21.24 MeV [2] the He^4 nucleus has also levels with approximate energies 24 and 30 MeV [3]. The existing experimental data indicate that the spin and parity of the first excited level is 0^+, and that the spin of the second level is 2. There are no experimental data as yet concerning the spins and parities of the remaining levels. The foregoing raises the interesting question of the possible nature of the excited states of He^4.

We wish to point out in this note some circumstances which allow us to regard the levels of He^4 as rotational ones. As is well known, the ground state of the doubly-magic nucleus He^4 is spherically symmetrical, its spin is J = 0, and its parity is positive. However, it is possible that the second 0^+ level, located 20 MeV from the ground state, corresponds to a deformed state belonging to the rotational band

$$E_J = aJ(J + 1). \qquad (1)$$

Using the foregoing experimental values of the excitation energy, we obtain

$$E_2 : E_4 : E_6 = 1 : 3.1 : 7.7.$$

This is in good agreement with the ratios for the rotational band of an even-even nucleus, 1 : 3.3 : 7.

It is interesting to note that a similar situation obtains also for the O^{16} nucleus, which has a 0^+ level belonging to the rotational band in addition to the 0^+ level at 6.06 MeV.

We are not concerned with the manner in which the spherical nucleus becomes deformed as a result of the excitation. We merely point out that inasmuch as the second 0^+ level lies quite high (20 MeV), it must be regarded as most probable that the excitation is single-particle and possibly corresponds to the formation of a 3 + 1 cluster configuration. The closeness of the following levels that are observed in the He^4 nucleus offers evidence in favor of a collective nature for these levels.

[1] L. E. Williams, Phys. Rev. Lett. 15, 170 (1965).
[2] P. F. Donovan, Revs. Modern Phys. 37, 501 (1965).
[3] P. E. Argan, G. C. Mantovani, P. Marazzini, A. Piazzoli, and D. Scanniccio, Nuovo Cimento Suppl. 3, 245 (1965).

POSSIBLE EXPERIMENTAL OBSERVATION OF THE HELICITY OF THE NEUTRINO

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Zacharias [1] proposed a method for experimentally observing the helicity of the neutrino, which has hitherto remained a Gedank experiment. The method consists of observing the rotation of a macro-body covered with β-active material. In fact, under normal conditions this effect would be too small to be observable.

The American firm "Martin Orlando" has constructed gyroscopes without a single moving part, using microscopically charged particles with 2.5 - 250 μ diameter placed in vacuum and suspended in a low-intensity electric field. The instrument consists of a vacuum chamber, in which are located electrodes that produce an electric field with induced balance. Charged droplets of spherical (better - spheroidal) shape are placed in the chamber, in which some of them are captured and suspended in the electric field in such a manner that they occupy an equilibrium position. Any change in their equilibrium position is registered optically. This instrument is used as the basis of an accelerometer that registers any change of an equilibrium position in terms of all three directions of the angular-acceleration vector. The instrument has ideal working characteristics and is immune to the action of any external random factors [2].

The use of such an instrument to observe the helicity of the neutrino is based on an elementary mechanical relation expressing the conservation of angular momentum. If I is the moment of inertia of the drop, equal to $2Ma^2/5$ (M = mass of drop, a = its radius), then the angular acceleration due to rotation induced in it by the spin from all the electrons absorbed in it from radioactive cobalt deposited on the surface of the drop is connected with the number of radioactive decays λN per second (λ = decay constant, N = number of radioactive atoms) by the relation

$$I\dot{\Omega} = \tfrac{1}{2}\hbar\lambda N.$$

The radioactive cobalt can be coated on either side of the droplet surface by evaporation, i.e., condensation from vapor. Such a coating can be made non-uniform with any desired distribution of surface density n. Then

$$\dot{\Omega} = \frac{15\lambda n}{16}\frac{\hbar}{a^3\rho},$$

where ρ is the density of the droplets. In view of the smallness of the droplet radius, observation of the rotation entails no difficulty.

[1] L. S. Rodberg and V. F. Weisskopf, Science 125, 627 (1957).

[2] J. H. Simpson, Nucl. Gyroscopes 2, 42 (1964).

POSSIBILITY OF DETERMINING THE RELATIVE SIGNS OF THE AMPLITUDES OF HADRON DECAYS OF HYPERONS

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1. The $\Delta T = 1/2$ rule leads, as is well known [1], to the following relations between the amplitudes of the hadron decays of the Λ, Σ, and Ξ hyperons:

$$\Lambda_-^0 = -\sqrt{2}\,\Lambda_0^0, \quad (1)$$

$$\Sigma_-^- = \sqrt{2}\,\Sigma_0^+ + \Sigma_+^+, \quad (2)$$

$$\Xi_-^- = -\sqrt{2}\,\Xi_0^0, \quad (3)$$