is the piezoelectric constant of the crystal, γ is the coefficient in the kinetic equation $\partial D_X/\partial t = \gamma \partial \Phi / \partial D_X$, Φ is the thermodynamic potential of the crystal, which is represented by a function of D_X and the shear stress σ_{zy} (on this decomposition of Φ, see reference 3).

The coefficient γ can be estimated by substituting the known values of all parameters in (1) and one of the values of κ found experimentally. In taking into account the numerical values of the quantities entering into (1), we make use of the approximate formula

$$\varkappa = 8\sqrt{\frac{\rho}{\mu}}\,\frac{\pi^2\lambda^2\omega^2/\gamma}{\varepsilon^{-2}+16\,\pi^2\omega^2\gamma^{-2}} \qquad (2)$$

for comparison of theory with experiment.

The theoretical curve 2 — 2 corresponding to Eq. (2) is shown in the drawing. In the scale chosen for the drawing, the lower temperature branch of the curve 2 — 2 coincides with the corresponding branch of the experimental curve 1 — 1. The excellent agreement of the Landau theory with experiment for $T < \Theta$ made it possible for us to estimate the relaxation time $\tau = 4\pi\epsilon/\gamma \approx 3.4 \times 10^{-8}/(\Theta - T)$ sec for $T < \Theta$.

*We note that misprints occurred in Eq. (1) which was given in reference 2 under the number (35), and also in the following Eq. (36).

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HYPOTHESIS OF CONSERVED VECTOR CURRENT AND GLOBAL SYMMETRY OF WEAK INTERACTIONS

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THE existence of divergences among the values of the vector coupling constants in β decay (decay of O^{14}) and μ decay, established on the basis of new experimental data, has been reported in recent papers.[1-6]

In the present communication we call attention to the fact that one of the reasons for the difference between the indicated coupling constants may be the nonconservation of the weak vector current, even without allowance for the radiative corrections for the electromagnetic and the weak[8] interactions.

In reference 7 an analogy was developed between the weak interaction and the electromagnetic one, based on the assumption of global symmetry of weak interactions and on the hypothesis of two forms of neutrinos — electron and muon[9,10] (global symmetry in weak interactions was considered also by Treiman[12]). It was assumed here that the properties of Fermi particles in weak interactions can be obtained from the classification of massless fermions with respect to possible values of charges (electric, baryon, and lepton) and the chirality γ_5, and the mass degeneracy is removed by strong interactions. It is easy to verify that since strong interactions are as a whole not globally symmetrical,[11] the weak vector current obtained in reference 7 is not conserved. We assume that the pion interactions are globally symmetrical and give rise to a mass difference between the leptons and baryons, while K-meson interactions lift the mass degeneracy of the baryon isotopic multiplets. Then the nonconservation of the isovector current will be due only to K interactions. Since the renormalization of even the axial coupling constant is small (0.2), we can expect the renormalization of the vector constant, in which π interactions make no contribution, to be even much smaller. An estimate of this reduction is the ratio of the splitting of the masses of the baryons to the mass difference between baryons and leptons (only the Σ-Λ mass difference is of importance here), equal to ~ 0.1. This gives a difference in constants of about 0.02 in β and μ decay, which does not contradict the available experimental data.[5,6] It must be kept in mind that strong interactions renormalize the constant g_β, while weak ones renormalize g_μ. An account of this fact is essential if information is to be obtained on the intermediate heavy vector meson from an analysis of the radiative corrections based on weak interaction (see reference 8).

It is essential to note that in spite of the theoretical attractiveness of the assumption of the global symmetry of the π interactions, the estimate obtained here for the difference of the β- and μ-decay coupling constants is essentially based on the considerably weaker requirement, namely $g_{\Sigma\Lambda\pi} = g_{\Sigma\Sigma\pi}$.

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FISSION INDUCED BY MUONS

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THERE is an observable probability that the energy released in the 2p to 1s transition in μ-mesonic atoms is converted into nuclear excitation.[1,2] In uranium and plutonium, the excitation energy amounts to ~ 6.3 Mev. At this energy the nucleus can decay into various channels, namely, by γ emission, neutron emission, and fission.

Grechukhin (private communication) has stated that the fission channel is forbidden. Qualitatively, this effect is due to the fact that the meson in the 1s state near the nucleus hinders the nuclear deformation which would lead to fission. Therefore, the fission barrier is higher with meson present than without the meson. The closer the fission threshold is to the excitation energy, the larger the effect of the presence of the 1s meson is on the fission probability.

Since the rotational energy of the nucleus is much less than the energy of the meson in the ground state, rotational effects and nuclear fission are adiabatic with respect to the mesonic motion. Thus, the calculation of the effect of the meson on fission can be carried out for a fixed orientation of the nuclear axis.

The binding energy of the meson in the ground state decreases when the nucleus is deformed and thus the energy threshold for fission is correspondingly increased, since the potential curve for nuclear fission with the meson present is $E^{\mu}_{\text{nuc}} = E^{0}_{\text{nuc}} + E_{\mu}$ where E^{0}_{nuc} is the potential curve for fission without the meson and E_{μ} is the binding energy of the meson which depends on the nuclear deformation parameters. To find E_{μ}, it is necessary to solve the Schrödinger equation for the meson in the Coulomb field of the deformed nucleus. We assume for simplicity that up to the saddle point the nucleus has the form of an ellipsoid of revolution. The Coulomb potential of a uniformly charged ellipsoid of revolution with semi-axes a and b has the form

$$\varphi(\alpha, \beta) = \frac{Ze}{c}\Big\{[1 - P_2(\operatorname{ch}\alpha) P_2(\cos\beta)] \ln \operatorname{cth}\frac{\alpha_0}{2} + \frac{3}{2}\frac{\operatorname{ch}^2\alpha}{\operatorname{ch}\alpha_0} P_2(\cos\beta) + \frac{3}{4}\Big(1 - \frac{\operatorname{sh}^2\alpha}{\operatorname{sh}^2\alpha_0}\Big)\frac{\sin^2\beta}{\operatorname{ch}\alpha_0}\Big\} \quad \text{for } \operatorname{ch}\alpha \leqslant \operatorname{ch}\alpha_0 = \frac{a}{c},$$

$$\varphi(\alpha, \beta) = \frac{Ze}{c}\Big\{[1 - P_2(\operatorname{ch}\alpha) P_2(\cos\beta)] \ln \operatorname{cth}\frac{\alpha}{2} + \frac{3}{2}\operatorname{ch}\alpha P_2(\cos\beta)\Big\} \quad \text{for } \operatorname{ch}\alpha \geqslant \frac{a}{c}, \qquad (1)^*$$

where Ze is the nuclear charge, $c^2 = a^2 - b^2$, $P_2(x)$ is the Legendre polynomial of order two, and α and β are the degenerate ellipsoidal coordinates.

The Schrödinger equation for the ground state of the mesonic atom with the potential (1) was numerically integrated on an electronic computer. Below are presented the values of the binding energy of the meson in the ground state of the U^{238} mesonic atom as a function of the ratio of the semiaxes of the nucleus

a/b =	1.2	1.4	1.6	1.8	2	2.2	2.5
E_{μ} (Mev) =	11.89	11.79	11.66	11.53	11.36	11.21	11.01

With the hydrodynamic model for fission,[3] it is possible to find the ratio of the nuclear semiaxes at the saddle point, $(a/b)_{\text{sp}}$. This ratio and the increase, ΔE, in the height of the fission barrier for several nuclei are given in the table [$(a/b)_0$ is the statistical nuclear deformation,[4] E_{thr} is the photofission threshold[5]].