assume that the gyromagnetic ratio for the collective motion $g_R \approx 1$. Σ states can arise in those cases in which the energy of interaction of the nucleon with deformations is greater than the energy of spin—orbital coupling. Evidently the multiplicity of the radiative transition between components of the doublet $^2\Sigma$ in the rotation spectrum of nuclei with spin 1/2 ought to correspond to a magnetic dipole The available data relative to the multiplicity of the transitions in rotational spectra of the nuclei Tm^{169}, W^{183} and Pu^{239} do not contradict this rule.

In conclusion, we note that the interaction (1) will also play a role in the coupling scheme of Bohr and Mottelson, since in this case the state with given $\Omega = 1/2$ is a combination of Σ and Π states.

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The Threshold of "Creation" and the Threshold of "Generation" of Negative *K*-Particles*

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GELL-MANN and Pais[1] were the first to analyze the peculiar behavior of the θ^0-particles. Starting from the notion of simultaneous creation of *K*-particles and hyperons, which has been confirmed experimentally[2], the small probability for producing two hyperons in a nucleon-nucleon collision[3] leads to the idea that the *K*-particle has isotopic spin ½. This is in agreement with the Gell-Mann classification[4], and implies that the θ^0-particle is not transformed into itself by charge-conjugation, i.e., the θ^0 and $\tilde{\theta}^0$ are distinct particles. Then, when one considers the weak interactions responsible for the θ^0 decay, the transitions $\theta^0 \rightleftarrows \tilde{\theta}^0$ are no longer forbidden. This led Gell-Mann and Pais[1] to the conclusion that the θ^0-particle is a mixture of two particles θ_1^0 and θ_2^0 having different charge-parity and different modes of decay. Pais and Piccioni[5] proposed various versions of an experiment to test the particle-mixture character of the θ^0-particle. We suppose the experimental arrangement of Pais and Piccioni to be known to the reader.

The present paper contains some remarks on the properties of charged *K*-particles, following immediately from the considerations of Pais and Piccioni but nevertheless not yet stated explicitly in the literature. We also propose a version of the Pais-Piccioni experiment which appears to us simpler than the other schemes which have been published.

Consider the process of creation of negative *K*-particles. According to Gell-Mann[4], the threshold for creating these particles (or $\tilde{\theta}^0$-particles) in pion-nucleon or in nucleon-nucleon collisions is much higher than the threshold for creating K^+ (or θ^0) particles. This is because a K^+ or θ^0 can be created together with a hyperon, whereas a K^- or $\tilde{\theta}^0$ cannot be created with a hyperon because of the conservation of strangeness. Thus for example, in nucleon-nucleon collisions the threshold for creation of K^+ or θ^0 is around 1580 mev, while the threshold for creating K^- is around 2500 mev. However, if one looks in detail at the properties of the θ^0-particle predicted by Pais and Piccioni, then it is clear that K^--particles can be obtained from a nucleon or pion beam at an energy below the threshold for the "creation" of K^-, i.e., below the threshold for the production of a pair of *K*-particles. For at an energy below the *K*-particle pair threshold one can produce a θ^0-particle which then undergoes the transition $\theta^0 \to \tilde{\theta}^0 \to K^-$, the first step occurring in the absence of matter and the second step resulting from nuclear scattering with charge exchange. Thus the threshold for the "generation" of K^--particles in thick targets is lower than the threshold for their "creation".

The special feature of our proposed experiment is that the observation of K^--particles below the threshold for K-particle pair-production is by itself sufficient to show the correctness of the particle-mixture theory.

The experimental arrangement[5], in which it was proposed to study the variation with time of the composition of a beam of θ^0-particles by observing the decay of the short-lived $\theta_1{}^0$ and Λ^0 components, requires the use of either a cloud-chamber or a bubble-chamber. Since K^--particles have a long life-time, they could be observed in our version of the experiment at a large distance from a suitably designed synchrophasotron target. The method of observing the K^--particles could then be the usual one (magnetic deflection and focussing) which was used for example in the experiments on the nuclear interactions of stopped K^--particles. This makes the experiment technically simpler.

In one possible arrangement of the experiment, the ratio (K^-/K^+) or (K^-/π^+) could be measured as a function of target size, using for example cylindrical targets with height and diameter equal. The (K^-/K^+) ratio, obtained from a proton beam of constant energy below the K^--particle "creation" threshold, should increase with the size of the target. In principle one could obtain from the experiment not only information about the $\theta_1{}^0$ and $\theta_2{}^0$ decay modes but also about the charge-exchange scattering process. One might expect that the upper limit of the (K^-/K^+) ratio at energies below the pair-creation threshold will be given by

$$(K^- / K^+) \leqslant 1/4\, (\theta^0 / K^+) \cdot \delta_{opt} / \lambda\, (\widetilde{\theta^0} \rightarrow K^-),$$

Here (θ^0/K^+) is the ratio of the numbers of neutral and positive K-particles initially created, ¼ is the maximum number of $\widetilde{\theta}^0$-particles which can arise from a single θ^0 by the Gell-Mann-Pais-Piccioni effect, δ_{opt} is the thickness of the target* in grams per cm^3, and $\lambda(\widetilde{\theta^0} \rightarrow K^-)$ is the mean free path for the charge-exchange process. The order of magnitude of the (K^-/K^+) ratio works out at about 0.01.

When a thick target is bombarded with protons above the K-particle pair threshold, the Gell-Mann-Pais-Piccioni effect may still markedly increase the flux of K^--particles. M. Podgoretskii has remarked that this may be important in designing experiments in which a high (K^-/π^-) ratio is required.

One may also find a relatively large probability for "charge exchange" of K^+-particles through two successive nuclear interactions $(K^+ \rightarrow \theta^0 \rightarrow \widetilde{\theta}^0 \rightarrow k^-)$. When a beam of K^+-particles bombards a thick target, the ratio of the numbers of charged K-particles which are scattered with and without charge-exchange will be, as in the previous case, of the order of magnitude 0.01.

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* The thickness δ_{opt} ought to be less (by about a factor 3) than the absorption mean free path of the K^--particles.

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Nuclear Saturation and the Lévy–Klein Potential of Pseudoscalar Meson Theory

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THE question of nuclear saturation has been investigated[3,4] on the basis of two models of the nuclear forces[1,2] derived from pseudoscalar meson theory. The authors of Ref. 3 came to the conclusion that the Lévy potential,[1], which has a strong Wigner–type attraction produced by two–meson exchange, satisfies the requirements of nuclear saturation if one includes the repulsive three-particle force arising from pair terms. In Ref. 4 it was shown that the two–particle potential[2] derived from pseudoscalar meson theory with gradient coupling (and without pair terms), including single and double meson exchange, gives a satisfactory degree of saturation for heavy nuclei without considering three–particle repulsion, provided that one takes in account not only the repulsive core of radius r_c but also the weak repulsion in the odd P–states.

It was found earlier [5–8] that the second–order