having kindly supplied us with photomultipliers and electronic equipment which have enabled us to carry out these experiments.

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Multiple Production of Strange Particles

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FIFTEEN cases[1–3] of pair production of strange particles have been reported in nuclear interactions caused by artifically accelerated particles and about as many others[4–11] in nuclear interactions caused by cosmic rays. A triple production[12] has been found among the particles of a cosmic-ray shower. We have now observed in the Sardinia stack S36 (consisting of 40 sheets of 600μ stripped emulsion) an event which involves at least three strange particles coming from a star of the type $14+5p$. The charged strange particles identified are a hyperon Σ^- captured at the end of its trajectory, a hyperon Σ^+ decaying in flight, and a negative K meson interacting in flight.

The negative hyperon is ejected from the primary star at a dip angle of +2° relative to the plane of the emulsion and has a flat trajectory of length 876μ. It comes to rest in the emulsion and produces a small star of three prongs. Direct mass determinations made on this track using blob-gap measurements give $(2830\pm560)m_e$ and multiple scattering $(2560\pm790)m_e$. The two longer prongs of the small star can be identified as α particles and the third, the shortest, could also be an α particle; the star has a visible energy of about 18 Mev. The longest prong is too long, and the shortest is too short, for either of them to be a radioactive α particle. The probability of an accidental coincidence[13] between a radioactive star and the end of a proton is less than 10^{-12}. The small star indicates that the primary particle is a hyperon Σ^-.

Close to the negative hyperon (at an angle of 13° measured clockwise) a positive hyperon is emitted at a dip angle of +2°. After traversing a distance of 8.6 mm approximately parallel to the plane of the emulsion, the track shows a deflection of 35° with an appreciable increase of ionization and multiple scattering afterwards. It ends in the next plate. The trajectory, 4535μ, after the deflection can be identified as that of a proton. Assuming a two-body decay into a proton and a neutral π meson, we obtain a Q value of 115 ± 20 Mev. Measurements on the 8.6-mm trajectory of the rate of change of ionization give $(2765\pm670)m_e$, and measurements of multiple scattering and ionization give $(2200\pm230)m_e$.

A negative K meson appears at 114° measured clockwise from the positive hyperon. This particle has an ionization twice the minimum and a dip angle of −3°. After traversing 285μ it interacts with a nucleus of the emulsion and produces two particles. One, forming an inclined black track, can be traced to its ending point and may be identified as a proton; the other traverses 24 plates covering a distance totalling 3.75 cm, at dip angles varying between 30° and 15°, and leaves the stack before coming to rest in the emulsion. The trajectories of the three particles are coplanar but the momenta are not balanced. The incident particle has a mass of $(662\pm290)m_e$ measured by ionization and scattering; the energy balance of the three particles excludes the possibility of this incident particle being a π meson or a proton. The particle with a trajectory of length 3.75 cm has a mass value of $(2480\pm150)m_e$, determined by measuring the rate of change of ionization; scattering measurements based on the third difference confirm the mass value of a hyperon. The interaction must therefore be the capture of a negative K meson by a nucleus with production of a hyperon.

The three strange particles happen to be emitted nearly in the same plane and to have the same sign of strangeness. As strangeness is conserved in the associated production of strange particles, there should be another three strange particles of the opposite sign, positive or neutral K mesons or θ^0 mesons. No positive K meson has been found among the low-energy prongs. If one of the three strange particles, e.g., the negative hyperon, were an antiparticle (strangeness +1), then it would be sufficient to postulate one neutral strange particle which would not be observed.

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