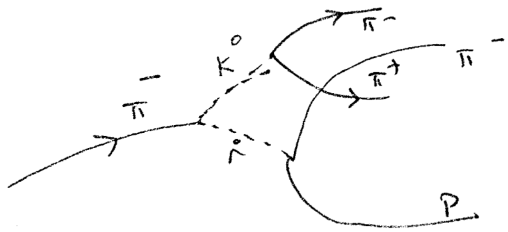
The discovery of strange particles

The first strange particle reaction was observed in 194? by Rochester and Butler of Manchester University.



There was a great leap forward when accelerators were capable of producing these particles in the laboratory.

$$\pi^- p \to \Lambda^0 K^0, \quad K^0 \to \pi^+\pi^-, \quad \Lambda^0 \to \pi^- p$$

Besides, the reaction

$$\pi^- p \to \Sigma^- K^+, \quad K^+ \to \pi^+\pi^0, \quad \Sigma^- \to \pi^- n$$

In due time Σ^+ and K^- were discovered:

$$\Sigma^+ \to \pi^+ n$$
$$\to p\pi^0$$

and $K^- \to \pi^-\pi^0$

And the "cascade" particle :

$$\Xi^- \rightarrow \Lambda \pi^-$$
$$\hookrightarrow p\pi^-$$

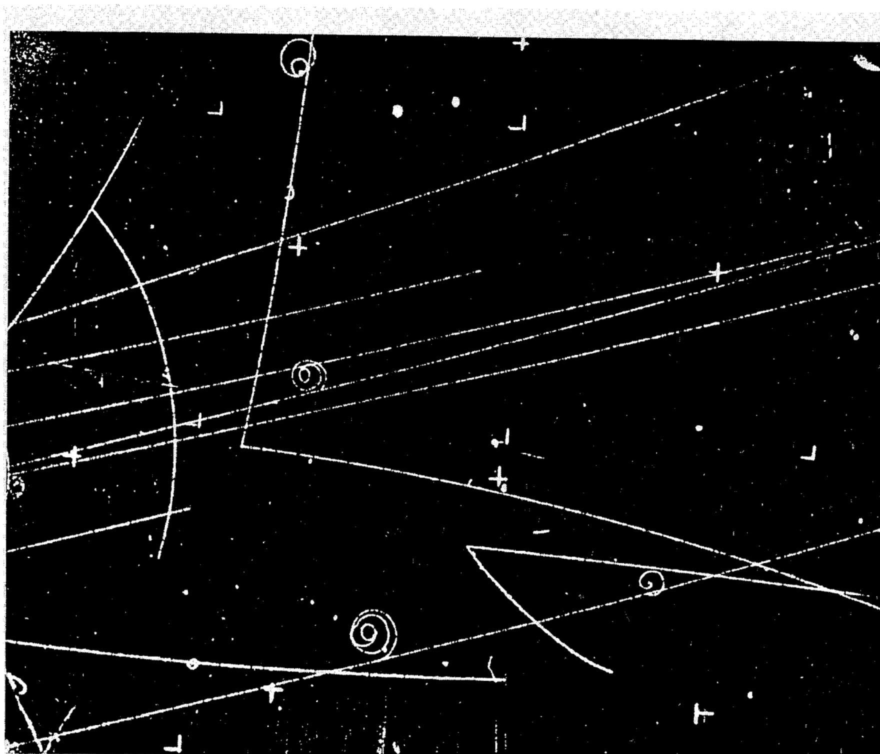
mass table

Particle	mass (Mev)
Λ	1115.4
Σ^-	1197.2
Σ^+	1189.4
Ξ^-	1320.8
K^+	493.8
K^-	493.8
K^0	497.8

Strangeness:

In reaction $\pi^- p \rightarrow \Lambda^0 K^0$, the cross section is measured to be about 1 mb. On the other hand, the decays occur rather slowly, about 10^{-10} sec. These times are typical of weak interactions. But if Λ and K are produced via strong interaction, why don't they decay strongly?

The situation was greatly clarified by the introduction of a new quantum number called "strangeness". Every particle has a particular value of strangeness and pions and nucleon have $\underline{S = 0}$. The new particles $\Lambda, K, \Sigma, \ldots$ have $S \neq 0$ and therefore called " strange particles". The idea is that strong interactions conserve strangeness but weak interactions change it.



›hotograph of an interaction of a 1 GeV/c π^-
›roton in a liquid hydrogen bubble chamber. The

$$\pi^- + p \rightarrow K^0 + \Lambda,$$

$$K^0 \rightarrow \pi^+ + \pi^-,$$

$$\Lambda \rightarrow \pi^- + p.$$