on the order of kT. This leads to a considerable smoothing of the anomalies that are actually observed in the experiment (each of the quantities listed above has a very broad extremum near T_{max} [4]).

To check on the advanced hypothesis it would be desirable to observe metals in which such an anomaly occurs at low temperatures. This may be the case with holmium, erbium, and thulium. If the point of view presented here is correct, the anomalies should become sharper. In addition, observation of anomalies at low temperatures would make it possible to investigate the topology of the Fermi surface directly.

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COSMOLOGICAL CONSTANT AND ELEMENTARY PARTICLES

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The hypothesis that the equations of general relativity contain the cosmological constant Λ of the order of $\Lambda \cong +5 \times 10^{-56}\ \mathrm{cm}^{-2}$ has been recently advanced again [1-3]. A closed world is assumed, with a contemporary radius $R_1 \sim \Lambda^{-1/2}$, a Hubble constant $H_1 \sim c\Lambda^{-1/2}$, and a density $\rho_1 \sim \Lambda c^4/G$; the presence of Λ significantly slows down the expansion during the period corresponding to the red shift $z = 1.95$, about which the red shifts of the absorption lines in the quasar spectrum are grouped [4]. Corresponding to the given Λ is the concept of vacuum as a medium having a density $\rho_0 = \Lambda c^4/8\pi G = 2.5 \times 10^{-29}\ \mathrm{g/cm^3}$, an energy density $\epsilon_0 = 2 \times 10^{-8}\ \mathrm{erg/cm^3}$, and a negative pressure (tension) $P_0 = -\epsilon_0 = -2 \times 10^{-8}$ dyne/cm^3.

How is one to visualize a theory in which such properties of the vacuum are obtained from our notions regarding elementary particles? The starting point of such a theory are the formulas that give the required order of magnitude of ϵ_0, expressed in terms of the constants m, c, $\hbar$, and G, where m is the elementary-particle mass. Using the formulas of Eddington [5] and Dirac [6] for the quantities characterizing the contemporary universe, and the connection between these quantities and Λ, we obtain

$$\Lambda \sim G^2 m^6/\hbar^4, \quad \rho_0 \sim G m^6 c^2/\hbar^4, \quad \epsilon_0 \sim G m^6 c^4/\hbar^4. \tag{1}$$

We introduce the Compton wavelength of the elementary particle $\lambda = \hbar/mc$ and write

$$\epsilon_0 \sim \frac{Gm^2}{\lambda} \frac{1}{\lambda^3}. \quad (2)$$

The latter formula corresponds to the assumption that the vacuum contains virtual pairs of particles with effective density $n \sim 1/\lambda^3$. It is assumed that the theory is such that the corresponding energy density is identically equal to zero. However, the energy of the gravitational interaction of these pairs (Gm^2/λ for one pair) does not vanish and yields precisely ϵ_0. In the relativistically invariant theory of vacuum, this ϵ_0 should correspond to $P_0 = -\epsilon_0$.

Numerically, expression (2) with m equal to the proton mass yields a value 10^8 times larger than required. This may mean that (2) contains also the weak-interaction constant. The dimensionless constant g^1 has a value $\sim 10^{-5}$; in dimensional form ($g = 2 \times 10^{-49}$ erg/cm^3) it is assumed that *

$$\epsilon_0 \cong Ggm^8 c^5/\hbar^7 \cong 10^{-5} \text{ erg/cm}^3. \quad (3)$$

Expressions (2) and (3) relate locally-measurable physical constants. They differ fundamentally from the Dirac-Eddington relations in that (2) and (3) presuppose neither variation of G nor the influence of the entire world (in the spirit of the Mach principle) on the local law (cf. [7]). The Dirac relations are obtained as approximately valid only for the present stage of the evolution of the world, soon after the cessation of the expansion. They are the consequences of the equations of general relativity with ϵ_0 and with the corresponding Λ.

It must be emphasized in conclusion that the final word with respect to the quantity Λ belongs to astronomic observations; it cannot be regarded as proved at present that $\Lambda \neq 0$.

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* The interaction that violates time parity is probably even weaker.