temperature variations of the lattice parameters may lead to analogous results. Thus, in addition to the previously noted change[17] in the concentration of current carriers in bismuth at temperatures higher than the degeneracy temperature of the electron gas, i.e., higher than 70-140° K, one can expect, for bismuth, a variation of the electron concentration related to the decrease of the lattice parameters upon cooling. The validity of this hypothesis could explain the lack of agreement in the curves of the dependence of the resistance of bismuth upon the magnitude of the effective magnetic field $H(r_{00^{\circ}C}/r_{0T})$ (see references 3, 4) obtained at different temperatures, because the Köhler scheme[18] does not take into account the variation in the number of current carriers with temperature.

On the basis of these same considerations, a comparison of galvanometric properties of bismuth having different purities is not possible, because, in addition to the changes in the mean free path caused by the admixtures, a very strong variation in the electron concentration can take place. Therefore, the considerable discrepancy between the curves of the dependence of the Hall constant upon the magnitude of the magnetic field, discovered by Gerritsen and de Haas[10], and the curves of $\Delta r_{HT}/r_{0T}$ is $H(r_{00^{\circ}C}/r_{0T})$, obtained by Borovik[3] for different samples of bismuth, is not surprising.

It is quite possible that the dependence of electron concentration upon pressure and the related dependence of electron concentration upon temperature may take place not only in bismuth, but also in a number of other metals and alloys.

It should be remarked that the oscillations of the Hall effect, preserved during the uniform compression, suggest the possibility of studying the influence of a uniform compression on the De Haas-van Alphen effect. This supposition becomes more probable if one evaluates the results of studies in references 10, 11, 12, which point out the correlation of the oscillation of the Hall e.m.f. with the magnetic susceptibility in bismuth.

A major part of the present work was conducted at the Cryogenic Laboratory of the Moscow State Institute of Measures and Measuring Apparatus, in connection with which we consider it our pleasant duty to express appreciation to the Director of the Laboratory, Prof. P. G. Strelkov and to A. S. Borovik-Romanov. We also express thanks to T. I. Kostina, N. M. Kreynes and V. V. Evdokimova for their assistance in conducting experiments.

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* A detailed communication about the results of the investigation of the influence of a uniform compression on pure bismuth will be published in the near future.

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On the Observation of Cerenkov Radiation Accompanying Broad Atmospheric Showers of Cosmic Rays

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(Submitted to JETP editor November 30, 1954)
J. Exper. Theoret. Phys. USSR **28**, 384
(March, 1955)

CERENKOV radiation, generated during the passage of fast charged particles through matter, can take place not only in dense media, but also in air, under the condition of a sufficiently high velocity of the particles. The intensity of light emitted by each particle in this case is very small, but in the case of a passage through the atmosphere of broad showers of cosmic rays, when a large number of particles simultaneously create a directed radiation, this radiation can be registered above the background of the night sky light.

The first results on the observation of this phenomenon were published by Galbraith and Jelley[1,2]. Theoretically it was considered by Gol'danskii and Zhdanov[3].

We have conducted preliminary experiments on the investigation of flashes in the illumination of the night sky and on the determination of their connection with broad showers through the Cerenkov radiation which they generate. The work was conducted at a height of 3860 meters above sea level, on moonless nights. The intensity distribution of light flashes and their coincidence in time with the passage of broad showers was investigated. The apparatus consisted of a parabolic mirror with a diameter of 30 cm, a photomultiplier and an electronic network. The light which fell upon the mirror at an angle from 0° to 10° to the vertical, was focused upon the cathode of the photomultiplier. The amplitude of the electrical pulses of the photomultiplier was measured by means of a network with a resolution in time of 5×10^{-8} sec. The amplification ratio of the photomultiplier was regularly controlled during the experiments.

In measuring the distribution of the light impulses according to their magnitude, it was possible to register from 1.5 to 2 pulses a minute. Under these conditions, the background, determined by the current fluctuations in the photomultiplier, did not affect the results of the measurements. The measurement was being controlled by illuminating the photocathode by a constant source of light, creating the same current at the output of the photomultiplier.

Distribution of the pulse amplitudes, measured in a tenfold range, turned out to be close to a power law, with the exponent of the integral spectrum equal to -1.5. This form of the spectrum reminds one of the density spectrum of broad atmospheric showers.

Several experiments were also made during cloudy weather. At a height of the cloud layer of 2000 meters above the place of observations the number of pulses per minute decreased approximately to half its value. During the study of connection between light flashes and wide atmospheric showers, only those flashes were registered which coincided in time with the signal from the counter system. This system was situated at a distance of 70 meters from the mirror and represented a set of a large number of hodoscopic counters, directed by a scheme of multiple coincidences. With the aid of this arrangement showers were selected which had been created by primary particles with energies of about 10^{14} eV, the axes of which were located within the limits of a circle of a radius of 50 meters from the center of the counting system *.

It was found as the result of measurements that, in 5 % of the cases, broad atmospheric showers were accompanied by light flashes, the intensity amplitude of which was above the level of our apparatus. Such a small percentage of coincidences is basically explainable by the fact that the light was being gathered within a space angle of 0.1 steradian, while the hodoscopic system registered showers passing at all possible angles to the vertical. The number of light flashes followed by registrations of showers in the hodoscopic system, turned out to be 25 times smaller than the total number of light flashes of the same amplitude. This should be explained by the fact that, in accordance with reference 3, the Cerenkov radiation of broad showers is distributed within the limits of a circle with the radius of about 250 meters and, consequently, the mirror system should register showers whose axes pass within a distance of 250 meters from the mirror system, while the counter system registered showers at distances up to only 50 meters.

Thus the experiments confirmed the possibility of observing the Cerenkov radiation engendered by wide atmospheric showers with an energy of 10^{14} eV.

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* Some 80 % of the showers registered by the system passed within the limits of a circle of a 50 meter radius.

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