capillary was produced by pressing on the lever (6) of a bellows (7). The mercury jet flowed through the capillary to electrode 3. The electric explosion of the jet took place when the gap between the jet and moving electrode 4 broke down. This breakdown could occur only when the jet reached electrode 3. The gap was set at the minimum value. We have tried earlier variants without a movable electrode, using the mercury in the capillary as one of the electrodes. It turned out then that at the instant of the mercury-jet explosion a glass capillary was shattered, the the diameter of a steel capillary approximately doubled after two or three shots.

When the pressure on the lever was released, the mercury flowed from the lower part of the chamber (8) through a tube (9) into the bellows. The tube had a rubber valve (10) which prevented the mercury from entering the interelectrode space from below. The working space was pumped out with a mercury diffusion pump and cooled with liquid nitrogen to -50°C. To determine what happens during the electric explosion of the mercury jet - whether it travels broken up into droplets or in the form of a molecular beam - the jet-explosion products were sounded with an electron beam. They passed first through a diaphragm (11) and then crossed the electron beam from a gun (12) at a distance 23 cm from the place of the explosion. This scattered the electrons and changed the current to the collector (13). This current was recorded with an oscilloscope (14). A typical oscillogram of the collector current is shown in Fig. 2. It is seen from this oscillogram that explosion of the mercury jet produces a molecular beam which contains no individual droplets (there are no gaps in the oscillogram). The velocity of the leading front of the molecular mercury beam is 2.5×10^{6} cm/sec, and its total duration at a distance 23 cm from the point of explosion is 600 μsec. The sweep duration was 1.2 msec.

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A NOTE ON C-ODD MULTIPOLES

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In discussing the possibility of charge-parity nonconservation in electromagnetic interactions, Bernstein, Feinberg, and Lee [1] emphasized that for particles with spin $I \leq 1/2$ there are no C-odd terms in the vertex part of photon emission even if the electromagnetic current contains a C-even component 1). This is connected with the fact that when $I \leq 1/2$

the C-odd terms are forbidden by current conservation and hermeticity requirements. As a result, the K-current for particles with $I \leq 1/2$ appears only in the nondiagonal transitions (of the type $\eta^0 \to \pi^0\gamma \to \pi^0 e^+ e^-$, $\Sigma^0 \to \Lambda^0\gamma$, etc.)

In this note we discuss briefly the possible presence of C-odd terms in vertex parts with $I \geq 1$ [2]. When $I = 1$ (e.g., deuteron) this term is of the form

$$if(q^2)\{q^2[(\varphi^*_{2\beta}q_\beta)\varphi_{1\alpha} + \varphi^*_{2\alpha}(\varphi_{1\beta}q_\beta)] - 2q_\alpha(\varphi^*_{2\beta}q_\beta)(\varphi_{1\gamma}q_\gamma)\}A_\alpha, \quad (1)$$

where $\varphi_{1\alpha}(\varphi_{2\alpha})$ is the wave function of the deuteron in the initial (final) state, and q_α is the photon 4-momentum. It follows from hermeticity that $f(q^2)$ is pure real. Generally speaking, $f(0) \neq 0$. The presence of the vertex (1), together with the charge and the magnetic and quadrupole moments of the deuteron, gives rise, in particular, to correlations of the type $\vec{\zeta}_1\cdot\vec{n}$ or $\vec{\zeta}_2\cdot\vec{n}$ when electrons are scattered by deuterons. Here $\vec{\zeta}_1(\vec{\zeta}_2)$ is the deuteron polarization in the initial (final) state and $\vec{n}$ is the normal to the scattering plane.

It is seen from (1) that this vertex vanishes for real photons ($q^2 = 0$, $eq = 0$). The effect will therefore be maximal if we consider large-angle scattering of electrons.

We note that in the case of a deuteron the coefficients in the term (1) may become small, owing to the effect noted in [1] (and similarly for other nuclei). These coefficients differ from zero only to the extent to which the effects of virtuality of the nucleons and mesonic "glue" are important. It is presently difficult to estimate this smallness quantitatively. As noted by B. M. Pontecorvo, at large q^2 the very presence of the elastic process indicates that an important role is played by the mesonic "glue." The smallness connected with the nonelementary nature of the nucleus is manifest in the smallness of the form factor, which can be naturally assumed to be the same for C-even and C-odd terms. Therefore, at large q^2 we can expect correlation effects of the order of unity in the model of Bernstein, Feinberg, and Lee [1].

The recently established [2,3] upper limit for the C-noninvariant transition $\eta^0 \to \pi^0 e^+ e^-$

$$\Gamma(\eta^0 \to \pi^0 e^+ e^-) : \Gamma(\eta^0 \to 2\gamma) \leq (0.7 \pm 0.7) \times 10^{-2}$$

does not mean that the foregoing correlations must be additionally small in ed scattering, since $\Delta T = 0$ in ed scattering and $\Delta T = 1$ in the $\eta^0 \to \pi^0 e^+ e^-$ decay. We note that correlations of the type $\vec{\zeta}_1\cdot\vec{n}$ or $\vec{\zeta}_2\cdot\vec{n}$ occur also in the absence of C-odd vertices, if account is taken of the electromagnetic interaction beyond the first Born approximation. For light nuclei, however, these effects are small and, furthermore, they can be estimated theoretically to a considerable degree.

For particles with $I = 3/2$ (for example, stable Li^7 or Be^9 nuclei), the C-invariant vertex is of the form:

$$if(q^2)\{q^2[\bar{\psi}^2_\alpha(\psi^1_\beta q_\beta) + (\bar{\psi}_\beta q_\beta)\psi^1_\alpha] - 2q_\alpha(\bar{\psi}^2_\beta q_\beta)(\psi^1_\gamma q_\gamma)\}A_\alpha. \quad (2)$$

Here ψ_α are the Rarita-Schwinger wave functions satisfying the conditions $p_\mu\psi_\mu = 0$, $\gamma_\mu\psi_\mu = 0$, and $(\hat{p} - m)\psi_\mu = 0$. Such C- and T-invariant amplitudes should yield correlations of the T-odd type, similar to those given above for the deuteron. In the general case this question was considered by M. S. Marinov. We note that such T-invariant terms can obviously not lead to a shift of the atomic levels. The C-odd vertices contain a factor q^2 for both I = 1 and I = 3/2. The same takes place for I = 2. Thus, in these three cases the C-odd interaction of the electron with the nucleus has a purely contact character. The dependence of the C-odd vertices on q^2 was not considered by us for I > 2.

For a particle with spin I the number of C-odd multipoles is equal to I (for integer I) or I - 1/2 (for half-integer I). In the general case (taking into account possible parity nonconservation), the number of corresponding multipoles is given in the table.

The number of corresponding multipoles N in the third and fourth lines pertains here to integer and half-integer I, respectively. The results of the table can be easily obtained by determining the number of states in the t-channel, where the particle and antiparticle with spin I form an "atom" with total angular momentum 1.

CP	+1	-1	+1	-1
P	+1	+1	-1	-1
N	2I +1	I	I	2I
	2I +1	I - 1/2	I + 1/2	2I

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Note added in proof. An expression for the electromagnetic current of particles with spin 1 and 3/2 with account taken of CP-noninvariant form factors is given in an article by V. Glaser and B. Jaksic, Nuovo Cimento 5, 1197 (1957). The authors are grateful to L. A. Kondratyuk for calling their attention to this paper.

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1) The C- and CP-parity of the vertex part (unlike the current) and of the multipole are determined in this note with account of C- and P-parity of the photon.

2) The possible presence of C-even terms in the vertex parts of particles with I ≥ 1 was called to the attention of one of us (L. Okun') by S. Coleman and S. Glashow. M. V. Dubovik advised us that analogous questions were considered by him jointly with A. A. Cheshko.

PLASMA HEATING BY A STOCHASTIC FIELD

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The interaction between plasma particles and an electromagnetic field, with account taken of the finite correlation time of the field Fourier harmonics, was investigated in [1]. It was shown there that a finite correlation time leads to an effective transfer of energy