the principal axis of the crystal).

In the graphs of Fig. 2, the influence of uniaxial elastic compression of the zinc crystals is illustrated by the shapes of the curves $\Delta\chi(1/H)$. The same figure shows the straight line $n(1/H)$, which determine the period of oscillation of susceptibility of a free and compressed crystal at $\theta = 20$ and 30°.

The uniform compression of zinc crystals in the region $\theta \leq 30°$ increases the period of susceptibility oscillations by 4 to 5%. With increasing θ, the oscillation period increases less, at $\theta = 70°$ it stays unchanged, and at $\theta = 80°$ the period of oscillation even diminishes somewhat ($\Delta T/T \sim 1\%$).

Uniaxial tension of zinc crystals in the region $\theta \leq 30°$ decreases the period of the susceptibility oscillations by 2 or 3%. The amplitude of the susceptibility oscillations diminishes several-fold in uniaxial elastic deformation of the crystal. After removing the load the period and the amplitude of the oscillations return to their initial values.

The investigations performed have thus shown that reducing c/a for elastic deformation of the crystal leads to an increase in the periods of the susceptibility oscillations, leading in turn to an increase in the number of charges in the anomalous group. On the contrary, an increase in c/a causes a reduction in the oscillation periods and a corresponding increase in the number of charges in this group.

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Translated by J. G. Adashko
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INFLUENCE OF MULTIPLE SCATTERING ON THE DEVELOPMENT OF HIGH-ENERGY ELECTRON-PHOTON CASCADES IN LEAD

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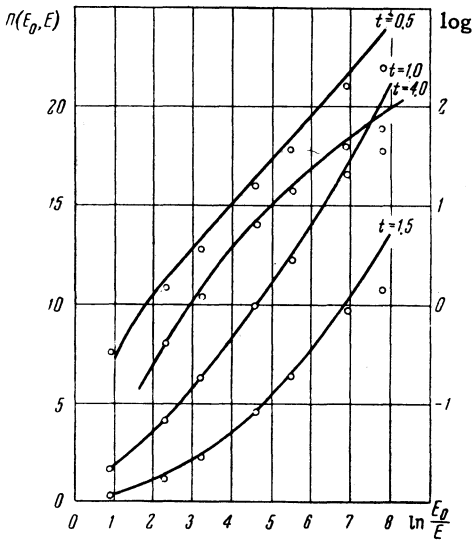
Submitted to JETP editor April 8, 1958

J. Exptl. Theoret. Phys. (U.S.S.R.) **35**, 293-294 (July, 1958)

THE influence of the multiple scattering of electrons on atomic nuclei on the processes of bremsstrahlung and pair production was investigated in recent years by several authors.[1-4] It was found that the cross-sections for the above processes for particle energies > 10^{11} ev are considerably different from the Bethe-Heitler cross sections.[5] For an experimental test of the theoretical predictions, it is necessary to recalculate the development of cascade showers using the new values of the cross-sections for the basic processes in the early stages of development.

We carried out calculations of the longitudinal development, for two cascade units, of 154 showers initiated by 10^{12} ev electrons, and of 40 showers initiated by an electron or a photon in lead, for four cascade units. The calculations were carried out by the Monte-Carlo method using the "Strela" electronic computer. The cross sections for bremsstrahlung and pair production were taken from reference 4, accounting for the fact that the refraction index of the medium is different from unity. Ionization losses were neglected.

The circles in the figure represent the mean energy spectrum of electrons at the depth of 0.5,



Mean energy spectra of electrons at various depths. Solid curves are taken from reference 5; circles represent calculations of the authors. The scale indicated refers to the curves for t = 0.5, 1.0, and 1.5. In order to obtain numerical values the ordinate of the first curve should be multiplied by 10^{-1}, of the second – by 3×10^{-1}, and of the third – by 1. The curve for t = 4 is represented in a logarithmic scale. The latter curve is calculated according to reference 5, since that given in reference 4 is subject to a ~ 30% error.

Number of showers having N electrons with energy > E at depth t

$t = 0.5$					$t = 1.5$				
N	E, ev				N	E, ev			
	10^{10}	$4\cdot10^{9}$	10^{9}	$4\cdot10^{8}$		10^{10}	$4\cdot10^{9}$	10^{9}	$4\cdot10^{8}$
0	1	0	0	0	0—5	103	76	46	41
1	102	94	84	83	6—10	45	57	49	44
2	24	23	14	9	11—15	4	18	35	29
3	16	24	38	41	16—20	1	2	14	21
4	7	6	4	6	21—25	0	1	6	14
5	4	5	9	8	26—30	0	0	3	0
6	0	2	0	2	31—35	0	0	0	3
7	0	0	4	4	36—40	0	0	1	1
8	0	0	1	0					
9	0	0	0	0					
10	0	0	0	1					

1.0, 1.5, and 4 cascade units, and the solid curves represent the spectra calculated using the usual values of the cross-sections.[6] It is evident that the energy spectrum calculated accounting for multiple scattering is different: there are more high-energy particles and less low-energy particles ($< 10^9$ ev) present than in the usual spectrum.

The distribution of showers with respect to the number of particles with energy > E at two depths is given in the table. It can be seen that the fluctuations of $\overline{N}(>E)$, of the order of $\pm 0.7\,\overline{N}(>E)$, occur in about 30% of all cases at the depth of one cascade unit. Fluctuations of $\overline{N}(>E)$ in showers calculated using the usual values of the cross sections are, evidently, of similar magnitude. Great statistical accuracy is, therefore, needed for a confirmation of the effects predicted in references 1 to 4 by a measurement of the energy spectrum of electrons with energies 4×10^8 ev in showers initiated by 10^{12}-ev particles.

The authors thank V. Ia. Pivkin for help in the reduction of data.

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Translated by H. Kasha
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INCREASE OF THE BAROMETRIC EFFECT WITH THE ENERGY OF EXTENSIVE AIR SHOWERS

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Submitted to JETP editor April 9, 1958

J. Exptl. Theoret. Phys. (U.S.S.R.) **35**, 295-296 (July, 1958)

TWO series of observations of the time variations of extensive air showers frequency were carried out in 1954 through 1956 in Yakutsk, latitude 62° N, longitude 129° E, elevation 100 m. The measurements covered a range of mean shower densities and arrays of self-quenching Geiger-Müller counters were used.

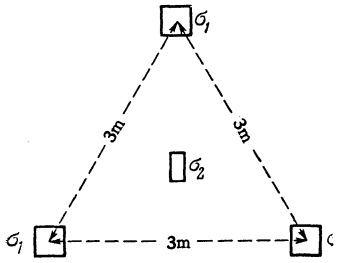

FIG. 1. Diagram of the position of counter trays under 60 g/cm² of matter. Effective counter tray area: $\sigma_1 = 0.1$ m², $\sigma_2 = 0.033$ m².

In the first series (Fig. 1), triple coincidences of counter trays of area σ_1 and fourfold coincidences C_3 and C_4 were recorded under 60 g/cm² of matter. In the second series (Fig. 2), the thickness was reduced to 2.5 g/cm² of a light substance. Six-fold coincidences C_6 of counter trays of area σ_1, eight-fold coincidences C_8 and, independently, coincidences C_3 not accompanied by a six-fold coincidence were recorded in the second series besides the coincidences C_3 and C_4 in the two independent arrays.

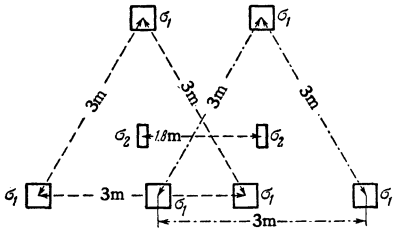

FIG. 2. Diagram of the position of counter trays under 2.5 g/cm² of matter. Effective counter tray area: $\sigma_1 = 0.1$ m², $\sigma_2 = 0.033$ m².

A statistical analysis of the variation of the mean daily number of showers, correlated with the variations of the mean daily values of the temperature and pressure at the point of observation, revealed a marked increase of the barometric coefficient with increasing mean particle