with the tabular data for Eu^{146}. On the basis of measurements of this isotope from the time of its separation from the gadolinium fraction we evaluated the period of the parent substance Gd^{146} to be 12 ± 4 hours. It should be noted that the mass number of Gd^{146} was determined with the same degree of reliability as that of the daughter europium isotope, which belongs, according to Seaborg's[2] tables, in class C (mass number "reliable or probable").

[1] Gorodinskii, Pokrovskii, Preobrazhenskii, Murin, and Titov, Dokl. Akad. Nauk, SSSR 112, 405 (1957); Soviet Phys. "Doklady" 2, 39 (1957).

[2] Seaborg, Perlman, and Hollander, Table of Isotopes, (M., 1956).

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Possibility of Constructing a Chain of Equations for Model Operators

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THE THEORY OF MODEL TRANSFORMATIONS[1] is characterized by the fact that the model operator M_n transforming the model state

$$|\varphi_1 \ldots \varphi_n\rangle = \prod_{\gamma=1}^{n} \varphi(\gamma)$$

into the real state of the system $|\Psi\rangle = \Psi(1 \ldots n)$, is an operator function of all the dynamic variables of the system. To reduce the many-particle problem to a single-particle problem, let us introduce the sequence of generalized transition amplitudes

$$\langle \varphi_1 \ldots \varphi_n | \Psi\rangle;\ \langle \varphi_1 \ldots \varphi_{\alpha-1}, \varphi_{\alpha+1} \ldots \varphi_n | \Psi\rangle \equiv \langle \ldots (\varphi_\alpha) \ldots | \Psi\rangle, \ldots, \langle \varphi_\alpha \varphi_\beta | \Psi\rangle;\ \langle \varphi_\alpha | \Psi\rangle;\ |\Psi\rangle,$$

where, for example,

$$\langle \ldots (\varphi_\alpha) \ldots | \Psi\rangle = \int \frac{d\tau}{d\tau_\alpha} \prod_{\gamma \neq \alpha} \overset{+}{\varphi}(\gamma)\, \Psi(1 \ldots n).$$

Assuming that the real and model states of the system are described by the wave equations

$$i\partial_t |\Psi\rangle = \Big\{\sum_\alpha T(\alpha) + \sum_{\alpha\beta} H(\alpha\beta)\Big\} |\Psi\rangle,\quad i\partial_t \varphi_\alpha = \{T(\alpha) + U(\alpha)\}\, \varphi_\alpha,$$

we obtain a system of equations

$$i\partial_t \langle \varphi_1 \ldots \varphi_n | \Psi\rangle = \sum_{\alpha\beta} \langle \varphi_\alpha \varphi_\beta | H(\alpha\beta) | \langle \ldots (\varphi_\alpha \varphi_\beta) \ldots | \Psi\rangle\rangle - \sum_\alpha \langle \varphi_\alpha | U(\alpha) | \langle \ldots (\varphi_\alpha) \ldots | \Psi\rangle\rangle,$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots,$$

$$\Big\{i\partial_t - \sum_{\alpha \neq \gamma} T(\alpha) - \sum_{\alpha\beta \neq \gamma} H(\alpha\beta)\Big\} \langle \varphi_\gamma | \Psi\rangle = \langle \varphi_\gamma \Big| \sum_{\alpha \neq \gamma} H(\alpha\gamma) - U(\gamma) | \Psi\rangle,$$

similar to the system of equations for a density matrix.[2] In the stationary case the system assumes the form

$$\Big\{E-\sum_{\alpha}E_\alpha\Big\}\langle E_1\ldots E_n\,|\,E\rangle=\sum_{\alpha\beta}\langle E_\alpha E_\beta\,|\,H(\alpha\beta)|\,\langle\ldots(E_\alpha E_\beta)\ldots|\,E\rangle\rangle-\sum_{\alpha}\langle E_\alpha\,|U(\alpha)|\,\langle\ldots(E_\alpha)\ldots|\,E\rangle\rangle;$$

$$\Big\{E-\sum_{\alpha\neq\gamma}E_\alpha-T(\gamma)\Big\}\langle\ldots(E_\gamma)\ldots|\,E\rangle=\sum_{\alpha\beta\neq\gamma}\langle E_\alpha E_\beta\,|\,H(\alpha\beta)|\langle\ldots(E_\alpha E_\beta E_\gamma)\ldots|\,E\rangle\rangle$$
$$+\sum_{\alpha\neq\gamma}(E_\alpha\,|\,H(\gamma\alpha)-U(\alpha)|\langle\ldots(E_\alpha E_\gamma)\ldots|E\rangle\rangle; \qquad (1)$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots;$$
$$\Big\{E-E_\gamma-\sum_{\alpha\neq\gamma}T(\alpha)-\sum_{\alpha\beta\neq\gamma}H(\alpha\beta)\Big\}\langle E_\gamma\big|E\rangle\Big|=\langle E_\gamma\Big|\sum_{\alpha\neq\gamma}H(\alpha\gamma)-U(\gamma)\Big|E\rangle.$$

System (1) jointly with the equations

$$\Big\{E-\sum_{\alpha}T(\alpha)-\sum_{\alpha\beta}H(\alpha\beta)\Big\}\,|\,E\rangle=0,\quad \{E_\alpha-T(\alpha)-U(\alpha)\}\,|\,E_\alpha\rangle=0$$

determines the single-particle potential U on the surface of constant energy $\left(E-\sum_\alpha E_\alpha=0\right)$ and is equivalent to the model transformation $|\,E\rangle=M_n\,|\,E_1\ldots E_n\rangle$. The last assertion becomes obvious, if we introduce the sequence of model operators

$$\langle\ldots(E_\alpha)\ldots|\,E\rangle=M_1(\alpha)|\,E_\alpha\rangle;$$
$$\langle\ldots(E_\alpha E_\beta)\ldots|\,E\rangle=M_2(\alpha\beta)|\,E_\alpha E_\beta\rangle;$$
$$\ldots\ldots\ldots\ldots\ldots;$$
$$\langle E_\alpha\,|\,E\rangle=M_{n-1}(\ldots\alpha-1,\alpha+1,\ldots)|\,E_1,\ldots E_{\alpha-1}E_{\alpha+1}\ldots E_n\rangle;$$
$$|\,E\rangle=M_n\,|\,E_1\ldots E_n\rangle$$

and find the operator equations for M_p.

Consideration of stationary transitions on a constant energy surface corresponds in this case to examination of such single-particle states which satisfy the requirement $\partial_t\langle\varphi_1,\ldots\varphi_n\,|\,\Psi\rangle=0$, that is an analogue of the usual condition of normalization of $\partial_t\langle\Psi\,|\,\Psi\rangle=0$.

[1] R. I. Eden and N. C. Francis, Phys. Rev. 97, 1366 (1955).

[2] N. N. Bogoliubov, *Lectures on Quantum Statistics*, Kiev, 1949.

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Some Remarks on Slow Processes of Transformation of Elementary Particles

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AS IS KNOWN, there are two types of slow processes:

(a) lepton:

$$n\to e+\bar\nu+p,\ \mu\to e+\nu+\bar\nu,\ \mu+p\to n+\nu,\ \pi\to\mu+\nu,$$
$$K\to\mu+\nu,\ K\to\mu+\nu+\pi,\ K\to e+\nu+\pi,$$

(b) non-lepton:

$$K\to 2\pi,\ K\to 3\pi,\ \Lambda(\Sigma)\to N+\pi,\ \Xi\to\Lambda+\pi.$$

The constants of the interactions responsible for these processes in units of $\hbar=\mu=c=1$ (where μ is the π-meson mass) are of the same order of magnitude as $G^2=10^{-14}-10^{-12}$. This suggests that the same mechanism (for example, the universal Fermi interaction[1]) may lie at the basis of all* these processes. This idea is supported by the fact that

*Non-conservation of parity in the decay of hyperons, although it has not yet been proved experimentally, almost inescapably follows from the established parity non-conservation in the decay of K-mesons.