Science Session of Division of General Physics and Astronomy, USSR Academy of Sciences

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A science session of the Division of General Physics and Astronomy of the USSR Academy of Sciences was held on September 27 and 28, 1972, in the Conference Hall of the P. N. Lebedev Physics Institute. The following papers were presented at the session:

1. I. D. Karachentsev. The Dynamic Conditions in Galactic Systems and the Problem of Latent Matter.

2. I. M. Kopylov and R. N. Kumaĭgorodskaya. Certain Distinctive Features of the Structure of the Atmospheres of Magnetic Stars.

3. M. I. Elinson. Problems of Functional Microelectronics.

4. K. A. Valiev. Present-day Semiconductor Microelectronics and the Prospects of its Development.

5. S. V. Bogdanov and D. V. Sheloput. The Current State of Acoustooptics.

We publish below summaries of the papers presented.

I. D. Karachentsev. The Dynamic Conditions in Galactic Systems and the Problem of Latent Matter. Galactic Systems of different scales—binaries, groups, clusters, and superclusters—indicate a discrepancy between the mass estimates computed from the virial theorem under the condition of stationarity of the systems and those determined from the internal rotation of the galaxies. The magnitude of this discrepancy attains one-two orders of magnitude and, on the average, increases when we go from binaries and groups to clusters of galaxies. There are alternative possibilities for the explanation of the virial paradox: either the galactic systems are stabilized by unobservable matter, or they are nonstationary and break up.

The following forms of latent matter have been suggested for the stabilization of the galactic systems: 1) independently indiscernible dwarf galaxies, 2) a homogeneous cosmological background, 3) dust, 4) neutral and ionized gas, and 5) invisible massive objects. Analysis of the optical data on galactic systems, as well as of the data on x-ray, L_α and ratio fluxes from clusters and the Metagalaxy as a whole does not support the existence of latent matter in quantities necessary for the stability of the systems.

The idea that the galactic systems are in a nonstationary state is at variance with certain observational data. The age of the disintegrating galactic systems is of the order of 3×10^8–3×10^9 years, whereas the theory of stellar evolution yields for the age of the stars in the elliptic galaxies an estimate of $(1–2)\times10^9$ years. The virial-mass surplus has been recorded for the majority (70–90%) of the galactic systems that have been studied, and, according to the latest data, only ≈5% of the galaxies generate a diffuse background between the systems. A significant discrepancy is observed between the velocity dispersions for the galaxies and members of clusters. As a way out of the indicated contradictions, we consider a phenomenological model according to which a nonstationary galactic system is formed through successive fragmentations of massive objects identified as galactic nuclei.

The following procedures are suggested for choosing between the stability and disintegration hypotheses for galactic systems: 1) investigation of the shape and substructure of clusters, 2) determination of the type of motions in the systems from the radial velocities and the intergalactic distances, 3) correlation analysis of the radial velocities and the apparent magnitudes of the galaxies in groups and clusters with large angular diameters, 4) investigation of the effects of the interaction in isolated binary galaxies, and 5) analysis of the kinematics of "ultraclose" binary galaxies.

Optimum programs are suggested for observations in large telescopes for the elucidation of the dynamical state of galactic systems.

[1]I. D. Karachentsev, Soobshch. Byurakanskoĭ Obs. **39**, 76 (1968).
[2]I. D. Karachentsev and V. Yu. Terebizh, ibid. **41**, 99 (1970).
[3]I. D. Karachentsev, Astrofiz. Issled. (Izv. SAO AN SSSR) **5**, 3 (1972).
[4]I. Karachentsev, W. Zonn, and A. Shcherbanovsky, Astrophys. Lett. **11**, 151 (1972).

I. M. Kopylov and R. N. Kumaĭgorodskaya. Certain Distinctive Features of the Structure of the Atmospheres of Magnetic Stars. The spectra of stars possessing strong and, as a rule, variable fields have a number of remarkable distinctive features. To these pertain the anomalous intensity of the lines of certain elements, the variability of the intensities and radial velocities of these lines in time (with the period of the variation of the magnetic-field intensity). These so-called magneto-variable or peculiar stars also exhibit periodic brightness and color variations.

Spectral investigations that have thus far been carried out have shown that the atmospheres of magneto-variable stars have a specific structure and, apparently, an anomalous chemical composition, which is connected with the presence of the high-intensity magnetic fields. However, the nature of the influence of the magnetic field on the formation of such atmospheres still remains obscure.

A spectrophotometric investigation of the magneto-variable star α^2CVn, using a series of high-resolution (linear dispersion 1.3 Å/mm) spectrograms, enabled us to obtain new data on the distinctive features of the structure of the atmospheres of this and similar stars.

A differentiated study of the contours of the hydrogen lines H_γ, H_δ, H_8, and H_9 showed that the various contour parameters vary synchronously with the phase of the variation of the stellar magnetic field, but the largest variations occur with the central parts of the contour—with the halfwidth ($\Delta\lambda_{0.6}$), the central intensity (R_0), and the total intensity (W_0) of the line cores (Fig. 1). The