

SCIENTIFIC SESSION OF THE DIVISION OF GENERAL PHYSICS AND ASTRONOMY,
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A scientific session of the Division of General Physics and Astronomy of the USSR Academy of Sciences was held on April 28 and 29, 1971 in the Conference Hall of the P. N. Lebedev Physics Institute. The following papers were delivered:

1. V. A. Krat, First Results from the Third Flight of the Soviet Solar Stratospheric Observatory.
2. V. N. Kuril'chik, Relativistic Electrons in Extragalactic Radio Sources.
3. Yu. N. Denisjuk and V. I. Sukhanov, Holography in Two-dimensional and Three-dimensional Media.
4. M. I. D'yakonov, B. P. Zakharchenya, V. I. Perel', S. I. Safarov, and V. G. Fleisher, Orientation of Electron Spins in Semiconductors.
5. Yu. M. Gal'perin, P. E. Zil'berman, S. N. Ivanov, V. D. Kagan, and G. D. Mansfel'd, A New Type of Acoustoelectric Nonlinearity (Nonlinear Landau Damping of Sound Waves).

We publish below brief contents of the papers.

V. A. Krat. First Results from the Third Flight of the Soviet Solar Stratospheric Observatory.

During the third flight (July 30, 1970) of the Soviet stratospheric solar observatory, 93 photographs of the sun's photosphere were obtained with unsurpassed resolution (the theoretical limit of resolution for a Cassegrain telescope with a 50-cm primary mirror). Twenty spectrograms with resolution double that of the best spectrograms recorded on the ground were also obtained.

The basic results obtained on reduction of some of the material collected reduce, briefly stated, to the following:

1. Comparison of 15 photographs of a series taken of a large sunspot in group No. 359 (numeration according to the "Solar Data") showed that changes can be observed even within two minutes both in the nucleus of the spot and in its penumbra. The strongest changes occur in the nucleus of the spot, which undergoes a complete change in structure in 40 min. The structure of the nucleus changes more rapidly than that of the penumbra. The nucleus has nothing structural in common with the granulation and presents an inhomogeneous continuous background with stellate inclusions. The structural elements were analyzed photometrically. This phenomenon is interpreted as the beginning of dissipation of the sunspot's magnetic field into individual strands of the facular or magnetic-bundle type.

2. The photometric analysis of the penumbra and nucleus structural elements of the sunspot has convinced us that the average coefficient of opacity in sunspots should be higher than the value usually assumed. The average brightness fluctuation of the photospheric granulation is 8.8%, but 11% after correction for the contrast frequency response of the instrument.

3. A preliminary analysis of the radial velocities of

the granulation according to the spectrograms, with recognition of the fact that large brightness gradients are observed at high resolution between the granules and the spaces between them—gives a satisfactory explanation of the blue-shift effect at the center of the disk, which obscures the Einstein effect.

4. It was observed that a velocity gradient exists in the dark intervals between granules and increases with height in the atmosphere. The correlation between the brightness distribution in the photosphere and the radial velocities is violated in the upper atmospheric layers.

5. It is shown that outside of the active processes, the average dimensions of the chromospheric elements are nearly twice as large as those of the small photospheric elements, and are represented by effective diameters of 500–600 km.

V. N. Kuril'chik. Relativistic Electrons in Extragalactic Radio Sources.

Analysis of the continuous radio-emission spectra of extra-galactic objects (quasars, radio galaxies, normal spiral galaxies) speaks convincingly in favor of a discretely continuous distribution of the spectral indices α (the exponents in the frequency dependence of the spectral flux density of the radio emission $F_\nu \sim \nu^{-\alpha}$), which characterize the power-law energy spectra of relativistic electrons emitting by the synchrotron mechanism $N(E)dE \sim E^{-\gamma}dE, \gamma = 2\alpha + 1$.

a) Distribution of spectral indices encountered among objects in 3CR catalogue; b) same, for radio-emission spectra of normal spiral galaxies; c) spectral-index distribution of objects in 3CR catalogue in the first maximum; spectra whose indices may be clearly high owing to the influence of halo-like radio structures have been eliminated; the dashed lines indicate the theoretical limits of the distribution; d) distribution of spectral indices of the spectra of halo-like radio structures of objects in catalogue 3CR.

