Letters to the Editor

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Communications should not in general exceed 600 words in length.

On the Theory of Integer Spin Mesons
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HEREFORE it has been assumed that there are two different possibilities for a field whose quanta have spin 0; scalar or pseudo-scalar wave function. For a spin one field an analogous possibility exists; the potentials may either be the components of a four vector or of a pseudo-four vector. We shall show that there is really only one possible kind of particle for each of the considered values of the spin; the difference in the nature of the nuclear forces is not due to the symmetry behavior of the meson field but is due to the fact that the interactions between the nuclear particles and the meson field herefore are not the most general ones. By considering more general forms of interaction the theory of nuclear forces: for each of the considered values of the spin the give the same forces between heavy particles.

The equations of motion of the system nuclear particles—meson field can be obtained from the variational principle:

$$\delta \int L \, dx \, dy \, dz = \delta \int (L_p + L_{neu} + L_{m} + L') \, dx \, dy \, dz.$$

$L'$ is the Lagrangian of the interaction between proton-neutrons and mesons:

$$L_{a}= -c \left[ f_{a} \phi \phi^{*} + f_{a} \omega_{a} \chi \chi^{*} \right] + \text{conj. complex}.$$

Spin 0

$$L_{b}= -c \left[ f_{b} \phi \chi \phi^{*} + f_{b} \omega_{b} \chi \chi^{*} \right] + \text{conj. complex}.$$

Spin 0

$$L'_{a}= -c \left[ f_{a} \phi \phi^{*} + f_{a} \omega_{a} \chi \chi^{*} \right] + \text{conj. complex}.$$

Spin 1

$$L'_{b}= -c \left[ f_{b} \phi \chi \phi^{*} + f_{b} \omega_{b} \chi \chi^{*} \right] + \text{conj. complex}.$$

Spin 1

These forms of $L'$ are not the most general ones. In order to get more general interactions let us consider the pseudo-scalar $\psi \phi$: $\psi \phi = (-g) \psi \phi$. $g = |\phi \phi^{*}|$. $\psi \phi$ is the well-known tensor density, antisymmetric in the four indices and equal to $\pm 1$, according to the parity of the permutation $\phi \phi^{*}$ of the numbers 0, 1, 2, 3. The most general interactions between proton-neutron and mesons are:

$$L_{a}= L_{a} - c \left[ f_{a} \phi \phi^{*} + f_{a} \omega_{a} \chi \chi^{*} \right] + \text{conj. complex.}$$

$$L_{b}= L_{b} - c \left[ f_{b} \phi \chi \phi^{*} + f_{b} \omega_{b} \chi \chi^{*} \right] + \text{conj. complex.}$$

$$L'_{a}= L'_{a} - c \left[ f_{a} \phi \phi^{*} + f_{a} \omega_{a} \chi \chi^{*} \right] + \text{conj. complex.}$$

$$L'_{b}= L'_{b} - c \left[ f_{b} \phi \chi \phi^{*} + f_{b} \omega_{b} \chi \chi^{*} \right] + \text{conj. complex.}$$

We see that $L_{a}$ and $L'_{a}$ have the same structure; therefore the two forms of the meson theory, for each of the values 0 and 1 of the spin, are perfectly equivalent, since we can describe the same field either by $\phi$ or by $\psi \phi$ and by $\phi \phi^{*}$ or $\phi \phi$.

Taking the interactions $L_{a}$ we get for the potentials of the nuclear forces:

$$V_{a} = -\frac{c}{4\pi} \left[ (\phi \phi^{*} - f^{2} \phi \phi^{*} - \phi \chi \phi^{*} \phi \chi) \right].$$

$$V'_{a} = \frac{c}{4\pi} \left[ (\phi \phi^{*} - f^{2} \phi \phi^{*} - \phi \chi \phi^{*} \phi \chi) \right].$$

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Transport Cross Sections of Monatomic Gas Mixtures
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THE coefficients of viscosity, thermal conduction, diffusion and thermal diffusion as given independently by Enskog and Chapman involve the integrals

$$\phi(\eta, s) = \pi \int_{0}^{\infty} e^{-\eta^{2} s} d\eta,$$

$$\phi(\eta, s) = (2m_{2} k T / m_{1} m_{2}) \pi \int_{0}^{\infty} \left( 1 - \cos \chi \right) d\eta,$$

where $\chi$ is the least positive root of the function in brackets.

Previously $\chi$ has been integrable only for the rigid