approximation by $\Delta\sigma \propto e^{-\Delta E/kT}$ with $\Delta E = 2 \times 10^{-2}$ ev/mole. Bismuth behaves in a similar manner.

This gives some grounds for supposing that pressure creates a condition similar to that in a semiconductor, for some of the electrons; but with a very small energy gap, which would overlap even at low temperatures.

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53

EFFECT OF μ^--MESON POLARIZATION ON THE CORRELATION OF GAMMA RAYS EMITTED BY THE MESONIC ATOM

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THE function describing the angular correlation of γ rays from mesonic atom transitions was derived in Ref. 1. Recently it has been established experimentally[2] that polarized μ^- mesons are formed in the π^--meson decay. It is therefore of interest to discuss the same question for a given degree of polarization of the μ^- meson.

In the case of heavy mesonic atoms, the correlation function for the cascade $l_A(L_1)\,l_B(L_2)\,l_C$ has the form:

$$
\begin{aligned}
W = {} & \sum_{\nu_1\nu_2} F_{2\nu_1}(L_1 l_A l_B)\, F_{2\nu_2}(L_2 l_C l_B) \\
& \times \sum_{F_B F'_B j_\beta l k \rho} \frac{(2F_B+1)(2F'_B+1)}{(2I+1)\,[1+(\nu_{FF'}\tau)^2]}\, W^2(j_\beta I 2\nu_2 F_B;\ F'_B j_\beta) \\
& \times (2j_\beta+1)^2 W(l_B s 2\nu_2 j_\beta;\ j_\beta l_B)\, W(l_B s 2\nu_2 j_\beta;\ j_\beta l) \\
& \times (2l+1)\, W(s2kj_\beta l;\ s l_B)\, W(2\nu_1 2\nu_2 l_B l;\ 2k l_B)\, C^{2k0}_{2\nu_1\rho;\ 2\nu_2-\rho} \\
& \times \langle|(ss)2k0\rangle\, 4\pi Y^{\rho}_{2\nu_1}\left(\theta_1,\ \varphi_1-\frac{\pi}{2}\right) Y^{-\rho}_{2\nu_2}\left(\theta_2,\ \varphi_2-\frac{\pi}{2}\right);
\end{aligned}
\tag{1}
$$

$$
F_{2\nu_1}(L_1 l_A l_B) = (-1)^{l_A-l_B-1}(2l_B+1)^{1/2}(2L_1+1) \times C^{2\nu_1 0}_{L_1 1;\ L_1-1} W(l_B l_B L_1 L_1;\ 2\nu_1 l_A); \tag{1a}
$$

$$
\langle|(ss)2k0\rangle = W^{-1}_{2k}(s)\, f_{2k}(s) = \sum_{\mu} a_\mu C^{2k0}_{s\mu;\ s-\mu}. \tag{1b}
$$

Here L_1, L_2 are the angular momenta of the quanta; l_A, l_B, l_C are the orbital angular momenta of the meson in the initial, intermediate, and final states; j_α, j_β, j_γ are the corresponding total angular momenta: $\mathbf{j} = \mathbf{l} + \mathbf{s}$ where s is the meson spin; F_B is the sum of the meson (j_β) and nucleus (I) angular momenta; $\langle|(ss)2k0\rangle$ is the statistical tensor of Fano, proportional to the meson orientation degree of 2k-th order $f_{2k}(s)$;[3] a_μ is the probability amplitude that the meson in the initial state has a spin projection equal to μ; $\nu_{FF'}$ is the hyperfine structure; τ is the lifetime of the intermediate state; C and W are the Clebsh-Gordan and Racah coefficients.

As can be seen from expression (1) the correlation function depends on the angles formed by the axis of rotational symmetry of the μ meson and the directions of emission of the first (θ_1) and the second (θ_2) quanta, as well as on the angle θ between the directions of the two quanta:

$$
\cos\theta = \cos\theta_1\cos\theta_2 + \sin\theta_1\sin\theta_2\cos(\varphi_2-\varphi_1). \tag{1c}
$$

If $a_\mu = \text{const} = 1/(2s+1)$ then (1) reduces to formula (2) obtained in Ref. 1.

Since the summation in (1) is only over even orders of the orientation degree $f_{2k}(s)$ we shall also obtain the same result if we set $s = \frac{1}{2}$.[2] Thus the correlation does not depend on the degree of the μ^--meson polarization $f_1(s)$. If one allows for the possibility of the μ^--meson spin being $3/2$ then in this case the correlation function would depend on the degree of alignment $f_2(s)$.

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ON THE THEORY OF MAGNETIC SUSCEPTIBILITY OF METALS

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RECENTLY, the magnetic susceptibility of an electron gas was calculated by several authors,[1-3] taking into account long-range Coulomb correlation. However, only the susceptibility due to the Fermi branch of the excitation spectrum was taken into account there. We would like to direct attention to the fact that the (Bose) plasma-oscillation quanta also make a definite contribution to the susceptibility. Actually, although these excitations are neutral and give no contribution to the current, their energy depends on the magnetic field intensity H and consequently the plasma quanta are "carriers of magnetism." At ordinary temperatures, real plasma quanta in a metal are practically not excited; their zero-point energy, however, also depends on H. This leads, as we shall show, to plasma diamagnetism comparable to the Landau diamagnetism.

As is known (see, for example, Ref. 4), a separation of plasma oscillations into longitudinal and transverse is still possible in a weak magnetic field. For our problem, only the former are of interest; the frequency of a longitudinal plasma quantum (in the frame of an isotropic model) is

$$\omega^2 = \omega_L^2 + \omega_H \sin^2\alpha + O(k^2), \qquad (1)$$

where **k** is the wave vector of a plasmon, α is the angle between **k** and H, $\omega_L^2 = 4\pi ne^2/m$, $\omega_H = eH/mc$, and n and m are the concentration and effective mass of the electrons ($\omega_H \ll \omega_L$). We shall disregard terms of order k^2 in Eq. (1) (apparently, they are small in comparison with ω_L^2 for all k up to the limiting wave number k_0).

The magnetic susceptibility per unit volume, due to the dependence of the zero-point energy of the plasma on the magnetic field, is:

$$\chi = -\frac{1}{2}\frac{\hbar}{(2\pi)^3}\frac{\partial^2}{\partial H^2}\int\limits_{k\leqslant k_0} d\mathbf{k}\,\omega(\mathbf{k}). \qquad (2)$$

By virtue of Eq. (1), this yields

$$\chi = -(1/18\pi^2)(e^2/mc^2)(\hbar/m)k_0^3/\omega_L. \qquad (3)$$

The quantity k_0 in our approximation (small H) can be regarded as independent of the magnetic field. Setting $\hbar k_0 = \beta p_F$, where p_F is the Fermi boundary momentum and β is a dimensionless parameter (which may depend on n) we obtain

$$\chi = -(\beta^3/12\sqrt{\pi})(\hbar/mc)(ne^2/mc^2)^{1/2}$$
$$= -0.96\cdot 10^{-18}(m_0/m)^{3/2}\beta^3\sqrt{n} \qquad (4)$$

(m_0 is the mass of a free electron). Inasmuch as $\beta < 1$, but evidently $\beta > \frac{1}{2}$,[5] $|\chi| \sim 10^{-6} - 10^{-7}$. This quantity can be fully comparable with the result of Pines, obtained in disregarding the zero-point energy of the plasma. Hence it is clear that this neglect, generally speaking, is by no means justified and the quantiative comparison of Pines' theory with experiment must be reviewed.

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THE PROPERTIES OF THE GREEN FUNCTION FOR PARTICLES IN STATISTICS

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IN an attempt to apply the methods which have recently been developed in quantum electrodynam-