

Heitler's theory. Numerically, with the coupling parameters taken from the weak coupling theory of nuclear forces, one should expect the excitation energy to be in the order of 20 Mev only.

From the S matrix of proton-neutron collisions one may in the same way determine the binding energy of the *deuteron*. Here, however, no appreciable influence of the reaction forces is to be expected, on account of the slow variation in space of the deuteron wave-function.

As to the crucial problem of the *magnetic anomalies of the nucleon*, we meet with the difficulty that the electric charge and current distribution of the "meson cloud" is not directly defined in the S matrix theory, although it might be determined indirectly for instance by studying the scattering of a light wave by a nucleon. However, the quantity that should be computed is the energy of a nucleon in a magnetic field, the nucleon being in one of the ground states. These states cannot be associated with a continuous spectrum of meson waves by analytic continuation. Instead one might try to study the behavior of nucleons in oscillating or inhomogeneous magnetic fields such as have actually served to measure the magnetic moments. The Heitler-Stueckelberg theories will have to solve this problem of the magnetic anomalies, before a fair comparison with other theories can be made.

APPENDIX

Notations: Greek indices refer to space-time coordinates ($x_4 = it$).

γ_ν = Dirac's matrices operating on the spin coordinates of the nucleon field. $\gamma_5 = \gamma_1\gamma_2\gamma_3\gamma_4$.

i = isotopic spin index (running from 1 to 3 in the charge-symmetrical theory).

τ_i = isotopic spin matrices = Pauli's matrices operating on the charge coordinate of the nucleon field.

ϕ = wave function of the nucleons (8 components, *viz.* 4 each for the proton and neutron states); $\phi^+ = i\phi^*\gamma_4$.
 $\psi_i, \psi_{i\nu}$ = (real) wave functions of the pseudoscalar and vector meson fields, respectively.

μ_N, μ_{ps}, μ_v = rest masses of the nucleon, pseudoscalar, and vector meson.

g_{ps}, f_{ps}, g_v, f_v = (real) coupling parameters, all having the dimension of a length.

Natural units are chosen such that $\hbar = c = 1$.

The Lagrangian of a system of nucleons and mesons can be represented by the space integral $\int d^3x L$, where

$L = L_N + L_{ps} + L_{ps}'$ in the pseudoscalar theory,

$L = L_N + L_v + L_v'$ in the vector theory,

$L = L_N + L_{ps} + L_v + L_{ps}' + L_v'$ in the mixture theory,

$$L_N = i\phi^+ \left(\sum_\nu \gamma_\nu \frac{\partial}{\partial x_\nu} + \mu_N \right) \phi,$$

$$L_{ps} = -\frac{1}{2}\mu_{ps}^2 \sum_i \psi_i^2 - \frac{1}{2} \sum_{i\nu} \left(\frac{\partial \psi_i}{\partial x_\nu} \right)^2,$$

$$L_v = -\frac{1}{2}\mu_v^2 \sum_{i\nu} \psi_{i\nu}^2 - \frac{1}{2} \sum_{i\mu\nu} \left(\frac{\partial \psi_{i\mu}}{\partial x_\nu} - \frac{\partial \psi_{i\nu}}{\partial x_\mu} \right)^2,$$

$$L_{ps}' = f_{ps}\mu_{ps} \sum_i \phi^+ \tau_i \gamma_5 \phi \psi_i + g_{ps} \sum_{i\nu} \phi^+ \tau_i \gamma_\nu \gamma_5 \phi \frac{\partial \psi_i}{\partial x_\nu},$$

$$L_v' = g_v\mu_v \sum_{i\nu} \phi^+ \tau_i \gamma_\nu \phi \psi_{i\nu} + \frac{1}{2}f_v \sum_{i\mu\nu} \phi^+ \tau_i \gamma_\mu \gamma_\nu \phi \left(\frac{\partial \psi_{i\mu}}{\partial x_\nu} - \frac{\partial \psi_{i\nu}}{\partial x_\mu} \right).$$

Erratum

THROUGH error, proper credit for permission to publish the article on "Nuclei Formed in Fission: Decay Characteristics, Fission Yields, and Chain Relationships," by the Plutonium Project, was not given. This article was published in the November issue of the *Journal of the American Chemical Society*, and through the courtesy of the Editors of that Journal we were permitted to use the type in its publication in the October issue of the *Reviews of Modern Physics*.

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—The Editor