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For the last ten years some new unstable particles - hyperons and K-mesons have been discovered as a result of great progress in the high energy experimental physics. An attempt to classify these particles was made in the well-known papers by Gell-Mann and Nishijima((G-MN)-scheme) [1]. However, such a great number of "elementary" particles is striking in some respect. Therefore, from time to time doubts appear whether these particles are elementary or not. Attempts are being made to regard the known particles as certain structural formations, reducing thereby the number of "elementary" particles, as well to restrict their possible interactions.

Below is given one more possibility which does not seem to have been discussed yet: by preserving all the known and predicted by (G-MN)-scheme hyperons and K-mesons, nevertheless, to reduce essentially the number of "elementary" particles.

It would be very attractive to deal with only one "elementary" baryon and only one "elementary" light particle. Of all the baryons of (G-MN)-scheme one may consider the isotopic singlets Ω^-, Λ^0 and Z^+ with the strangeness -3, -1 and $+1$, respectively. The possibility of taking a Λ^0-hyperon as an "elementary" baryon has already been discussed in literature. Now there remains to choose between Ω^- and Z^+ to which the isotopic doublets K^+K^0 and $K^-\overline{K^0}$ respectively may be referred as "elementary" light particles.

The variants Ω^-, K^+, K^0, and Z^+, K^-, $\overline{K^0}$ are symmetrical. The effects may be explained both in this and that variant. Further we shall make use of the Ω^-, K^+, K^0 variant since it seems to be more coorresponding to the known experimental data.

So, we shall suppose that there exist only electrically neutral and singly-charged baryons and K-mesons.

Consider a hypothetical negatively charged hyperon Ω^-, isotopic singlet ($I=0$) with the strangeness $S=-3$ and a usual baryon spin (S_m is equal to a half integer), to be an "elementary" baryon.

Assume the isotopic doublet (K^+ K^0), $I = 1/2$, being a boson in the usual space (S is equal to an integer) and having a strangeness $S = +1$ to be an elementary light particle. The antiparticles with respect to the chosen particles will be $\overline{\Omega}^+$ and ($\overline{K^0}$ $\overline{K}$) respectively.

Let us determine the strong ΩK-interaction with a Lagrangian of the form

$$g\overline{\Omega}\Omega\overline{K}K$$

where Ω is an isoscalar and spinor in a usual space, whereas K is an isospinor and scalar (pseudoscalar) in the usual space.

We begin to construct a series of hyperons with an isotopic doublet of Ξ-hyperons, the structure of which may be determined by joining to Ω^- one of the two postulated K-mesons in turn, i.e., as follows*

$$\Xi^0 = (\Omega^- K^+) \qquad \Xi^- = (\Omega^- K^0)$$

Further we may determine the structure of a series of the isotopic triplet of Σ-hyperons, joining to Ω^- by two K-mesons in three possible combinations, i.e., in the form

$$\Sigma^+ = (\Omega^- K^+ K^+) \quad \Sigma^0 = (\Omega^- K^+ K^0) \quad \Sigma^- = (\Omega^- K^0 K^0)$$

It is well-known that Σ^0-hyperon cannot exist for a long time, by means of a quick electromagnetic transition it turns into a Λ^0-hyperon. This may be explained if we assume that K^+ and K^0 which form a bound state

$$\omega^+ = (K^+ K^0)$$

through strong $K^+ K^0$-interaction in the isotopically singlet state** cannot exist together near Ω^-. This bound state may be treated as a meson with the strangeness S = + 2, an isotopic singlet, predicted by (G-MN)-scheme.

Thus, the structure of the isotopic singlet Λ^0-hyperon may be written as follows

$$\Lambda^0 = (\Omega^- \omega^+)$$

Joining further K^+ and K^0-mesons we obtain the structure of the isotopic doublet of nucleons in the form

$$p = (\Omega^- \omega^+) K^+ \qquad n = (\Omega^- \omega^+) K^0$$

Now in virtue of our original assumptions there remains only one possible structure

$$Z^+ = (\Omega^- \omega^+ \omega^+)$$

which corresponds to a hyperon, isotopic singlet with the strangeness S = +1 of the (G-MN)-scheme.

It is possible to construct 4 isobosons by the schemes

$$K^+ \overline{K^0} \qquad K^0 K^- \qquad K^+ K^- \qquad K^0 \overline{K^0}$$

out of the particles ($K^+ K^0$) and their antiparticles (K^- $\overline{K^0}$).

The charged systems may be treated as π^+ and π^--mesons and using the neutral systems it is possilbe to construct a third component of the isotopic triplet $(\pi^+ \pi^0 \pi^-)$

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* The constructions in the $Z^+, K^-, \overline{K^0}$ -variant must be begun with the isotopic nucleon doublet by the scheme $p = (Z^+ \overline{K^0}), \quad n = (Z^+ K^-)$

** The form of the Lagrangian of KK -interaction $g_K \overline{K} K$, determining the interaction in different isospin states is also related to the problem of a ρ^0-meson (see below).

and a neutral isotopic singlet which contains in (G-MN)-scheme as a ρ°-meson.

Thus, by postulating only two elementary particles we succeeded in constructing all the particles containing in (G-MN) - scheme. The attractiveness of the scheme in question is that we can do with only two particles both in the usual and the isotopic space as well as with only one type of interaction. At the same time one may identify pions with the quanta of the field providing for the (ΩK)-coupling.

Using the suggested scheme it is possible to evaluate magnitudes of masses of the predicted hyperons by the measured masses of the known hyperons. The mass difference of Σ^- and Σ^+-hyperons is most likely to be a consequence of m_{K° being greater than m_{K^+}. Then one may think that Ξ°-hyperon must be lighter than Ξ^--hyperon by the magnitude of the order of 5 m_e .

For an absolute magnitude of the binding energy of a K-meson with Ω^- the value of the order of 1200-1300 m_e is obtained. It follows from here that a Ω -hyperon is 250-350m_e heavier than a Ξ-hyperon. This means that Ω^--hyperon is likely to decay according to the modes (if the rule $|\Delta S = 1|$ is valid):

$$\Omega^- \rightarrow \begin{matrix} \Xi^{\circ} + \pi^- \\ \Xi^- + \pi^{\circ} \end{matrix}$$

An interesting situation takes place when evaluating the mass of a Z^+ -hyperon. The estimates show that the mass of Z^+ must be of the order of 1500 m_e . But if it has such a mass it cannot be observed since we do not know the ways by which Z^+ – hyperon may turn into a stable baryon-nucleon being lighter than the latter. In view of all this the problems about the existence of a Z^+ -hyperon, about the magnitude of its mass and the modes of its decay are extremely interesting.

Within the scheme under consideration there is a possibility of explaining a great number of the well-known experimental data on hyperon and K-meson production and interaction. Let us be concerned only with some of them.

It seems more reasonable to explain the reactions of the type

$$\pi + N \rightarrow Y + K$$

by the pion dissociation in the field of a Ω^--particle into a pair ($\bar{K}$, K)-mesons with a subsequent annihilation of the produced $\bar{K}$-meson with one of the K-mesons near Ω^- (the pairs K^+, K^- or K°, $\overline{K^{\circ}}$ annihilate). According to this scheme the Λ° -hyperons created in the reactions

$$\pi + N \rightarrow \Lambda^{\circ} + K$$

will be produced in the c.m.s. predominantly backward since in this case K-meson leaves a compound system practically without an interaction moving in the direction "forward", whereas a $\bar{K}$-meson interacts only with a K-meson without affecting the ω^+-system.

Charged hyperons obtained in the reactions

$$\pi^- + p \rightarrow \Sigma^- + K^+ \qquad \pi^+ + n \rightarrow \Sigma^+ + K^0$$

will be directed "forward" in the c.m.s. since both K- and $\bar{K}$- mesons interact with the ω^+-system*. In the reactions

$$\pi^- + p \rightarrow \Sigma^0 + K^0$$

$$\pi^- + n \rightarrow \Sigma^- + K^0$$

$$\pi^+ + p \rightarrow \Sigma^+ + K^+$$

$$\pi^+ + n \rightarrow \Sigma^0 + K^+$$

both above-mentioned channels may participate. Therefore, it seems that the angular distribution of these reactions must be more isotropic in the c.m.s., perhaps, with some preference for the "backward" Σ^0-hyperon and "forward" $\Sigma^{\pm}$-hyperon emergence. It would be of interest to test these considerations by the reaction

$$\pi^+ + p \rightarrow \Sigma^+ + K^+$$

With the increase of a incident pion energy the created $K\bar{K}$-pair may leave the compound system that will lead to the production of K^+, K^- - and K^0, $\bar{K}^0$ pairs. By the same total cross section for strange particles generation this circumstance may lead to the decrease of the cross section for Y,K-pair generation if compared with its value before the K, $\bar{K}$-pair generation threshold (the pion kinetic energy being 1.34 BeV/** The analysis shows that the one-staged reactions of the type

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

$$\pi^+ + N \rightarrow N + K^+ + \bar{K}^0$$

are more preferable than the reactions

$$\pi^- + p \rightarrow n + K^+ + K^- \qquad \pi^+ + n \rightarrow p + K^0 + \bar{K}^0$$

which require an additional stage of charge exchange $K^+ \rightleftarrows K^0$.

Consider now the problem of $\bar{K}$ -meson interaction with nucleons. Let us first note the smallness of the charge exchange effect in the reaction

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* Experimental data concerning this are given in |2|.

** This tendency in the cross sections of (YK)and(KK)-reactions was suggested by Prof. Wang Kan-chang due to other considerations.

$$K^- + p \to \overline{K}^o + n$$

because this process must go through $K^+ K^- \to K^o \overline{K}^o$ chain*.

Of all the reactions of the type**

$$K^- + N \to Y + \pi$$

the reaction $$K^- + n \to \Lambda^o + \pi^-$$

is more probable since it occurs through the process $(K^- K^o) \to \pi^-$ without a $(\Omega^- \omega^+)$-system.

It is also interest to note that in the $\Sigma^{\pm}$-hyperon interaction with nucleons the reactions of the type

$$\Sigma^{\pm} + {n \atop p} \to \Sigma^o + {p \atop n}$$

are more probable rather than those of the type

$$\Sigma + N \to \Lambda^o + N$$

since the first ones occur only through a simple process of charge exchange $K^+ \rightleftarrows K^o$.

Is it possible to observe a ω^+-particle? If it may really exist then the most convinient means for its obtaining are the reactions

$$K + N \to \Lambda^o + \omega^+$$

If $m_{\omega} \leq 2m_K$, then the threshold of these reactions must be by the K-meson kinetic energy less than 1.23 BeV. The decay of this particle occurs by the modes

$$\omega^+ \to K^+ + \pi^o$$

or $$\omega^+ \to K^o + \pi^+$$

So far there are no definite experimental indications to such reactions and decays. The observation of a ω^+-particle is one of the main problems of the scheme under discussion***.

Now let us proceed to the problem of the Ξ^o and Ω^- cascade hyperon generation. Evidently, the most simple way of a Ξ^--hyperon generation will be the reactions on a neutron since they take place only through the $\overline{K}\,\omega^+$-interaction:

$$\overline{K} + n \to \Xi^- + K$$

$$\pi + n \to \Xi^- + K + K$$

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* In the Z^+, K^-, $\overline{K^o}$ - scheme this reaction is allowed, that is likely to be not in agreement with experiment.

** The consideration in the $Z^+, K^-, \overline{K^o}$ -scheme must be made by the interaction with a wirtual $K\overline{K}$ -pair near Z^+.

*** As well as the reaction $K^- + P \to Z^+ + \omega^-$ in the Z^+, K^- $\overline{K^o}$ -scheme.

The reactions of the type

$$K^- + p \to \Xi^- + K^+$$
$$\pi^- + p \to \Xi^- + K^+ + K^0$$

are less probable as they require the participation both of K-and ω^+-mesons. The generation of a Ξ^0-hyperon is possible only on a proton as a result of the reactions:

$$\bar{K} + p \to \Xi^0 + K$$
$$\pi + p \to \Xi^0 + K + K$$

The reaction of the type $\bar{K} + n \to \Xi^0 + K$ is less probable.

Thus, in liquid hydrogen bubble chambers it is possible to observe a Ξ^0-hyperon whereas the generation of a Ξ^--hyperon is difficult.

It is well-known experimentally that Alvarez's group observed a Ξ^0-hyperon in the liquid hydrogen bubble chamber and failed to observe Ξ^--hyperons. Thus, this circumstance is in agreement with the consequences of the scheme under consideration. Due to the above-mentioned reasons the reaction

$$\pi^- + p \to \Xi^- + \omega^+$$

is also not convenient to observe a ω^+-meson.

The generation process of a Ω^--hyperon is still more difficult for the observation. In this case all possible reactions of the type

$$\bar{K} + N \to \Omega^- + K + K$$
$$\pi + N \to \Omega^- + K + K + K$$

are many -staged and their yield must be sharply limited.

An interesting possibility of explaining the decay properties of hyperons is also presented by a mechanism of the virtual (K $\bar{K}$)-pair production with a subsequent decay of $\bar{K}$-meson. The conclusions are obtained which are in qualitative agreement with the known experimental data. A Ξ^0-hyperon lifetime must be shorter than that of a Ξ^--hyperon. The most probable decay of a Ω^--hyperon is that by the mode

$$\Omega^- \to \Xi^- + \pi^0$$

We dwelt here only upon the effects connected with the existence of "strange" particles. It seems to us that in the framework of the scheme we developed there are interesting possibilities of explaining some problems of nucleon structure (isobars etc) and the related effects (photomesons and others).

For instance, and attempt may be made to draw some qualitative conclusions about the electrical form-factor of nucleons. According to our scheme their structures have the forms

$$p = (\Omega^- \omega^+) K^+ \qquad n = (\Omega^- \omega^+) K^0$$

It can be seen from here that since the system $(\Omega^- \omega^+)$ is more compact then the nucleon core must be electrically neutral*. As on the outer "shells" of a proton and a neutron there are K^+ and K^0-mesons, respectively, one may think that the picture of an electrical form-factor of a oorresponding nucleon depends upon them. It seems to us that such a picture corresponds to the known experimental facts |4|

The problem about the mean radius of an electrical charge distribution in a proton may be subjected to discussion. From the above picture this radius must be somewhat less (approximately $\frac{m_K}{m_\pi} \sim 3$ times) then it is accepted. The possibility of introducing the ΩK-coupling by means of pions may be considered. Then the electrical radius of a proton will be of the order of a pion one, whereas the magnetic moments of nucleons will be determined by the sum of the Dirac momentum of a Ω-particle and an additional magnetic moment of a pion cloud with the mean radius of the order of a pion one.

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* An analogous idea was suggested by Academician V.I. Veksler from the analysis of hyperon angular distributions in $\pi + p$-reactions.