion tracks from the magnetically analyzed beam. The momenta of these pions were checked by making multiple scattering measurements. The average $p\beta$ in the vicinity was 290 Mev/c. Pions of this energy

FIG. 1. K^--star in which a high-energy electron is emitted. Track K^- is a negative heavy meson which stops in the emulsion. Track e^- is a high-energy electron ejected from the point where the K^--meson stops.



should be 1.05 times minimum. Therefore, the ionization of the emitted track is 1.11 ± 0.03 times minimum. This value corresponds to plateau ionization. Multiple Coulomb scattering measurements made over 1.2 cm of the ejected track gave a $p\beta$ of 73.7 ± 5.1 Mev/c. A π meson with this momentum would have an energy of 41.5 ± 4 Mev and a grain density of 1.8 ± 0.1 times minimum. A μ meson with this $p\beta$ would have a grain density of 1.4 ± 0.1 times minimum. Hence, the secondary particle must be a high-energy electron.

We believe this to be the first case of a K^--meson capture star in which a high-energy electron is emitted

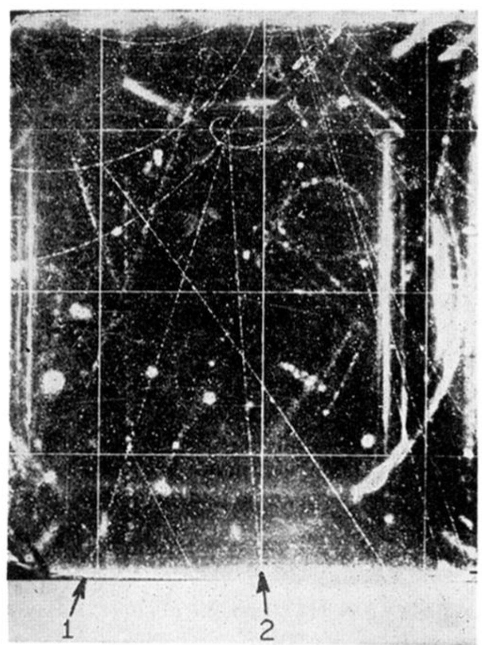


FIG. 2. Photograph of Event 199–608. Tracks 1 and 2 are the positive and negative secondaries, respectively, of a neutral *V*-particle.